Appendix 1: QCA Results

"Pathways for overcoming commitment problems in the transition from intra-state conflict to peace: a fuzzy set qualitative comparative analysis of 34 comprehensive peace agreements"

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1 Data matrices

Table 1: Data matrix with calibrated conditions

Cases (identifying label for comprehensive peace agreement)	**Multidimensional Power-sharing (PS)**	**Robust Transitional Justice (TJ)**	**Comprehensive Transitional Reform (TR)**	**Strong International Assistance (IA)**	**High-level Implementation Process (IP)**	**Successful Transition from Conflict to Negative Peace (SCNPT)**
Leb89	0,265939271	0,088116187	0,782482263	0,265939271	0,318703658	0,474551085
Cam91	0,734060729	0,314545774	0,412230626	0,95460828	0,440066593	0,210072556
Sal92	0,734060729	0,645863538	0,605092621	0,95460828	0,914956117	0,963441529
Mal92	0,734060729	0,314545774	0,782482263	0,265939271	0,623384378	0,424176608
Moz92	0,734060729	0,314545774	0,412230626	0,95460828	0,858122071	0,963441529
Ind93	0,95460828	0,197480898	0,605092621	0,04539172	0,113362522	0,150329008
Rwa93	0,734060729	0,385238618	0,47047176	0,95460828	0,44921782	0,178249067
SoA93	0,734060729	0,645863538	0,782482263	0,04539172	0,858122071	0,963441529
Ang94	0,734060729	0,314545774	0,356347454	0,95460828	0,279884005	0,245877622
Dji94	0,95460828	0,197480898	0,256497149	0,265939271	0,797029701	0,474551085
Nig95	0,95460828	0,197480898	0,356347454	0,265939271	0,368798665	0,963441529
Cro95	0,265939271	0,152685117	0,176934337	0,95460828	0,440066593	0,963441529
Bos95	0,95460828	0,645863538	0,782482263	0,95460828	0,874764821	0,963441529

Phi96	0,95460828	0,197480898	0,782482263	0,734060729	0,326804115	0,049518265
Sie96	0,734060729	0,314545774	0,47047176	0,734060729	0,063752584	0,285579084
Gua96	0,265939271	0,858479442	0,894131153	0,95460828	0,403926054	0,963441529
Taj97	0,734060729	0,251517933	0,304120199	0,95460828	0,467617648	0,328895253
Ban97	0,734060729	0,461130977	0,356347454	0,04539172	0,244098649	0,963441529
UKg98	0,265939271	0,461130977	0,894131153	0,265939271	0,903062591	0,963441529
GuB98	0,265939271	0,066085399	0,118129937	0,95460828	0,914956117	0,474551085
Ins99	0,734060729	0,197480898	0,782482263	0,95460828	0,889706243	0,963441529
Sie99	0,95460828	0,645863538	0,47047176	0,95460828	0,623384378	0,424176608
Con99	0,265939271	0,197480898	0,214037781	0,734060729	0,440066593	0,474551085
Bur00	0,734060729	0,952778339	0,951988483	0,95460828	0,486105974	0,150329008
Dji01	0,265939271	0,385238618	0,412230626	0,265939271	0,265191521	0,963441529
Mac01	0,734060729	0,251517933	0,894131153	0,95460828	0,839672991	0,963441529
PNG01	0,95460828	0,197480898	0,605092621	0,95460828	0,797029701	0,963441529
Ang02	0,265939271	0,116574595	0,145075555	0,95460828	0,772740358	0,963441529
Lib03	0,95460828	0,645863538	0,782482263	0,95460828	0,772740358	0,963441529

Sen04	0,04539172	0,197480898	0,09562925	0,04539172	0,151446223	0,474551085
Sud05	0,95460828	0,858479442	0,951988483	0,95460828	0,458403553	0,060038102
Ins05	0,95460828	0,461130977	0,782482263	0,734060729	0,746468926	0,963441529
Nep06	0,04539172	0,858479442	0,951988483	0,95460828	0,430955924	0,963441529
Ivo07	0,265939271	0,251517933	0,412230626	0,734060729	0,623384378	0,474551085
Qualitative anchors: (Full non-membership, point of indifference, full membership)	(2.95, 1,50, 0.05)	(11.95, 9.50, 0.05)	(15.95, 12.50, 0.05)	(2.95, 1.50, 0.05)	(99.95, 79.50, 0.05)	(0.05, 0.50, 14.95)

Table 2: Data matrix of raw values of data before calibration

Cases (identifying label for comprehensive peace agreement)	**Country**	**Region**	**Power-sharing**	**Transitional Justice**	**Transitional Reform**	**International Assistance**	**Implementation Process**	**Conflict Years (15)**
Leb89	Lebanon	Middle East & West Asia	1	2	14	1	59	1
Cam91	Cambodia	Asia & Pacific	2	7	11	3	73	7
Sal92	El Salvador	America	2	10	13	3	96	0
Mal92	Mali	Africa	2	7	14	1	83	2
Moz92	Mozambique	Africa	2	7	11	3	92	0
Ind93	India	Asia & Pacific	3	5	13	0	24	9
Rwa93	Rwanda	Africa	2	8	12	3	74	8
SoA93	South Africa	Africa	2	10	14	0	92	0
Ang94	Angola	Africa	2	7	10	3	54	6
Dji94	Djibouti	Africa	3	5	8	1	89	1

Nig95	Niger	Africa	3	5	10	1	65	0
Cro95	Croatia	Europe	1	4	6	3	73	0
Bos95	Bosnia and Herzegovina	Europe	3	10	14	3	93	0
Phi96	Philippines	Asia & Pacific	3	5	14	2	60	15
Sie96	Sierra Leone	Africa	2	7	12	2	7	5
Gua96	Guatemala	America	1	11	15	3	69	0
Taj97	Tajikistan	Middle East & West Asia	2	6	9	3	76	4
Ban97	Bangladesh	Asia & Pacific	2	9	10	0	49	0
UKg98	United Kingdom	Europe	1	9	15	1	95	0
GuB98	Guinea-Bissau	Africa	1	1	4	3	96	1
Ins99	Indonesia (Timor-Leste)	Asia & Pacific	2	5	14	3	94	0
Sie99	Sierra Leone	Africa	3	10	12	3	83	2
Con99	Congo	Africa	1	5	7	2	73	1
Bur00	Burundi	Africa	2	12	16	3	78	9
Dji01	Djibouti	Africa	1	8	11	1	52	0
Mac01	Macedonia FYR	Europe	2	6	15	3	91	0
PNG01	Papua New Guinea	Asia & Pacific	3	5	13	3	89	0
Ang02	Angola	Africa	1	3	5	3	88	0
Lib03	Liberia	Africa	3	10	14	3	88	0
Sen04	Senegal	Africa	0	5	3	0	33	1
Sud05	Sudan	Africa	3	11	16	3	75	14
Ins05	Indonesia	Asia & Pacific	3	9	14	2	87	0
Nep06	Nepal	Asia & Pacific	0	11	16	3	72	0
Ivo07	Cote D'Ivoire	Africa	1	6	11	2	83	1

 # Descriptive statistics for the raw data matrix

	vars	n	mean	sd	median	trimmed	mad	min	max	range	skew	kurtosis	se
country*	1	34	15.68	9.33	15.5	15.68	11.86	1	31	30	0.01	-1.36	1.60
region*	2	34	2.12	1.34	1.0	1.96	0.00	1	5	4	0.67	-1.00	0.23
power_sharing	3	34	1.91	0.90	2.0	1.96	1.48	0	3	3	-0.32	-0.90	0.15
transitional_justice	4	34	7.09	2.77	7.0	7.18	2.97	1	12	11	-0.12	-0.87	0.47
transitional_reform	5	34	11.65	3.49	12.5	12.00	2.22	3	16	13	-0.88	-0.14	0.60
international_assistance	6	34	2.15	1.10	3.0	2.29	0.00	0	3	3	-0.80	-0.92	0.19
implementation_process	7	34	73.68	21.38	77.0	76.93	17.79	7	96	89	-1.33	1.36	3.67
conflict_years_15	8	34	2.56	4.14	0.5	1.75	0.74	0	15	15	1.65	1.70	0.71

2 Calibration patterns

Figure 1: Calibration patterns of the conditions and outcome

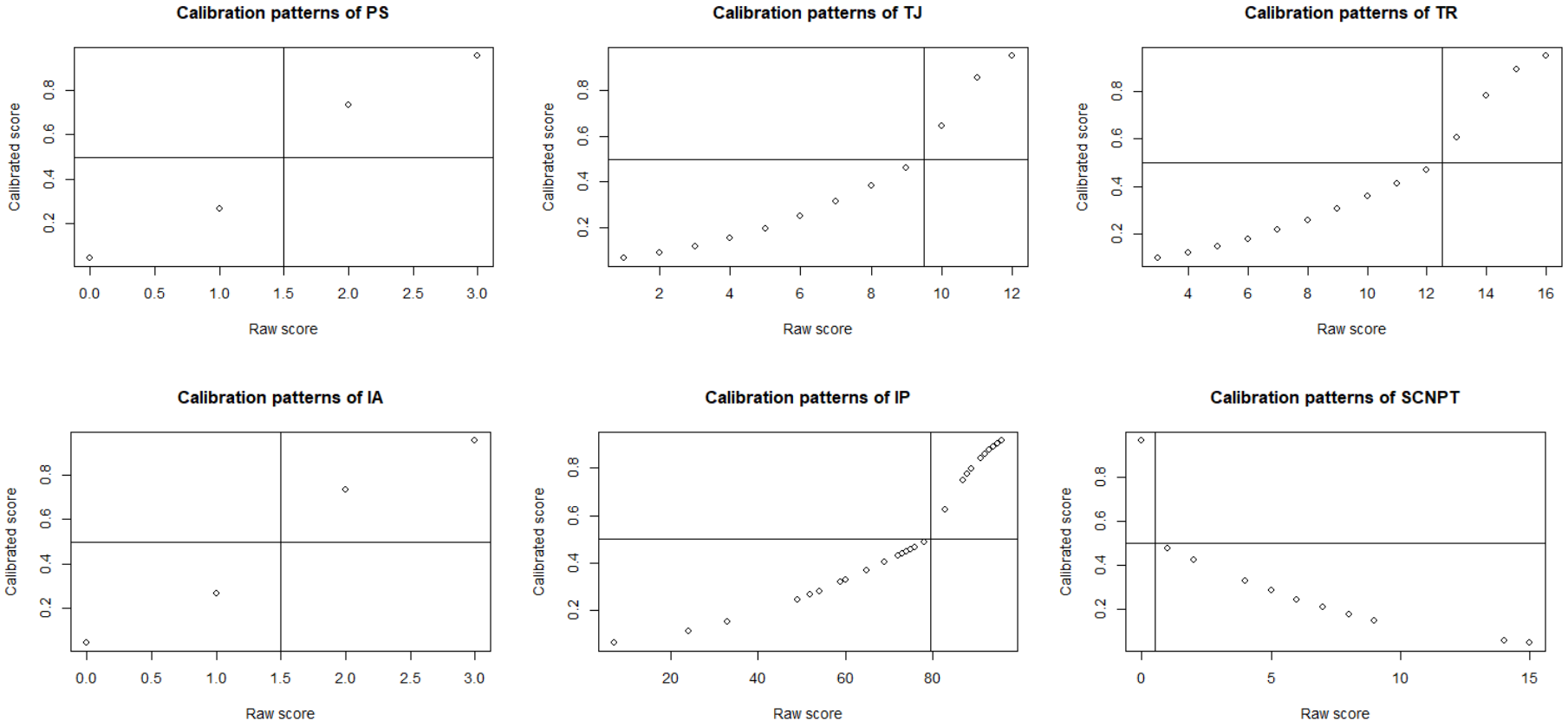
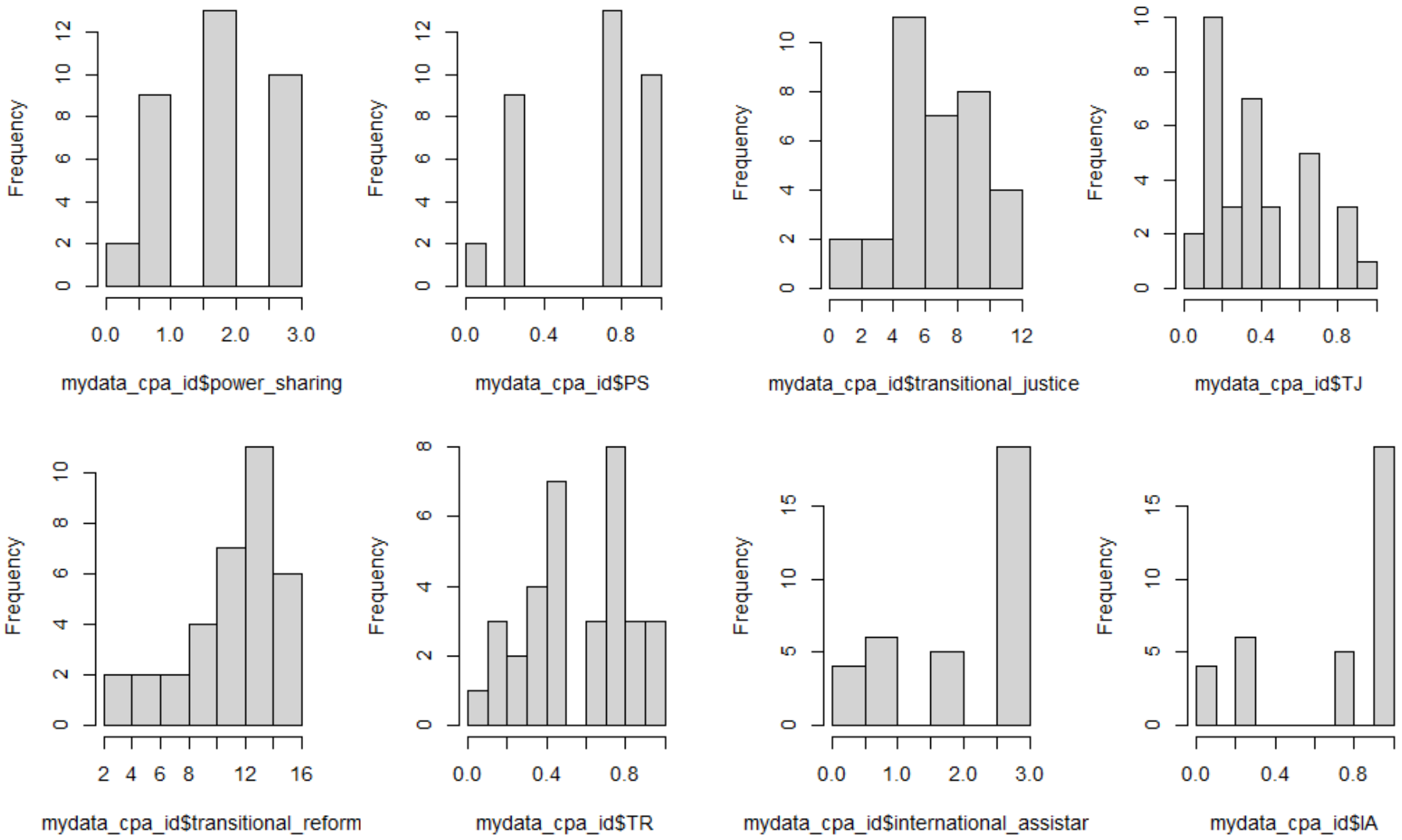
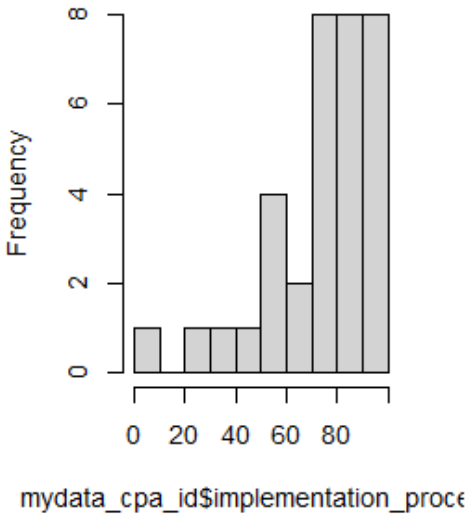
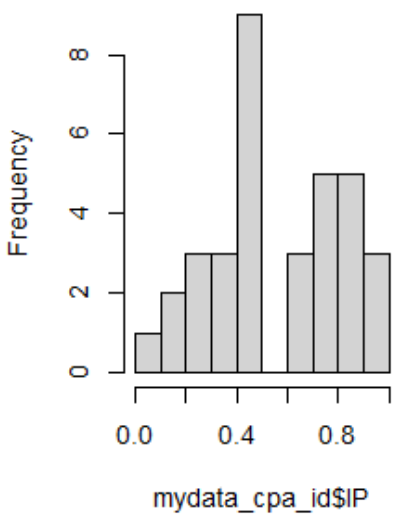
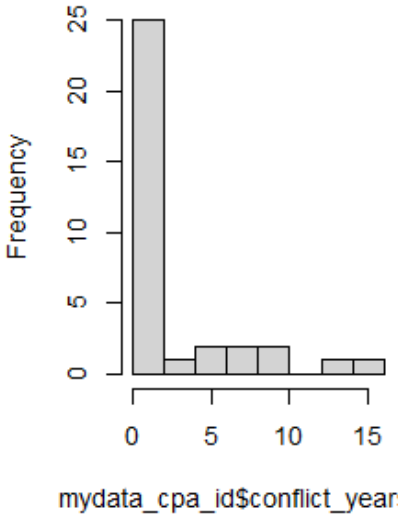


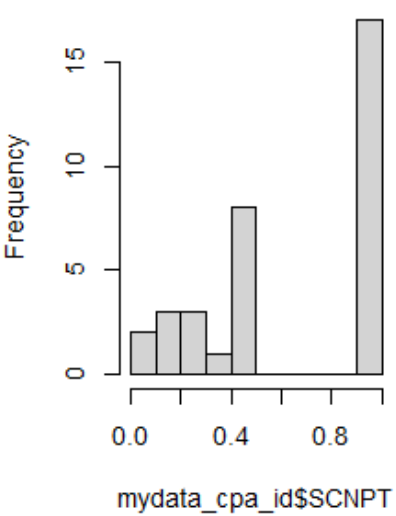
Figure 2: Visualizing with histogram, combining two graphs




Frequency
0
2
4
6
8
0
20
40
60
80
mydata_cpa_id$implementation_proce


Frequency
0
2
4
6
8
0.0
0.4
0.8
mydata_cpa_id$IP


Frequency
0
5
10
15
20
25
0
5
10
15
mydata_cpa_id$conflict_years_15


Frequency
0
5
10
15
0.0
0.4
0.8
mydata_cpa_id$SCNPT

3 Overview of calibrated data

Skewness checks

```
[1] "Set PS - Cases > 0.5 / Total number of cases: 23 / 34 = 67.65 %"
[2] "Set TJ - Cases > 0.5 / Total number of cases: 9 / 34 = 26.47 %"
[3] "Set TR - Cases > 0.5 / Total number of cases: 17 / 34 = 50 %"
[4] "Set IA - Cases > 0.5 / Total number of cases: 24 / 34 = 70.59 %"
[5] "Set IP - Cases > 0.5 / Total number of cases: 16 / 34 = 47.06 %"
[6] "Set SCNPT - Cases > 0.5 / Total number of cases: 17 / 34 = 50 %"
```

Case names that are more inside than outside of the set

```
PS > 0.5
 [1] "Cam91" "Sal92" "Mal92" "Moz92" "Ind93" "Rwa93" "SoA93" "Ang94" "Dji94" "Nig95" "Bos95" "Phi96" "Sie96"
[14] "Taj97" "Ban97" "Ins99" "Sie99" "Bur00" "Mac01" "PNG01" "Lib03" "Sud05" "Ins05"

TJ > 0.5
[1] "Sal92" "SoA93" "Bos95" "Gua96" "Sie99" "Bur00" "Lib03" "Sud05" "Nep06"

TR > 0.5
 [1] "Leb89" "Sal92" "Mal92" "Ind93" "SoA93" "Bos95" "Phi96" "Gua96" "UKg98" "Ins99" "Bur00" "Mac01" "PNG01"
[14] "Lib03" "Sud05" "Ins05" "Nep06"

IA > 0.5
 [1] "Cam91" "Sal92" "Moz92" "Rwa93" "Ang94" "Cro95" "Bos95" "Phi96" "Sie96" "Gua96" "Taj97" "GuB98" "Ins99"
[14] "Sie99" "Con99" "Bur00" "Mac01" "PNG01" "Ang02" "Lib03" "Sud05" "Ins05" "Nep06" "Ivo07"

IP > 0.5
 [1] "Sal92" "Mal92" "Moz92" "SoA93" "Dji94" "Bos95" "UKg98" "GuB98" "Ins99" "Sie99" "Mac01" "PNG01" "Ang02"
[14] "Lib03" "Ins05" "Ivo07"

SCNPT > 0.5
 [1] "Sal92" "Moz92" "SoA93" "Nig95" "Cro95" "Bos95" "Gua96" "Ban97" "UKg98" "Ins99" "Dji01" "Mac01" "PNG01"
[14] "Ang02" "Lib03" "Ins05" "Nep06"
```

 # Case names that are more outside than inside of the set

```
PS < 0.5
 [1] "Leb89" "Cro95" "Gua96" "UKg98" "GuB98" "Con99" "Dji01" "Ang02" "Sen04" "Nep06" "Ivo07"

TJ < 0.5
 [1] "Leb89" "Cam91" "Mal92" "Moz92" "Ind93" "Rwa93" "Ang94" "Dji94" "Nig95" "Cro95" "Phi96" "Sie96" "Taj97"
[14] "Ban97" "UKg98" "GuB98" "Ins99" "Con99" "Dji01" "Mac01" "PNG01" "Ang02" "Sen04" "Ins05" "Ivo07"

TR < 0.5
 [1] "Cam91" "Moz92" "Rwa93" "Ang94" "Dji94" "Nig95" "Cro95" "Sie96" "Taj97" "Ban97" "GuB98" "Sie99" "Con99"
[14] "Dji01" "Ang02" "Sen04" "Ivo07"

IA < 0.5
 [1] "Leb89" "Mal92" "Ind93" "SoA93" "Dji94" "Nig95" "Ban97" "UKg98" "Dji01" "Sen04"

IP < 0.5
 [1] "Leb89" "Cam91" "Ind93" "Rwa93" "Ang94" "Nig95" "Cro95" "Phi96" "Sie96" "Gua96" "Taj97" "Ban97" "Con99"
[14] "Bur00" "Dji01" "Sen04" "Sud05" "Nep06"

SCNPT < 0.5
 [1] "Leb89" "Cam91" "Mal92" "Ind93" "Rwa93" "Ang94" "Dji94" "Phi96" "Sie96" "Taj97" "GuB98" "Sie99" "Con99"
[14] "Bur00" "Sen04" "Sud05" "Ivo07"
```

 # Checking for cases on the crossover point

```
[1] "There are no cases with fuzzy-set scores of 0.5."
```

4 Testing for necessary conditions

 # Testing necessity of conditions for the SCNPT.

```
    Cons.Nec Cov.Nec   RoN
PS     0.674   0.679 0.642
TJ     0.498   0.817 0.895
TR     0.675   0.770 0.773
IA     0.753   0.694 0.591
IP     0.734   0.842 0.834
~PS    0.489   0.855 0.923
~TJ    0.676   0.707 0.686
~TR    0.514   0.747 0.834
~IA    0.372   0.776 0.910
~IP    0.466   0.673 0.794
```

 # Testing necessity of conditions for the ~SCNPT.

```
    Cons.Nec Cov.Nec   RoN
PS     0.853   0.485 0.528
TJ     0.505   0.468 0.747
TR     0.691   0.445 0.586
IA     0.810   0.421 0.433
IP     0.599   0.387 0.564
~PS    0.435   0.429 0.753
~TJ    0.802   0.474 0.548
~TR    0.643   0.527 0.730
~IA    0.412   0.485 0.815
~IP    0.756   0.616 0.767
```

 # Testing for necessary disjunctions.

```
                          inclN   RoN   covN
-------------------------------------------
1  ~PS + TJ + ~IA + IP    0.904  0.584  0.767
2  ~PS + ~TR + ~IA + IP   0.906  0.571  0.762
3  ~PS + TR + ~IA + IP    0.910  0.521  0.744
4  TJ + ~TR + ~IA + IP    0.908  0.516  0.740
-------------------------------------------
```

 # Data frame with the membership scores of the resulting combinations.

	~PS+TJ+~IA+IP	~PS+~TR+~IA+IP	~PS+TR+~IA+IP	TJ+~TR+~IA+IP
Leb89	0.7340607	0.7340607	0.7824823	0.7340607
Cam91	0.4400666	0.5877694	0.4400666	0.5877694
Sal92	0.9149561	0.9149561	0.9149561	0.9149561
Mal92	0.7340607	0.7340607	0.7824823	0.7340607
Moz92	0.8581221	0.8581221	0.8581221	0.8581221
Ind93	0.9546083	0.9546083	0.9546083	0.9546083
Rwa93	0.4492178	0.5295282	0.4704718	0.5295282
SoA93	0.9546083	0.9546083	0.9546083	0.9546083
Ang94	0.3145458	0.6436525	0.3563475	0.6436525
Dji94	0.7970297	0.7970297	0.7970297	0.7970297
Nig95	0.7340607	0.7340607	0.7340607	0.7340607
Cro95	0.7340607	0.8230657	0.7340607	0.8230657
Bos95	0.8747648	0.8747648	0.8747648	0.8747648
Phi96	0.3268041	0.3268041	0.7824823	0.3268041
Sie96	0.3145458	0.5295282	0.4704718	0.5295282
Gua96	0.8584794	0.7340607	0.8941312	0.8584794
Taj97	0.4676176	0.6958798	0.4676176	0.6958798
Ban97	0.9546083	0.9546083	0.9546083	0.9546083
UKg98	0.9030626	0.9030626	0.9030626	0.9030626
GuB98	0.9149561	0.9149561	0.9149561	0.9149561
Ins99	0.8897062	0.8897062	0.8897062	0.8897062
Sie99	0.6458635	0.6233844	0.6233844	0.6458635
Con99	0.7340607	0.7859622	0.7340607	0.7859622
Bur00	0.9527783	0.4861060	0.9519885	0.9527783
Dji01	0.7340607	0.7340607	0.7340607	0.7340607
Mac01	0.8396730	0.8396730	0.8941312	0.8396730
PNG01	0.7970297	0.7970297	0.7970297	0.7970297
Ang02	0.7727404	0.8549244	0.7727404	0.8549244
Lib03	0.7727404	0.7727404	0.7824823	0.7727404
Sen04	0.9546083	0.9546083	0.9546083	0.9546083
Sud05	0.8584794	0.4584036	0.9519885	0.8584794
Ins05	0.7464689	0.7464689	0.7824823	0.7464689
Nep06	0.9546083	0.9546083	0.9546083	0.8584794
Ivo07	0.7340607	0.7340607	0.7340607	0.6233844

5 Truth table for the SCNPT

```
  OUT: output value
    n: number of cases in configuration
 incl: sufficiency inclusion score
  PRI: proportional reduction in inconsistency
```

	PS	TJ	TR	IA	IP	OUT	n	incl	PRI	cases
6	0	0	1	0	1	1	1	1.000	1.000	UKg98
30	1	1	1	0	1	1	1	0.965	0.923	SoA93
3	0	0	0	1	0	1	2	0.952	0.853	Cro95,Con99
15	0	1	1	1	0	1	2	0.948	0.877	Gua96,Nep06
5	0	0	1	0	0	1	1	0.946	0.811	Leb89
1	0	0	0	0	0	1	2	0.922	0.764	Dji01,Sen04
4	0	0	0	1	1	1	3	0.918	0.808	GuB98,Ang02,Ivo07
17	1	0	0	0	0	1	2	0.915	0.811	Nig95,Ban97
22	1	0	1	0	1	1	1	0.912	0.797	Mal92
24	1	0	1	1	1	1	4	0.907	0.849	Ins99,Mac01,PNG01,Ins05
18	1	0	0	0	1	1	1	0.903	0.752	Dji94
28	1	1	0	1	1	1	1	0.903	0.795	Sie99
20	1	0	0	1	1	1	1	0.890	0.787	Moz92
32	1	1	1	1	1	1	3	0.855	0.763	Sal92,Bos95,Lib03
21	1	0	1	0	0	0	1	0.861	0.668	Ind93
31	1	1	1	1	0	0	2	0.797	0.577	Bur00,Sud05
23	1	0	1	1	0	0	1	0.791	0.561	Phi96
19	1	0	0	1	0	0	5	0.768	0.532	Cam91,Rwa93,Ang94,Sie96,Taj97
2	0	0	0	0	1	?	0	-	-	
7	0	0	1	1	0	?	0	-	-	
8	0	0	1	1	1	?	0	-	-	
9	0	1	0	0	0	?	0	-	-	
10	0	1	0	0	1	?	0	-	-	
11	0	1	0	1	0	?	0	-	-	
12	0	1	0	1	1	?	0	-	-	
13	0	1	1	0	0	?	0	-	-	
14	0	1	1	0	1	?	0	-	-	
16	0	1	1	1	1	?	0	-	-	
25	1	1	0	0	0	?	0	-	-	
26	1	1	0	0	1	?	0	-	-	
27	1	1	0	1	0	?	0	-	-	
29	1	1	1	0	0	?	0	-	-	

 # The truth table itself.

```
   PS TJ TR IA IP OUT n               incl                PRI                          cases
1   0  0  0  0  0   1 2 0.922232660814349 0.763897275003106                    Dji01,Sen04
2   0  0  0  0  1   ? 0                 -                   -
3   0  0  0  1  0   1 2 0.951843623372876 0.852861001066625                    Cro95,Con99
4   0  0  0  1  1   1 3  0.91768889323101 0.807549187963846                GuB98,Ang02,Ivo07
5   0  0  1  0  0   1 1 0.945524078672184 0.810729837928947                       Leb89
6   0  0  1  0  1   1 1                 1                 1                       UKg98
7   0  0  1  1  0   ? 0                 -                 -
8   0  0  1  1  1   ? 0                 -                 -
9   0  1  0  0  0   ? 0                 -                 -
10  0  1  0  0  1   ? 0                 -                 -
11  0  1  0  1  0   ? 0                 -                 -
12  0  1  0  1  1   ? 0                 -                 -
13  0  1  1  0  0   ? 0                 -                 -
14  0  1  1  0  1   ? 0                 -                 -
15  0  1  1  1  0   1 2  0.94766333743814 0.877006542833603                    Gua96,Nep06
16  0  1  1  1  1   ? 0                 -                 -
17  1  0  0  0  0   1 2 0.914904783897937 0.810981289174526                    Nig95,Ban97
18  1  0  0  0  1   1 1 0.903331738850303 0.752070488994392                       Dji94
19  1  0  0  1  0   0 5 0.767640443459761 0.532012575097433 Cam91,Rwa93,Ang94,Sie96,Taj97
20  1  0  0  1  1   1 1 0.890414475807018 0.786582578771902                       Moz92
21  1  0  1  0  0   0 1 0.861362397193102 0.667727116752217                       Ind93
22  1  0  1  0  1   1 1 0.912098360037301 0.796768116743524                       Mal92
23  1  0  1  1  0   0 1 0.791081267684978 0.561415094440344                       Phi96
24  1  0  1  1  1   1 4 0.907287613633048 0.848827570077228       Ins99,Mac01,PNG01,Ins05
25  1  1  0  0  0   ? 0                 -                 -
26  1  1  0  0  1   ? 0                 -                 -
27  1  1  0  1  0   ? 0                 -                 -
28  1  1  0  1  1   1 1 0.902946712183814    0.794935177188                       Sie99
29  1  1  1  0  0   ? 0                 -                 -
30  1  1  1  0  1   1 1 0.964905208582823 0.922544441484013                       SoA93
31  1  1  1  1  0   0 2 0.796789872802569 0.576823295027749                    Bur00,Sud05
32  1  1  1  1  1   1 3 0.854974598679438 0.762839443782812             Sal92,Bos95,Lib03
```

 # The line numbers for the observed causal configurations.

```
[1]  1  3  4  5  6 15 17 18 19 20 21 22 23 24 28 30 31 32
```

 # Deviant cases for consistency.

```
                  1                                3                                4 
            "Sen04"                          "Con99"                    "GuB98,Ivo07" 
                  5                                6                               15 
            "Leb89"                               ""                               "" 
                 17                               18                               19 
                 ""                          "Dji94" "Cam91,Rwa93,Ang94,Sie96,Taj97" 
                 20                               21                               22 
                 ""                          "Ind93"                          "Mal92" 
                 23                               24                               28 
            "Phi96"                               ""                          "Sie99" 
                 30                               31                               32 
                 ""                    "Bur00,Sud05"                               "" 
```

6 Truth table for the ~SCNPT

```
  OUT: output value
    n: number of cases in configuration
 incl: sufficiency inclusion score
  PRI: proportional reduction in inconsistency
```

	PS	TJ	TR	IA	IP	OUT	n	incl	PRI	cases
19	1	0	0	1	0	0	5	0.736	0.468	Cam91,Rwa93,Ang94,Sie96,Taj97
23	1	0	1	1	0	0	1	0.733	0.439	Phi96
5	0	0	1	0	0	0	1	0.726	0.047	Leb89
31	1	1	1	1	0	0	2	0.723	0.423	Bur00,Sud05
21	1	0	1	0	0	0	1	0.721	0.332	Ind93
3	0	0	0	1	0	0	2	0.714	0.127	Cro95,Con99
1	0	0	0	0	0	0	2	0.683	0.037	Dji01,Sen04
18	1	0	0	0	1	0	1	0.660	0.127	Dji94
6	0	0	1	0	1	0	1	0.646	0.000	UKg98
22	1	0	1	0	1	0	1	0.645	0.180	Mal92
17	1	0	0	0	0	0	2	0.635	0.189	Nig95,Ban97
15	0	1	1	1	0	0	2	0.627	0.123	Gua96,Nep06
28	1	1	0	1	1	0	1	0.624	0.205	Sie99
4	0	0	0	1	1	0	3	0.613	0.095	GuB98,Ang02,Ivo07
20	1	0	0	1	1	0	1	0.596	0.213	Moz92
30	1	1	1	0	1	0	1	0.582	0.077	SoA93
32	1	1	1	1	1	0	3	0.534	0.237	Sal92,Bos95,Lib03
24	1	0	1	1	1	0	4	0.479	0.151	Ins99,Mac01,PNG01,Ins05
2	0	0	0	0	1	?	0	-	-	
7	0	0	1	1	0	?	0	-	-	
8	0	0	1	1	1	?	0	-	-	
9	0	1	0	0	0	?	0	-	-	
10	0	1	0	0	1	?	0	-	-	
11	0	1	0	1	0	?	0	-	-	
12	0	1	0	1	1	?	0	-	-	
13	0	1	1	0	0	?	0	-	-	
14	0	1	1	0	1	?	0	-	-	
16	0	1	1	1	1	?	0	-	-	
25	1	1	0	0	0	?	0	-	-	
26	1	1	0	0	1	?	0	-	-	
27	1	1	0	1	0	?	0	-	-	
29	1	1	1	0	0	?	0	-	-	

 # The truth table itself.

	PS	TJ	TR	IA	IP	OUT	n	incl	PRI	cases
1	0	0	0	0	0	0	2	0.68268957277256	0.0366411230879493	Dji01,Sen04
2	0	0	0	0	1	?	0	-	-	
3	0	0	0	1	0	0	2	0.714202202965216	0.126761507023838	Cro95,Con99
4	0	0	0	1	1	0	3	0.613032684903682	0.0952354190699118	GuB98,Ang02,Ivo07
5	0	0	1	0	0	0	1	0.725590252040746	0.046595703125716	Leb89
6	0	0	1	0	1	0	1	0.646396619859801	0	UKg98
7	0	0	1	1	0	?	0	-	-	
8	0	0	1	1	1	?	0	-	-	
9	0	1	0	0	0	?	0	-	-	
10	0	1	0	0	1	?	0	-	-	
11	0	1	0	1	0	?	0	-	-	
12	0	1	0	1	1	?	0	-	-	
13	0	1	1	0	0	?	0	-	-	
14	0	1	1	0	1	?	0	-	-	
15	0	1	1	1	0	0	2	0.626812705697604	0.122993457166398	Gua96,Nep06
16	0	1	1	1	1	?	0	-	-	
17	1	0	0	0	0	0	2	0.634900546323402	0.189018710825476	Nig95,Ban97
18	1	0	0	0	1	0	1	0.659594809207534	0.126947236940019	Dji94
19	1	0	0	1	0	0	5	0.735851436501297	0.467987424902567	Cam91,Rwa93,Ang94,Sie96,Taj97
20	1	0	0	1	1	0	1	0.59610577374722	0.213417421228098	Moz92
21	1	0	1	0	0	0	1	0.721397407182771	0.332272883247785	Ind93
22	1	0	1	0	1	0	1	0.645323985337508	0.179975772507237	Mal92
23	1	0	1	1	0	0	1	0.73257143976871	0.438584905559656	Phi96
24	1	0	1	1	1	0	4	0.479423399649499	0.151172429922772	Ins99,Mac01,PNG01,Ins05
25	1	1	0	0	0	?	0	-	-	
26	1	1	0	0	1	?	0	-	-	
27	1	1	0	1	0	?	0	-	-	
28	1	1	0	1	1	0	1	0.623772271182908	0.205064822812	Sie99
29	1	1	1	0	0	?	0	-	-	
30	1	1	1	0	1	0	1	0.581998950530127	0.0774555585159883	SoA93
31	1	1	1	1	0	0	2	0.723008535735169	0.423176704972251	Bur00,Sud05
32	1	1	1	1	1	0	3	0.533518143816284	0.237160556217188	Sal92,Bos95,Lib03

 # Deviant cases for consistency.

```
       1                         3                         4                         5
"Dji01"                   "Cro95"                   "Ang02"                        ""
       6                        15                        17                        18
"UKg98"             "Gua96,Nep06"             "Nig95,Ban97"                        ""
      19                        20                        21                        22
      ""                   "Moz92"                        ""                        ""
      23                        24                        28                        30
      "" "Ins99,Mac01,PNG01,Ins05"                        ""                   "SoA93"
      31                        32
      ""       "Sal92,Bos95,Lib03"
```

7 Logical minimization for the SCNPT

7.1. Conservative solution

```
M1: PS*TR*IP + PS*IA*IP + ~PS*TJ*TR*IA*~IP + (PS*~TJ*IP + ~PS*~TJ*~TR*IA + ~PS*~TJ*TR*~IA + ~TJ*~TR*~IA*~IP)
    -> SCNPT
M2: PS*TR*IP + PS*IA*IP + ~PS*TJ*TR*IA*~IP + (~PS*~TJ*~TR*IA + ~PS*~TJ*~TR*~IP + ~PS*~TJ*TR*~IA +
    PS*~TJ*~TR*~IA) -> SCNPT
M3: PS*TR*IP + PS*IA*IP + ~PS*TJ*TR*IA*~IP + (~PS*~TJ*~TR*IA + ~PS*~TJ*TR*~IA + ~PS*~TJ*~IA*~IP +
    PS*~TJ*~TR*~IA) -> SCNPT
M4: PS*TR*IP + PS*IA*IP + ~PS*TJ*TR*IA*~IP + (~PS*~TJ*~TR*IA + ~PS*~TJ*TR*~IA + PS*~TJ*~TR*~IA +
    ~TJ*~TR*~IA*~IP) -> SCNPT
M5: PS*TR*IP + PS*IA*IP + ~PS*TJ*TR*IA*~IP + (~PS*~TJ*~TR*IA + ~PS*~TJ*~IA*~IP + PS*~TJ*~TR*~IA +
    ~TJ*TR*~IA*IP) -> SCNPT
M6: PS*TR*IP + PS*IA*IP + ~PS*TJ*TR*IA*~IP + (~PS*~TJ*~TR*~IP + ~PS*~TJ*TR*~IA + PS*~TJ*~TR*~IA +
    ~TJ*~TR*IA*IP) -> SCNPT
```

					----------					
		inclS	PRI	covS	covU	(M1)	(M2)	(M3)	(M4)	(M5)	(M6)
1	PS*TR*IP	0.865	0.805	0.519	0.018	0.018	0.029	0.029	0.029	0.018	0.029
2	PS*IA*IP	0.856	0.793	0.517	0.012	0.012	0.035	0.035	0.035	0.035	0.026
3	~PS*TJ*TR*IA*~IP	0.948	0.877	0.233	0.039	0.039	0.039	0.039	0.039	0.039	0.039
4	PS*~TJ*IP	0.870	0.798	0.480	0.000	0.010					
5	~PS*~TJ*~TR*IA	0.891	0.762	0.300	0.008	0.072	0.044	0.072	0.072	0.072	
6	~PS*~TJ*~TR*~IP	0.912	0.783	0.276	0.000		0.026				0.033
7	~PS*~TJ*TR*~IA	0.941	0.848	0.191	0.000	0.022	0.022	0.013	0.022		0.022
8	~PS*~TJ*~IA*~IP	0.888	0.671	0.194	0.001			0.027		0.041	
9	PS*~TJ*~TR*~IA	0.877	0.735	0.221	0.001		0.037	0.037	0.010	0.037	0.037
10	~TJ*~TR*~IA*~IP	0.875	0.739	0.239	0.000	0.052			0.026		
11	~TJ*~TR*IA*IP	0.856	0.735	0.373	0.002						0.037
12	~TJ*TR*~IA*IP	0.919	0.821	0.216	0.000					0.013	
	M1	0.816	0.743	0.788							
	M2	0.818	0.746	0.789							
	M3	0.818	0.746	0.790							
	M4	0.818	0.746	0.789							
	M5	0.821	0.749	0.790							
	M6	0.818	0.745	0.782							

```
                      cases
--------------------------
 1          PS*TR*IP  Mal92; Ins99,Mac01,PNG01,Ins05; SoA93; Sal92,Bos95,Lib03
 2          PS*IA*IP  Moz92; Ins99,Mac01,PNG01,Ins05; Sie99; Sal92,Bos95,Lib03
 3  ~PS*TJ*TR*IA*~IP  Gua96,Nep06
--------------------------
 4         PS*~TJ*IP  Dji94; Moz92; Mal92; Ins99,Mac01,PNG01,Ins05
 5    ~PS*~TJ*~TR*IA  Cro95,Con99; GuB98,Ang02,Ivo07
 6   ~PS*~TJ*~TR*~IP  Dji01,Sen04; Cro95,Con99
 7    ~PS*~TJ*TR*~IA  Leb89; UKg98
 8   ~PS*~TJ*~IA*~IP  Dji01,Sen04; Leb89
 9    PS*~TJ*~TR*~IA  Nig95,Ban97; Dji94
10   ~TJ*~TR*~IA*~IP  Dji01,Sen04; Nig95,Ban97
11     ~TJ*~TR*IA*IP  GuB98,Ang02,Ivo07; Moz92
12     ~TJ*TR*~IA*IP  UKg98; Mal92
--------------------------
```

 # The row number(s) of the negative configuration(s).

```
19 21 23 31
```

 # The initial positive configuration(s).

```
[1] "~PS*~TJ*~TR*~IA*~IP" "~PS*~TJ*~TR*IA*~IP"  "~PS*~TJ*~TR*IA*IP"   "~PS*~TJ*TR*~IA*~IP"
 [5] "~PS*~TJ*TR*~IA*IP"   "~PS*TJ*TR*IA*~IP"    "PS*~TJ*~TR*~IA*~IP"  "PS*~TJ*~TR*~IA*IP"
 [9] "PS*~TJ*~TR*IA*IP"    "PS*~TJ*TR*~IA*IP"    "PS*~TJ*TR*IA*IP"     "PS*TJ*~TR*IA*IP"
[13] "PS*TJ*TR*~IA*IP"     "PS*TJ*TR*IA*IP"
```

 # List containing the PI chart(s).

	1	3	4	5	6	15	17	18	20	22	24	28	30	32
PS*~TJ*IP	-	-	-	-	-	-	-	x	x	x	x	-	-	-
PS*TR*IP	-	-	-	-	-	-	-	-	-	x	x	-	x	x
PS*IA*IP	-	-	-	-	-	-	-	-	x	-	x	x	-	x
~PS*~TJ*~TR*IA	-	x	x	-	-	-	-	-	-	-	-	-	-	-
~PS*~TJ*~TR*~IP	x	x	-	-	-	-	-	-	-	-	-	-	-	-
~PS*~TJ*TR*~IA	-	-	-	x	x	-	-	-	-	-	-	-	-	-
~PS*~TJ*~IA*~IP	x	-	-	x	-	-	-	-	-	-	-	-	-	-
PS*~TJ*~TR*~IA	-	-	-	-	-	-	x	x	-	-	-	-	-	-
~TJ*~TR*~IA*~IP	x	-	-	-	-	-	x	-	-	-	-	-	-	-
~TJ*~TR*IA*IP	-	-	x	-	-	-	-	-	x	-	-	-	-	-
~TJ*TR*~IA*IP	-	-	-	-	x	-	-	-	-	x	-	-	-	-
~PS*TJ*TR*IA*~IP	-	-	-	-	-	x	-	-	-	-	-	-	-	-

 # The prime implicant(s).

	PS	TJ	TR	IA	IP
PS*~TJ*IP	2	1	0	0	2
PS*TR*IP	2	0	2	0	2
PS*IA*IP	2	0	0	2	2
~PS*~TJ*~TR*IA	1	1	1	2	0
~PS*~TJ*~TR*~IP	1	1	1	0	1
~PS*~TJ*TR*~IA	1	1	2	1	0
~PS*~TJ*~IA*~IP	1	1	0	1	1
PS*~TJ*~TR*~IA	2	1	1	1	0
~TJ*~TR*~IA*~IP	0	1	1	1	1
~TJ*~TR*IA*IP	0	1	1	2	2
~TJ*TR*~IA*IP	0	1	2	1	2
~PS*TJ*TR*IA*~IP	1	2	2	2	1

 # List of solution model(s).

```
[[1]]
[1] "PS*~TJ*IP"         "PS*TR*IP"          "PS*IA*IP"          "~PS*~TJ*~TR*IA"   "~PS*~TJ*TR*~IA"
[6] "~TJ*~TR*~IA*~IP"   "~PS*TJ*TR*IA*~IP"

[[2]]
[1] "PS*TR*IP"          "PS*IA*IP"          "~PS*~TJ*~TR*IA"   "~PS*~TJ*~TR*~IP"  "~PS*~TJ*TR*~IA"
[6] "PS*~TJ*~TR*~IA"    "~PS*TJ*TR*IA*~IP"

[[3]]
[1] "PS*TR*IP"          "PS*IA*IP"          "~PS*~TJ*~TR*IA"   "~PS*~TJ*TR*~IA"   "~PS*~TJ*~IA*~IP"
[6] "PS*~TJ*~TR*~IA"    "~PS*TJ*TR*IA*~IP"

[[4]]
[1] "PS*TR*IP"          "PS*IA*IP"          "~PS*~TJ*~TR*IA"   "~PS*~TJ*TR*~IA"   "PS*~TJ*~TR*~IA"
[6] "~TJ*~TR*~IA*~IP"   "~PS*TJ*TR*IA*~IP"

[[5]]
[1] "PS*TR*IP"          "PS*IA*IP"          "~PS*~TJ*~TR*IA"   "~PS*~TJ*~IA*~IP"  "PS*~TJ*~TR*~IA"
[6] "~TJ*TR*~IA*IP"     "~PS*TJ*TR*IA*~IP"

[[6]]
[1] "PS*TR*IP"          "PS*IA*IP"          "~PS*~TJ*~TR*~IP"  "~PS*~TJ*TR*~IA"   "PS*~TJ*~TR*~IA"
[6] "~TJ*~TR*IA*IP"     "~PS*TJ*TR*IA*~IP"
```

 # List of essential PI(s).

```
[1] "PS*TR*IP"          "PS*IA*IP"          "~PS*TJ*TR*IA*~IP"
```

 # List of PI membership scores.

	PS*~TJ*IP	PS*TR*IP	PS*IA*IP	~PS*~TJ*~TR*IA	~PS*~TJ*~TR*~IP	~PS*~TJ*TR*~IA	~PS*~TJ*~IA*~IP
Leb89	0.26593927	0.26593927	0.26593927	0.21751774	0.21751774	0.73406073	0.68129634
Cam91	0.44006659	0.41223063	0.44006659	0.26593927	0.26593927	0.04539172	0.04539172
Sal92	0.35413646	0.60509262	0.73406073	0.26593927	0.08504388	0.04539172	0.04539172
Mal92	0.62338438	0.62338438	0.26593927	0.21751774	0.21751774	0.26593927	0.26593927
Moz92	0.68545423	0.41223063	0.73406073	0.26593927	0.14187793	0.04539172	0.04539172
Ind93	0.11336252	0.11336252	0.04539172	0.04539172	0.04539172	0.04539172	0.04539172
Rwa93	0.44921782	0.44921782	0.44921782	0.26593927	0.26593927	0.04539172	0.04539172
SoA93	0.35413646	0.73406073	0.04539172	0.04539172	0.14187793	0.26593927	0.14187793
Ang94	0.27988400	0.27988400	0.27988400	0.26593927	0.26593927	0.04539172	0.04539172
Dji94	0.79702970	0.25649715	0.26593927	0.04539172	0.04539172	0.04539172	0.04539172
Nig95	0.36879867	0.35634745	0.26593927	0.04539172	0.04539172	0.04539172	0.04539172
Cro95	0.26593927	0.17693434	0.26593927	0.73406073	0.55993341	0.04539172	0.04539172
Bos95	0.35413646	0.78248226	0.87476482	0.04539172	0.04539172	0.04539172	0.04539172
Phi96	0.32680412	0.32680412	0.32680412	0.04539172	0.04539172	0.04539172	0.04539172
Sie96	0.06375258	0.06375258	0.06375258	0.26593927	0.26593927	0.26593927	0.26593927
Gua96	0.14152056	0.26593927	0.26593927	0.10586885	0.10586885	0.04539172	0.04539172
Taj97	0.46761765	0.30412020	0.46761765	0.26593927	0.26593927	0.04539172	0.04539172
Ban97	0.24409865	0.24409865	0.04539172	0.04539172	0.26593927	0.26593927	0.26593927
UKg98	0.26593927	0.26593927	0.26593927	0.10586885	0.09693741	0.53886902	0.09693741
GuB98	0.26593927	0.11812994	0.26593927	0.73406073	0.08504388	0.04539172	0.04539172
Ins99	0.73406073	0.73406073	0.73406073	0.21751774	0.11029376	0.04539172	0.04539172
Sie99	0.35413646	0.47047176	0.62338438	0.04539172	0.04539172	0.04539172	0.04539172
Con99	0.26593927	0.21403778	0.26593927	0.73406073	0.55993341	0.21403778	0.26593927
Bur00	0.04722166	0.48610597	0.48610597	0.04722166	0.04722166	0.04539172	0.04539172
Dji01	0.26519152	0.26519152	0.26519152	0.26593927	0.58776937	0.41223063	0.61476138
Mac01	0.73406073	0.73406073	0.73406073	0.10586885	0.10586885	0.04539172	0.04539172
PNG01	0.79702970	0.60509262	0.79702970	0.04539172	0.04539172	0.04539172	0.04539172
Ang02	0.26593927	0.14507555	0.26593927	0.73406073	0.22725964	0.04539172	0.04539172
Lib03	0.35413646	0.77274036	0.77274036	0.04539172	0.04539172	0.04539172	0.04539172
Sen04	0.04539172	0.04539172	0.04539172	0.04539172	0.80251910	0.09562925	0.80251910
Sud05	0.14152056	0.45840355	0.45840355	0.04539172	0.04539172	0.04539172	0.04539172
Ins05	0.53886902	0.74646893	0.73406073	0.04539172	0.04539172	0.04539172	0.04539172
Nep06	0.04539172	0.04539172	0.04539172	0.04801152	0.04801152	0.04539172	0.04539172
Ivo07	0.26593927	0.26593927	0.26593927	0.58776937	0.37661562	0.26593927	0.26593927

	PS*~TJ*~TR*~IA	~TJ*~TR*~IA*~IP	~TJ*~TR*IA*IP	~TJ*TR*~IA*IP	~PS*TJ*TR*IA*~IP
Leb89	0.21751774	0.21751774	0.21751774	0.31870366	0.08811619
Cam91	0.04539172	0.04539172	0.44006659	0.04539172	0.26593927
Sal92	0.04539172	0.04539172	0.35413646	0.04539172	0.08504388
Mal92	0.21751774	0.21751774	0.21751774	0.62338438	0.26593927
Moz92	0.04539172	0.04539172	0.58776937	0.04539172	0.14187793
Ind93	0.39490738	0.39490738	0.04539172	0.11336252	0.04539172
Rwa93	0.04539172	0.04539172	0.44921782	0.04539172	0.26593927
SoA93	0.21751774	0.14187793	0.04539172	0.35413646	0.04539172
Ang94	0.04539172	0.04539172	0.27988400	0.04539172	0.26593927
Dji94	0.73406073	0.20297030	0.26593927	0.25649715	0.04539172
Nig95	0.64365255	0.63120133	0.26593927	0.35634745	0.04539172
Cro95	0.04539172	0.04539172	0.44006659	0.04539172	0.15268512
Bos95	0.04539172	0.04539172	0.21751774	0.04539172	0.04539172
Phi96	0.21751774	0.21751774	0.21751774	0.26593927	0.04539172
Sie96	0.26593927	0.26593927	0.06375258	0.06375258	0.26593927
Gua96	0.04539172	0.04539172	0.10586885	0.04539172	0.59607395
Taj97	0.04539172	0.04539172	0.46761765	0.04539172	0.25151793
Ban97	0.53886902	0.53886902	0.04539172	0.24409865	0.04539172
UKg98	0.10586885	0.09693741	0.10586885	0.53886902	0.09693741
GuB98	0.04539172	0.04539172	0.88187006	0.04539172	0.06608540
Ins99	0.04539172	0.04539172	0.21751774	0.04539172	0.11029376
Sie99	0.04539172	0.04539172	0.35413646	0.04539172	0.04539172
Con99	0.26593927	0.26593927	0.44006659	0.21403778	0.19748090
Bur00	0.04539172	0.04539172	0.04722166	0.04539172	0.26593927
Dji01	0.26593927	0.58776937	0.26519152	0.26519152	0.26593927
Mac01	0.04539172	0.04539172	0.10586885	0.04539172	0.16032701
PNG01	0.04539172	0.04539172	0.39490738	0.04539172	0.04539172
Ang02	0.04539172	0.04539172	0.77274036	0.04539172	0.11657460
Lib03	0.04539172	0.04539172	0.21751774	0.04539172	0.04539172
Sen04	0.04539172	0.80251910	0.04539172	0.09562925	0.04539172
Sud05	0.04539172	0.04539172	0.04801152	0.04539172	0.04539172
Ins05	0.21751774	0.21751774	0.21751774	0.26593927	0.04539172
Nep06	0.04539172	0.04539172	0.04801152	0.04539172	0.56904408
Ivo07	0.26593927	0.26593927	0.58776937	0.26593927	0.25151793

7.2. Most parsimonious solution

```
M1: ~PS + IP + ~TR*~IA -> SCNPT

            inclS   PRI   covS   covU
-------------------------------------
1      ~PS  0.855  0.764  0.489  0.068
2       IP  0.842  0.782  0.734  0.308
3  ~TR*~IA  0.837  0.675  0.260  0.032
-------------------------------------
        M1  0.814  0.750  0.875

            cases
-----------------
1      ~PS  Dji01,Sen04; Cro95,Con99; GuB98,Ang02,Ivo07; Leb89; UKg98; Gua96,Nep06
2       IP  GuB98,Ang02,Ivo07; UKg98; Dji94; Moz92; Mal92; Ins99,Mac01,PNG01,Ins05; Sie99; SoA93; Sal92,Bos95,Lib03
3  ~TR*~IA  Dji01,Sen04; Nig95,Ban97; Dji94
-----------------
```

 # List containing the PI chart(s).

```
          1  3  4  5  6  15 17 18 20 22 24 28 30 32
~PS       x  x  x  x  x  x  -  -  -  -  -  -  -  -
IP        -  -  x  -  x  -  -  x  x  x  x  x  x  x
TJ*~TR    -  -  -  -  -  -  -  -  -  -  -  x  -  -
TJ*~IA    -  -  -  -  -  -  -  -  -  -  -  -  x  -
~TR*~IA   x  -  -  -  -  -  x  x  -  -  -  -  -  -
```

 # The prime implicant(s).

```
        PS TJ TR IA IP
~PS      1  0  0  0  0
IP       0  0  0  0  2
~TR*~IA  0  0  1  1  0
```

 # List of solution model(s).

```
[[1]]
[1] "~PS"     "IP"      "~TR*~IA"
```

 # List of PI membership scores.

```
             ~PS         IP    ~TR*~IA
Leb89 0.73406073 0.31870366 0.21751774
Cam91 0.26593927 0.44006659 0.04539172
Sal92 0.26593927 0.91495612 0.04539172
Mal92 0.26593927 0.62338438 0.21751774
Moz92 0.26593927 0.85812207 0.04539172
Ind93 0.04539172 0.11336252 0.39490738
Rwa93 0.26593927 0.44921782 0.04539172
SoA93 0.26593927 0.85812207 0.21751774
Ang94 0.26593927 0.27988400 0.04539172
Dji94 0.04539172 0.79702970 0.73406073
Nig95 0.04539172 0.36879867 0.64365255
Cro95 0.73406073 0.44006659 0.04539172
Bos95 0.04539172 0.87476482 0.04539172
Phi96 0.04539172 0.32680412 0.21751774
Sie96 0.26593927 0.06375258 0.26593927
Gua96 0.73406073 0.40392605 0.04539172
Taj97 0.26593927 0.46761765 0.04539172
Ban97 0.26593927 0.24409865 0.64365255
UKg98 0.73406073 0.90306259 0.10586885
GuB98 0.73406073 0.91495612 0.04539172
Ins99 0.26593927 0.88970624 0.04539172
Sie99 0.04539172 0.62338438 0.04539172
Con99 0.73406073 0.44006659 0.26593927
Bur00 0.26593927 0.48610597 0.04539172
Dji01 0.73406073 0.26519152 0.58776937
Mac01 0.26593927 0.83967299 0.04539172
PNG01 0.04539172 0.79702970 0.04539172
Ang02 0.73406073 0.77274036 0.04539172
Lib03 0.04539172 0.77274036 0.04539172
Sen04 0.95460828 0.15144622 0.90437075
```

```
Sud05 0.04539172 0.45840355 0.04539172
Ins05 0.04539172 0.74646893 0.21751774
Nep06 0.95460828 0.43095592 0.04539172
Ivo07 0.73406073 0.62338438 0.26593927
```

 # List of simplifying assumptions.

```
$M1
   PS TJ TR IA IP
2   0  0  0  0  1
7   0  0  1  1  0
8   0  0  1  1  1
9   0  1  0  0  0
10  0  1  0  0  1
11  0  1  0  1  0
12  0  1  0  1  1
13  0  1  1  0  0
14  0  1  1  0  1
16  0  1  1  1  1
25  1  1  0  0  0
26  1  1  0  0  1
```

7.3. Intermediate solution

```
From C1P1, C2P1, C3P1, C4P1, C5P1, C6P1:

M1:    ~PS*~TJ + ~PS*TR*IA + PS*TR*IP + PS*IA*IP + ~TJ*~TR*~IA -> SCNPT

                inclS   PRI   covS   covU   cases
-----------------------------------------------------------------------------------------------
1       ~PS*~TJ  0.852  0.729  0.405  0.089  Dji01,Sen04; Cro95,Con99; GuB98,Ang02,Ivo07; Leb89; UKg98
2     ~PS*TR*IA  0.960  0.922  0.312  0.059  Gua96,Nep06
3      PS*TR*IP  0.865  0.805  0.519  0.029  Mal92; Ins99,Mac01,PNG01,Ins05; SoA93; Sal92,Bos95,Lib03
4      PS*IA*IP  0.856  0.793  0.517  0.035  Moz92; Ins99,Mac01,PNG01,Ins05; Sie99; Sal92,Bos95,Lib03
5  ~TJ*~TR*~IA  0.847  0.686  0.256  0.037  Dji01,Sen04; Nig95,Ban97; Dji94
-----------------------------------------------------------------------------------------------
            M1  0.817  0.748  0.814
```

 # List of components specific to intermediate model(s), each having a PI chart, prime implicant membership scores, (non-simplifying) easy counterfactuals and difficult counterfactuals.

$C1P1

$C1P1$EC

```
   PS TJ TR IA IP
2   0  0  0  0  1
7   0  0  1  1  0
8   0  0  1  1  1
16  0  1  1  1  1
```

$C1P1$DC

```
   PS TJ TR IA IP
9   0  1  0  0  0
10  0  1  0  0  1
11  0  1  0  1  0
12  0  1  0  1  1
13  0  1  1  0  0
14  0  1  1  0  1
25  1  1  0  0  0
26  1  1  0  0  1
```

$C1P1$solution

```
$C1P1$solution[[1]]
[1] "~PS*~TJ"     "~PS*TR*IA"   "PS*TR*IP"    "PS*IA*IP"    "~TJ*~TR*~IA"
```

$C1P1$essential

```
[1] "~PS*~TJ"     "~PS*TR*IA"   "PS*TR*IP"    "PS*IA*IP"    "~TJ*~TR*~IA"
```

$C1P1$primes

```
            PS TJ TR IA IP
~PS*~TJ      1  1  0  0  0
~PS*TR*IA    1  0  2  2  0
PS*TR*IP     2  0  2  0  2
PS*IA*IP     2  0  0  2  2
~TJ*~TR*~IA  0  1  1  1  0
```

$C1P1$PIchart

```
             1  3  4  5  6  15 17 18 20 22 24 28 30 32
~PS*~TJ      x  x  x  x  x  -  -  -  -  -  -  -  -  -
~TJ*IP       -  -  x  -  x  -  -  x  x  x  x  -  -  -
~PS*TR*IA    -  -  -  -  -  x  -  -  -  -  -  -  -  -
PS*TR*IP     -  -  -  -  -  -  -  -  -  x  x  -  x  x
PS*IA*IP     -  -  -  -  -  -  -  -  x  -  x  x  -  x
~TJ*~TR*~IA  x  -  -  -  -  -  x  x  -  -  -  -  -  -
```

$C1P1$c.sol

```
[1] "PS*~TJ*IP"         "PS*TR*IP"          "PS*IA*IP"          "~PS*~TJ*~TR*IA"   "~PS*~TJ*TR*~IA"
[6] "~TJ*~TR*~IA*~IP"   "~PS*TJ*TR*IA*~IP"
```

$C1P1$p.sol

```
[1] "~PS"     "IP"      "~TR*~IA"
```

$C1P1$IC

```
               inclS   PRI   covS   covU   cases
-----------------------------------------------------------------------------------------------
1      ~PS*~TJ  0.852  0.729  0.405  0.089  Dji01,Sen04; Cro95,Con99; GuB98,Ang02,Ivo07; Leb89; UKg98
2    ~PS*TR*IA  0.960  0.922  0.312  0.059  Gua96,Nep06
3     PS*TR*IP  0.865  0.805  0.519  0.029  Mal92; Ins99,Mac01,PNG01,Ins05; SoA93; Sal92,Bos95,Lib03
4     PS*IA*IP  0.856  0.793  0.517  0.035  Moz92; Ins99,Mac01,PNG01,Ins05; Sie99; Sal92,Bos95,Lib03
5  ~TJ*~TR*~IA  0.847  0.686  0.256  0.037  Dji01,Sen04; Nig95,Ban97; Dji94
-----------------------------------------------------------------------------------------------
           M1  0.817  0.748  0.814
```

$C1P1$pims

	~PS*~TJ	~PS*TR*IA	PS*TR*IP	PS*IA*IP	~TJ*~TR*~IA
Leb89	0.73406073	0.26593927	0.26593927	0.26593927	0.21751774
Cam91	0.26593927	0.26593927	0.41223063	0.44006659	0.04539172
Sal92	0.26593927	0.26593927	0.60509262	0.73406073	0.04539172
Mal92	0.26593927	0.26593927	0.62338438	0.26593927	0.21751774
Moz92	0.26593927	0.26593927	0.41223063	0.73406073	0.04539172
Ind93	0.04539172	0.04539172	0.11336252	0.04539172	0.39490738
Rwa93	0.26593927	0.26593927	0.44921782	0.44921782	0.04539172
SoA93	0.26593927	0.04539172	0.73406073	0.04539172	0.21751774
Ang94	0.26593927	0.26593927	0.27988400	0.27988400	0.04539172
Dji94	0.04539172	0.04539172	0.25649715	0.26593927	0.73406073
Nig95	0.04539172	0.04539172	0.35634745	0.26593927	0.64365255
Cro95	0.73406073	0.17693434	0.17693434	0.26593927	0.04539172
Bos95	0.04539172	0.04539172	0.78248226	0.87476482	0.04539172
Phi96	0.04539172	0.04539172	0.32680412	0.32680412	0.21751774
Sie96	0.26593927	0.26593927	0.06375258	0.06375258	0.26593927
Gua96	0.14152056	0.73406073	0.26593927	0.26593927	0.04539172
Taj97	0.26593927	0.26593927	0.30412020	0.46761765	0.04539172
Ban97	0.26593927	0.04539172	0.24409865	0.04539172	0.53886902
UKg98	0.53886902	0.26593927	0.26593927	0.26593927	0.10586885
GuB98	0.73406073	0.11812994	0.11812994	0.26593927	0.04539172
Ins99	0.26593927	0.26593927	0.73406073	0.73406073	0.04539172
Sie99	0.04539172	0.04539172	0.47047176	0.62338438	0.04539172
Con99	0.73406073	0.21403778	0.21403778	0.26593927	0.26593927
Bur00	0.04722166	0.26593927	0.48610597	0.48610597	0.04539172
Dji01	0.61476138	0.26593927	0.26519152	0.26519152	0.58776937
Mac01	0.26593927	0.26593927	0.73406073	0.73406073	0.04539172
PNG01	0.04539172	0.04539172	0.60509262	0.79702970	0.04539172
Ang02	0.73406073	0.14507555	0.14507555	0.26593927	0.04539172
Lib03	0.04539172	0.04539172	0.77274036	0.77274036	0.04539172
Sen04	0.80251910	0.04539172	0.04539172	0.04539172	0.80251910
Sud05	0.04539172	0.04539172	0.45840355	0.45840355	0.04539172
Ins05	0.04539172	0.04539172	0.74646893	0.73406073	0.21751774
Nep06	0.14152056	0.95198848	0.04539172	0.04539172	0.04539172
Ivo07	0.73406073	0.41223063	0.26593927	0.26593927	0.26593927

$C2P1

$C2P1$EC

	PS	TJ	TR	IA	IP
2	0	0	0	0	1
7	0	0	1	1	0
8	0	0	1	1	1
16	0	1	1	1	1

$C2P1$DC

	PS	TJ	TR	IA	IP
9	0	1	0	0	0
10	0	1	0	0	1
11	0	1	0	1	0
12	0	1	0	1	1
13	0	1	1	0	0
14	0	1	1	0	1
25	1	1	0	0	0
26	1	1	0	0	1

$C2P1$solution

$C2P1$solution[[1]]

```
[1] "~PS*~TJ"     "~PS*TR*IA"   "PS*TR*IP"    "PS*IA*IP"    "~TJ*~TR*~IA"
```

$C2P1$essential

```
[1] "~PS*~TJ"     "~PS*TR*IA"   "PS*TR*IP"    "PS*IA*IP"    "~TJ*~TR*~IA"
```

$C2P1$primes

	PS	TJ	TR	IA	IP
~PS*~TJ	1	1	0	0	0
~PS*TR*IA	1	0	2	2	0
PS*TR*IP	2	0	2	0	2
PS*IA*IP	2	0	0	2	2
~TJ*~TR*~IA	0	1	1	1	0

$C2P1$PIchart

	1	3	4	5	6	15	17	18	20	22	24	28	30	32
~PS*~TJ	x	x	x	x	x	-	-	-	-	-	-	-	-	-
~TJ*IP	-	-	x	-	x	-	-	x	x	x	x	-	-	-
~PS*TR*IA	-	-	-	-	-	x	-	-	-	-	-	-	-	-
PS*TR*IP	-	-	-	-	-	-	-	-	-	x	x	-	x	x
PS*IA*IP	-	-	-	-	-	-	-	-	x	-	x	x	-	x
~TJ*~TR*~IA	x	-	-	-	-	-	x	x	-	-	-	-	-	-

$C2P1$c.sol

```
[1] "PS*TR*IP"          "PS*IA*IP"          "~PS*~TJ*~TR*IA"   "~PS*~TJ*~TR*~IP"  "~PS*~TJ*TR*~IA"
[6] "PS*~TJ*~TR*~IA"    "~PS*TJ*TR*IA*~IP"
```

$C2P1$p.sol

```
[1] "~PS"     "IP"      "~TR*~IA"
```

$C2P1$IC

```
                incls   PRI   covS   covU   cases
-------------------------------------------------------------------------------------------------
1      ~PS*~TJ  0.852  0.729  0.405  0.089  Dji01,Sen04; Cro95,Con99; GuB98,Ang02,Ivo07; Leb89; UKg98
2    ~PS*TR*IA  0.960  0.922  0.312  0.059  Gua96,Nep06
3     PS*TR*IP  0.865  0.805  0.519  0.029  Mal92; Ins99,Mac01,PNG01,Ins05; SoA93; Sal92,Bos95,Lib03
4     PS*IA*IP  0.856  0.793  0.517  0.035  Moz92; Ins99,Mac01,PNG01,Ins05; Sie99; Sal92,Bos95,Lib03
5  ~TJ*~TR*~IA  0.847  0.686  0.256  0.037  Dji01,Sen04; Nig95,Ban97; Dji94
-------------------------------------------------------------------------------------------------
           M1  0.817  0.748  0.814
```

$C2P1$pims

```
         ~PS*~TJ  ~PS*TR*IA   PS*TR*IP   PS*IA*IP ~TJ*~TR*~IA
Leb89 0.73406073 0.26593927 0.26593927 0.26593927  0.21751774
Cam91 0.26593927 0.26593927 0.41223063 0.44006659  0.04539172
Sal92 0.26593927 0.26593927 0.60509262 0.73406073  0.04539172
Mal92 0.26593927 0.26593927 0.62338438 0.26593927  0.21751774
Moz92 0.26593927 0.26593927 0.41223063 0.73406073  0.04539172
Ind93 0.04539172 0.04539172 0.11336252 0.04539172  0.39490738
Rwa93 0.26593927 0.26593927 0.44921782 0.44921782  0.04539172
SoA93 0.26593927 0.04539172 0.73406073 0.04539172  0.21751774
Ang94 0.26593927 0.26593927 0.27988400 0.27988400  0.04539172
Dji94 0.04539172 0.04539172 0.25649715 0.26593927  0.73406073
Nig95 0.04539172 0.04539172 0.35634745 0.26593927  0.64365255
Cro95 0.73406073 0.17693434 0.17693434 0.26593927  0.04539172
Bos95 0.04539172 0.04539172 0.78248226 0.87476482  0.04539172
Phi96 0.04539172 0.04539172 0.32680412 0.32680412  0.21751774
Sie96 0.26593927 0.26593927 0.06375258 0.06375258  0.26593927
Gua96 0.14152056 0.73406073 0.26593927 0.26593927  0.04539172
Taj97 0.26593927 0.26593927 0.30412020 0.46761765  0.04539172
Ban97 0.26593927 0.04539172 0.24409865 0.04539172  0.53886902
UKg98 0.53886902 0.26593927 0.26593927 0.26593927  0.10586885
GuB98 0.73406073 0.11812994 0.11812994 0.26593927  0.04539172
Ins99 0.26593927 0.26593927 0.73406073 0.73406073  0.04539172
Sie99 0.04539172 0.04539172 0.47047176 0.62338438  0.04539172
```

```
Con99 0.73406073 0.21403778 0.21403778 0.26593927  0.26593927
Bur00 0.04722166 0.26593927 0.48610597 0.48610597  0.04539172
Dji01 0.61476138 0.26593927 0.26519152 0.26519152  0.58776937
Mac01 0.26593927 0.26593927 0.73406073 0.73406073  0.04539172
PNG01 0.04539172 0.04539172 0.60509262 0.79702970  0.04539172
Ang02 0.73406073 0.14507555 0.14507555 0.26593927  0.04539172
Lib03 0.04539172 0.04539172 0.77274036 0.77274036  0.04539172
Sen04 0.80251910 0.04539172 0.04539172 0.04539172  0.80251910
Sud05 0.04539172 0.04539172 0.45840355 0.45840355  0.04539172
Ins05 0.04539172 0.04539172 0.74646893 0.73406073  0.21751774
Nep06 0.14152056 0.95198848 0.04539172 0.04539172  0.04539172
Ivo07 0.73406073 0.41223063 0.26593927 0.26593927  0.26593927
```

$C3P1

$C3P1$EC

	PS	TJ	TR	IA	IP
2	0	0	0	0	1
7	0	0	1	1	0
8	0	0	1	1	1
16	0	1	1	1	1

$C3P1$DC

	PS	TJ	TR	IA	IP
9	0	1	0	0	0
10	0	1	0	0	1
11	0	1	0	1	0
12	0	1	0	1	1
13	0	1	1	0	0
14	0	1	1	0	1
25	1	1	0	0	0
26	1	1	0	0	1

$C3P1$solution

$C3P1$solution[[1]]

```
[1] "~PS*~TJ"     "~PS*TR*IA"   "PS*TR*IP"    "PS*IA*IP"    "~TJ*~TR*~IA"
```

$C3P1$essential

```
[1] "~PS*~TJ"     "~PS*TR*IA"   "PS*TR*IP"    "PS*IA*IP"    "~TJ*~TR*~IA"
```

$C3P1$primes

	PS	TJ	TR	IA	IP
~PS*~TJ	1	1	0	0	0
~PS*TR*IA	1	0	2	2	0
PS*TR*IP	2	0	2	0	2
PS*IA*IP	2	0	0	2	2
~TJ*~TR*~IA	0	1	1	1	0

$C3P1$PIchart

	1	3	4	5	6	15	17	18	20	22	24	28	30	32
~PS*~TJ	x	x	x	x	x	-	-	-	-	-	-	-	-	-
~TJ*IP	-	-	x	-	x	-	-	x	x	x	x	-	-	-
~PS*TR*IA	-	-	-	-	-	x	-	-	-	-	-	-	-	-
PS*TR*IP	-	-	-	-	-	-	-	-	-	x	x	-	x	x
PS*IA*IP	-	-	-	-	-	-	-	-	x	-	x	x	-	x
~TJ*~TR*~IA	x	-	-	-	-	-	x	x	-	-	-	-	-	-

$C3P1$c.sol

```
[1] "PS*TR*IP"         "PS*IA*IP"         "~PS*~TJ*~TR*IA"   "~PS*~TJ*TR*~IA"   "~PS*~TJ*~IA*~IP"
[6] "PS*~TJ*~TR*~IA"   "~PS*TJ*TR*IA*~IP"
```

$C3P1$p.sol

```
[1] "~PS"     "IP"      "~TR*~IA"
```

$C3P1$IC

		inclS	PRI	covS	covU	cases
1	~PS*~TJ	0.852	0.729	0.405	0.089	Dji01,Sen04; Cro95,Con99; GuB98,Ang02,Ivo07; Leb89; UKg98
2	~PS*TR*IA	0.960	0.922	0.312	0.059	Gua96,Nep06
3	PS*TR*IP	0.865	0.805	0.519	0.029	Mal92; Ins99,Mac01,PNG01,Ins05; SoA93; Sal92,Bos95,Lib03
4	PS*IA*IP	0.856	0.793	0.517	0.035	Moz92; Ins99,Mac01,PNG01,Ins05; Sie99; Sal92,Bos95,Lib03
5	~TJ*~TR*~IA	0.847	0.686	0.256	0.037	Dji01,Sen04; Nig95,Ban97; Dji94
	M1	0.817	0.748	0.814		

$C3P1$pims

	~PS*~TJ	~PS*TR*IA	PS*TR*IP	PS*IA*IP	~TJ*~TR*~IA
Leb89	0.73406073	0.26593927	0.26593927	0.26593927	0.21751774
Cam91	0.26593927	0.26593927	0.41223063	0.44006659	0.04539172
Sal92	0.26593927	0.26593927	0.60509262	0.73406073	0.04539172
Mal92	0.26593927	0.26593927	0.62338438	0.26593927	0.21751774
Moz92	0.26593927	0.26593927	0.41223063	0.73406073	0.04539172

Ind93	0.04539172	0.04539172	0.11336252	0.04539172	0.39490738
Rwa93	0.26593927	0.26593927	0.44921782	0.44921782	0.04539172
SoA93	0.26593927	0.04539172	0.73406073	0.04539172	0.21751774
Ang94	0.26593927	0.26593927	0.27988400	0.27988400	0.04539172
Dji94	0.04539172	0.04539172	0.25649715	0.26593927	0.73406073
Nig95	0.04539172	0.04539172	0.35634745	0.26593927	0.64365255
Cro95	0.73406073	0.17693434	0.17693434	0.26593927	0.04539172
Bos95	0.04539172	0.04539172	0.78248226	0.87476482	0.04539172
Phi96	0.04539172	0.04539172	0.32680412	0.32680412	0.21751774
Sie96	0.26593927	0.26593927	0.06375258	0.06375258	0.26593927
Gua96	0.14152056	0.73406073	0.26593927	0.26593927	0.04539172
Taj97	0.26593927	0.26593927	0.30412020	0.46761765	0.04539172
Ban97	0.26593927	0.04539172	0.24409865	0.04539172	0.53886902
UKg98	0.53886902	0.26593927	0.26593927	0.26593927	0.10586885
GuB98	0.73406073	0.11812994	0.11812994	0.26593927	0.04539172
Ins99	0.26593927	0.26593927	0.73406073	0.73406073	0.04539172
Sie99	0.04539172	0.04539172	0.47047176	0.62338438	0.04539172
Con99	0.73406073	0.21403778	0.21403778	0.26593927	0.26593927
Bur00	0.04722166	0.26593927	0.48610597	0.48610597	0.04539172
Dji01	0.61476138	0.26593927	0.26519152	0.26519152	0.58776937
Mac01	0.26593927	0.26593927	0.73406073	0.73406073	0.04539172
PNG01	0.04539172	0.04539172	0.60509262	0.79702970	0.04539172
Ang02	0.73406073	0.14507555	0.14507555	0.26593927	0.04539172
Lib03	0.04539172	0.04539172	0.77274036	0.77274036	0.04539172
Sen04	0.80251910	0.04539172	0.04539172	0.04539172	0.80251910
Sud05	0.04539172	0.04539172	0.45840355	0.45840355	0.04539172
Ins05	0.04539172	0.04539172	0.74646893	0.73406073	0.21751774
Nep06	0.14152056	0.95198848	0.04539172	0.04539172	0.04539172
Ivo07	0.73406073	0.41223063	0.26593927	0.26593927	0.26593927

$C4P1

$C4P1$EC

	PS	TJ	TR	IA	IP
2	0	0	0	0	1
7	0	0	1	1	0
8	0	0	1	1	1
16	0	1	1	1	1

$C4P1$DC

	PS	TJ	TR	IA	IP
9	0	1	0	0	0
10	0	1	0	0	1
11	0	1	0	1	0
12	0	1	0	1	1
13	0	1	1	0	0
14	0	1	1	0	1
25	1	1	0	0	0
26	1	1	0	0	1

$C4P1$solution

$C4P1$solution[[1]]

```
[1] "~PS*~TJ"     "~PS*TR*IA"   "PS*TR*IP"    "PS*IA*IP"    "~TJ*~TR*~IA"
```

$C4P1$essential

```
[1] "~PS*~TJ"     "~PS*TR*IA"   "PS*TR*IP"    "PS*IA*IP"    "~TJ*~TR*~IA"
```

$C4P1$primes

```
            PS TJ TR IA IP
~PS*~TJ      1  1  0  0  0
~PS*TR*IA    1  0  2  2  0
PS*TR*IP     2  0  2  0  2
PS*IA*IP     2  0  0  2  2
~TJ*~TR*~IA  0  1  1  1  0
```

$C4P1$PIchart

```
             1  3  4  5  6  15 17 18 20 22 24 28 30 32
~PS*~TJ      x  x  x  x  x  -  -  -  -  -  -  -  -  -
~TJ*IP       -  -  x  -  x  -  -  x  x  x  x  -  -  -
~PS*TR*IA    -  -  -  -  -  x  -  -  -  -  -  -  -  -
PS*TR*IP     -  -  -  -  -  -  -  -  -  x  x  -  x  x
PS*IA*IP     -  -  -  -  -  -  -  -  x  -  x  x  -  x
~TJ*~TR*~IA  x  -  -  -  -  -  x  x  -  -  -  -  -  -
```

$C4P1$c.sol

```
[1] "PS*TR*IP"          "PS*IA*IP"          "~PS*~TJ*~TR*IA"   "~PS*~TJ*TR*~IA"   "PS*~TJ*~TR*~IA"
[6] "~TJ*~TR*~IA*~IP"  "~PS*TJ*TR*IA*~IP"
```

$C4P1$p.sol

```
[1] "~PS"     "IP"      "~TR*~IA"
```

$C4P1$IC

	inclS	PRI	covS	covU	cases
1 ~PS*~TJ	0.852	0.729	0.405	0.089	Dji01,Sen04; Cro95,Con99; GuB98,Ang02,Ivo07; Leb89; UKg98
2 ~PS*TR*IA	0.960	0.922	0.312	0.059	Gua96,Nep06
3 PS*TR*IP	0.865	0.805	0.519	0.029	Mal92; Ins99,Mac01,PNG01,Ins05; SoA93; Sal92,Bos95,Lib03
4 PS*IA*IP	0.856	0.793	0.517	0.035	Moz92; Ins99,Mac01,PNG01,Ins05; Sie99; Sal92,Bos95,Lib03
5 ~TJ*~TR*~IA	0.847	0.686	0.256	0.037	Dji01,Sen04; Nig95,Ban97; Dji94
M1	0.817	0.748	0.814		

$C4P1$pims

	~PS*~TJ	~PS*TR*IA	PS*TR*IP	PS*IA*IP	~TJ*~TR*~IA
Leb89	0.73406073	0.26593927	0.26593927	0.26593927	0.21751774
Cam91	0.26593927	0.26593927	0.41223063	0.44006659	0.04539172
Sal92	0.26593927	0.26593927	0.60509262	0.73406073	0.04539172
Mal92	0.26593927	0.26593927	0.62338438	0.26593927	0.21751774
Moz92	0.26593927	0.26593927	0.41223063	0.73406073	0.04539172
Ind93	0.04539172	0.04539172	0.11336252	0.04539172	0.39490738
Rwa93	0.26593927	0.26593927	0.44921782	0.44921782	0.04539172
SoA93	0.26593927	0.04539172	0.73406073	0.04539172	0.21751774
Ang94	0.26593927	0.26593927	0.27988400	0.27988400	0.04539172
Dji94	0.04539172	0.04539172	0.25649715	0.26593927	0.73406073
Nig95	0.04539172	0.04539172	0.35634745	0.26593927	0.64365255
Cro95	0.73406073	0.17693434	0.17693434	0.26593927	0.04539172
Bos95	0.04539172	0.04539172	0.78248226	0.87476482	0.04539172
Phi96	0.04539172	0.04539172	0.32680412	0.32680412	0.21751774
Sie96	0.26593927	0.26593927	0.06375258	0.06375258	0.26593927
Gua96	0.14152056	0.73406073	0.26593927	0.26593927	0.04539172
Taj97	0.26593927	0.26593927	0.30412020	0.46761765	0.04539172
Ban97	0.26593927	0.04539172	0.24409865	0.04539172	0.53886902
UKg98	0.53886902	0.26593927	0.26593927	0.26593927	0.10586885
GuB98	0.73406073	0.11812994	0.11812994	0.26593927	0.04539172
Ins99	0.26593927	0.26593927	0.73406073	0.73406073	0.04539172
Sie99	0.04539172	0.04539172	0.47047176	0.62338438	0.04539172
Con99	0.73406073	0.21403778	0.21403778	0.26593927	0.26593927
Bur00	0.04722166	0.26593927	0.48610597	0.48610597	0.04539172
Dji01	0.61476138	0.26593927	0.26519152	0.26519152	0.58776937
Mac01	0.26593927	0.26593927	0.73406073	0.73406073	0.04539172
PNG01	0.04539172	0.04539172	0.60509262	0.79702970	0.04539172
Ang02	0.73406073	0.14507555	0.14507555	0.26593927	0.04539172
Lib03	0.04539172	0.04539172	0.77274036	0.77274036	0.04539172
Sen04	0.80251910	0.04539172	0.04539172	0.04539172	0.80251910

```
Sud05 0.04539172 0.04539172 0.45840355 0.45840355  0.04539172
Ins05 0.04539172 0.04539172 0.74646893 0.73406073  0.21751774
Nep06 0.14152056 0.95198848 0.04539172 0.04539172  0.04539172
Ivo07 0.73406073 0.41223063 0.26593927 0.26593927  0.26593927
```

$C5P1

$C5P1$EC

```
   PS TJ TR IA IP
2   0  0  0  0  1
7   0  0  1  1  0
8   0  0  1  1  1
16  0  1  1  1  1
```

$C5P1$DC

```
   PS TJ TR IA IP
9   0  1  0  0  0
10  0  1  0  0  1
11  0  1  0  1  0
12  0  1  0  1  1
13  0  1  1  0  0
14  0  1  1  0  1
25  1  1  0  0  0
26  1  1  0  0  1
```

$C5P1$solution

$C5P1$solution[[1]]

```
[1] "~PS*~TJ"     "~PS*TR*IA"   "PS*TR*IP"    "PS*IA*IP"    "~TJ*~TR*~IA"
```

$C5P1$essential

```
[1] "~PS*~TJ"     "~PS*TR*IA"   "PS*TR*IP"    "PS*IA*IP"    "~TJ*~TR*~IA"
```

$C5P1$primes

```
            PS TJ TR IA IP
~PS*~TJ      1  1  0  0  0
~PS*TR*IA    1  0  2  2  0
PS*TR*IP     2  0  2  0  2
PS*IA*IP     2  0  0  2  2
~TJ*~TR*~IA  0  1  1  1  0
```

$C5P1$PIchart

```
             1  3  4  5  6  15 17 18 20 22 24 28 30 32
~PS*~TJ      x  x  x  x  x  -  -  -  -  -  -  -  -  -
~TJ*IP       -  -  x  -  x  -  -  x  x  x  x  -  -  -
~PS*TR*IA    -  -  -  -  -  x  -  -  -  -  -  -  -  -
PS*TR*IP     -  -  -  -  -  -  -  -  -  x  x  -  x  x
PS*IA*IP     -  -  -  -  -  -  -  -  x  -  x  x  -  x
~TJ*~TR*~IA  x  -  -  -  -  -  x  x  -  -  -  -  -  -
```

$C5P1$c.sol

```
[1] "PS*TR*IP"          "PS*IA*IP"          "~PS*~TJ*~TR*IA"   "~PS*~TJ*~IA*~IP"  "PS*~TJ*~TR*~IA"
[6] "~TJ*TR*~IA*IP"     "~PS*TJ*TR*IA*~IP"
```

$C5P1$p.sol

```
[1] "~PS"     "IP"      "~TR*~IA"
```

$C5P1$IC

	inclS	PRI	covS	covU	cases
1 ~PS*~TJ	0.852	0.729	0.405	0.089	DjiO1,SenO4; CroO5,ConO9; GuBO8,AngO2,IvoO7; LebO9; UKgO8
2 ~PS*TR*IA	0.960	0.922	0.312	0.059	GuaO6,NepO6
3 PS*TR*IP	0.865	0.805	0.519	0.029	MalO2; InsO9,MacO1,PNGO1,InsO5; SoAO3; SalO2,BosO5,LibO3
4 PS*IA*IP	0.856	0.793	0.517	0.035	MozO2; InsO9,MacO1,PNGO1,InsO5; SieO9; SalO2,BosO5,LibO3
5 ~TJ*~TR*~IA	0.847	0.686	0.256	0.037	DjiO1,SenO4; NigO5,BanO7; DjiO4
M1	0.817	0.748	0.814		

$C5P1$pims

	~PS*~TJ	~PS*TR*IA	PS*TR*IP	PS*IA*IP	~TJ*~TR*~IA
Leb89	0.73406073	0.26593927	0.26593927	0.26593927	0.21751774
Cam91	0.26593927	0.26593927	0.41223063	0.44006659	0.04539172
Sal92	0.26593927	0.26593927	0.60509262	0.73406073	0.04539172
Mal92	0.26593927	0.26593927	0.62338438	0.26593927	0.21751774
Moz92	0.26593927	0.26593927	0.41223063	0.73406073	0.04539172
Ind93	0.04539172	0.04539172	0.11336252	0.04539172	0.39490738
Rwa93	0.26593927	0.26593927	0.44921782	0.44921782	0.04539172
SoA93	0.26593927	0.04539172	0.73406073	0.04539172	0.21751774
Ang94	0.26593927	0.26593927	0.27988400	0.27988400	0.04539172
Dji94	0.04539172	0.04539172	0.25649715	0.26593927	0.73406073
Nig95	0.04539172	0.04539172	0.35634745	0.26593927	0.64365255
Cro95	0.73406073	0.17693434	0.17693434	0.26593927	0.04539172
Bos95	0.04539172	0.04539172	0.78248226	0.87476482	0.04539172
Phi96	0.04539172	0.04539172	0.32680412	0.32680412	0.21751774
Sie96	0.26593927	0.26593927	0.06375258	0.06375258	0.26593927

```
Gua96 0.14152056 0.73406073 0.26593927 0.26593927  0.04539172
Taj97 0.26593927 0.26593927 0.30412020 0.46761765  0.04539172
Ban97 0.26593927 0.04539172 0.24409865 0.04539172  0.53886902
UKg98 0.53886902 0.26593927 0.26593927 0.26593927  0.10586885
GuB98 0.73406073 0.11812994 0.11812994 0.26593927  0.04539172
Ins99 0.26593927 0.26593927 0.73406073 0.73406073  0.04539172
Sie99 0.04539172 0.04539172 0.47047176 0.62338438  0.04539172
Con99 0.73406073 0.21403778 0.21403778 0.26593927  0.26593927
Bur00 0.04722166 0.26593927 0.48610597 0.48610597  0.04539172
Dji01 0.61476138 0.26593927 0.26519152 0.26519152  0.58776937
Mac01 0.26593927 0.26593927 0.73406073 0.73406073  0.04539172
PNG01 0.04539172 0.04539172 0.60509262 0.79702970  0.04539172
Ang02 0.73406073 0.14507555 0.14507555 0.26593927  0.04539172
Lib03 0.04539172 0.04539172 0.77274036 0.77274036  0.04539172
Sen04 0.80251910 0.04539172 0.04539172 0.04539172  0.80251910
Sud05 0.04539172 0.04539172 0.45840355 0.45840355  0.04539172
Ins05 0.04539172 0.04539172 0.74646893 0.73406073  0.21751774
Nep06 0.14152056 0.95198848 0.04539172 0.04539172  0.04539172
Ivo07 0.73406073 0.41223063 0.26593927 0.26593927  0.26593927
```

$C6P1

$C6P1$EC

	PS	TJ	TR	IA	IP
2	0	0	0	0	1
7	0	0	1	1	0
8	0	0	1	1	1
16	0	1	1	1	1

$C6P1$DC

	PS	TJ	TR	IA	IP
9	0	1	0	0	0
10	0	1	0	0	1
11	0	1	0	1	0
12	0	1	0	1	1
13	0	1	1	0	0
14	0	1	1	0	1
25	1	1	0	0	0
26	1	1	0	0	1

$C6P1$solution

$C6P1$solution[[1]]

```
[1] "~PS*~TJ"     "~PS*TR*IA"   "PS*TR*IP"    "PS*IA*IP"    "~TJ*~TR*~IA"
```

$C6P1$essential

```
[1] "~PS*~TJ"     "~PS*TR*IA"   "PS*TR*IP"    "PS*IA*IP"    "~TJ*~TR*~IA"
```

$C6P1$primes

```
            PS TJ TR IA IP
~PS*~TJ      1  1  0  0  0
~PS*TR*IA    1  0  2  2  0
PS*TR*IP     2  0  2  0  2
PS*IA*IP     2  0  0  2  2
~TJ*~TR*~IA  0  1  1  1  0
```

$C6P1$PIchart

```
             1  3  4  5  6  15 17 18 20 22 24 28 30 32
~PS*~TJ      x  x  x  x  x  -  -  -  -  -  -  -  -  -
~TJ*IP       -  -  x  -  x  -  -  x  x  x  x  -  -  -
~PS*TR*IA    -  -  -  -  -  x  -  -  -  -  -  -  -  -
PS*TR*IP     -  -  -  -  -  -  -  -  -  x  x  -  x  x
PS*IA*IP     -  -  -  -  -  -  -  -  x  -  x  x  -  x
~TJ*~TR*~IA  x  -  -  -  -  -  x  x  -  -  -  -  -  -
```

$C6P1$c.sol

```
[1] "PS*TR*IP"         "PS*IA*IP"         "~PS*~TJ*~TR*~IP"  "~PS*~TJ*TR*~IA"   "PS*~TJ*~TR*~IA"
[6] "~TJ*~TR*IA*IP"    "~PS*TJ*TR*IA*~IP"
```

$C6P1$p.sol

```
[1] "~PS"     "IP"      "~TR*~IA"
```

$C6P1$IC

```
               inclS   PRI   covS   covU   cases
-------------------------------------------------------------------------------------------------
1      ~PS*~TJ  0.852  0.729  0.405  0.089  Dji01,Sen04; Cro95,Con99; GuB98,Ang02,Ivo07; Leb89; UKg98
2    ~PS*TR*IA  0.960  0.922  0.312  0.059  Gua96,Nep06
3     PS*TR*IP  0.865  0.805  0.519  0.029  Mal92; Ins99,Mac01,PNG01,Ins05; SoA93; Sal92,Bos95,Lib03
4     PS*IA*IP  0.856  0.793  0.517  0.035  Moz92; Ins99,Mac01,PNG01,Ins05; Sie99; Sal92,Bos95,Lib03
5  ~TJ*~TR*~IA  0.847  0.686  0.256  0.037  Dji01,Sen04; Nig95,Ban97; Dji94
-------------------------------------------------------------------------------------------------
           M1  0.817  0.748  0.814
```

$C6P1$pims

	~PS*~TJ	~PS*TR*IA	PS*TR*IP	PS*IA*IP	~TJ*~TR*~IA
Leb89	0.73406073	0.26593927	0.26593927	0.26593927	0.21751774
Cam91	0.26593927	0.26593927	0.41223063	0.44006659	0.04539172
Sal92	0.26593927	0.26593927	0.60509262	0.73406073	0.04539172
Mal92	0.26593927	0.26593927	0.62338438	0.26593927	0.21751774
Moz92	0.26593927	0.26593927	0.41223063	0.73406073	0.04539172
Ind93	0.04539172	0.04539172	0.11336252	0.04539172	0.39490738
Rwa93	0.26593927	0.26593927	0.44921782	0.44921782	0.04539172
SoA93	0.26593927	0.04539172	0.73406073	0.04539172	0.21751774
Ang94	0.26593927	0.26593927	0.27988400	0.27988400	0.04539172
Dji94	0.04539172	0.04539172	0.25649715	0.26593927	0.73406073
Nig95	0.04539172	0.04539172	0.35634745	0.26593927	0.64365255
Cro95	0.73406073	0.17693434	0.17693434	0.26593927	0.04539172
Bos95	0.04539172	0.04539172	0.78248226	0.87476482	0.04539172
Phi96	0.04539172	0.04539172	0.32680412	0.32680412	0.21751774
Sie96	0.26593927	0.26593927	0.06375258	0.06375258	0.26593927
Gua96	0.14152056	0.73406073	0.26593927	0.26593927	0.04539172
Taj97	0.26593927	0.26593927	0.30412020	0.46761765	0.04539172
Ban97	0.26593927	0.04539172	0.24409865	0.04539172	0.53886902
UKg98	0.53886902	0.26593927	0.26593927	0.26593927	0.10586885
GuB98	0.73406073	0.11812994	0.11812994	0.26593927	0.04539172
Ins99	0.26593927	0.26593927	0.73406073	0.73406073	0.04539172
Sie99	0.04539172	0.04539172	0.47047176	0.62338438	0.04539172
Con99	0.73406073	0.21403778	0.21403778	0.26593927	0.26593927
Bur00	0.04722166	0.26593927	0.48610597	0.48610597	0.04539172
Dji01	0.61476138	0.26593927	0.26519152	0.26519152	0.58776937
Mac01	0.26593927	0.26593927	0.73406073	0.73406073	0.04539172
PNG01	0.04539172	0.04539172	0.60509262	0.79702970	0.04539172
Ang02	0.73406073	0.14507555	0.14507555	0.26593927	0.04539172
Lib03	0.04539172	0.04539172	0.77274036	0.77274036	0.04539172
Sen04	0.80251910	0.04539172	0.04539172	0.04539172	0.80251910
Sud05	0.04539172	0.04539172	0.45840355	0.45840355	0.04539172
Ins05	0.04539172	0.04539172	0.74646893	0.73406073	0.21751774
Nep06	0.14152056	0.95198848	0.04539172	0.04539172	0.04539172
Ivo07	0.73406073	0.41223063	0.26593927	0.26593927	0.26593927

8 Robustness tests and cluster diagnostics

 # Calculating sensitivity ranges for the calibration of PS condition

```
Exclusion:  Lower bound  -3.45 Threshold  0.05 Upper bound  1.05
Crossover:  Lower bound  1.5 Threshold  1.5 Upper bound  2.5
Inclusion:  Lower bound  1.95 Threshold  2.95 Upper bound  NA
```

 # Calculating sensitivity ranges for the calibration of TJ condition

```
Exclusion:  Lower bound  NA Threshold  0.05 Upper bound  9.05
Crossover:  Lower bound  5 Threshold  9.5 Upper bound  11.5
Inclusion:  Lower bound  9.95 Threshold  11.95 Upper bound  NA
```

 # Calculating sensitivity ranges for the calibration of TR condition

```
Exclusion:  Lower bound  NA Threshold  0.05 Upper bound  NA
Crossover:  Lower bound  6.5 Threshold  12.5 Upper bound  15.5
Inclusion:  Lower bound  12.95 Threshold  15.95 Upper bound  NA
```

 # Calculating sensitivity ranges for the calibration of IA condition

```
Exclusion:  Lower bound  -6.45 Threshold  0.05 Upper bound  1.05
Crossover:  Lower bound  0.5 Threshold  1.5 Upper bound  2.5
Inclusion:  Lower bound  1.95 Threshold  2.95 Upper bound  NA
```

 # Calculating sensitivity ranges for the calibration of IP condition

```
Exclusion:  Lower bound  NA Threshold  0.05 Upper bound  75.05
Crossover:  Lower bound  34.5 Threshold  79.5 Upper bound  94.5
Inclusion:  Lower bound  79.95 Threshold  99.95 Upper bound  NA
```

 # Calculating sensitivity ranges for the raw consistency threshold

```
Raw Consistency T.:  Lower bound  0.8 Threshold  0.8 Upper bound  0.85
```

 # Calculating sensitivity ranges for the frequency threshold

```
N.Cut:  Lower bound  1 Threshold  1 Upper bound  2
```

 # Calculate robustness parameters

```
                RF_cov RF_cons RF_SC_minTS RF_SC_maxTS
Robustness_Fit  0.852   0.973       0.829       0.997
```

 # Looking at case types and robustness case parameters

$CaseParameters

```
                        RCR_typ RCR_dev RCC_Rank
Robustness_Case_Ratio     0.824   0.889        3
```

$CaseTypes

```
Robust Typical Cases (IS*MIN_TS and Y > 0.5) :
--------------------

Boolean Expression: ~PS

Cases in the intersection/Total number of cases: 14 / 34 = 41.18 %
Cases in the intersection/Total number of cases Y > 0.5:  14 / 17 = 82.35 %

Case Names:
```

```
Moz92 SoA93 Nig95 Cro95 Gua96 Ban97 UKg98 Ins99 Dji01 Mac01 PNG01 Ang02 Ins05 Nep06
-------------------

Robust Deviant Cases (IS*MIN_TS and Y < 0.5) :
-------------------

Boolean Expression: ~PS

Cases in the intersection/Total number of cases: 8 / 34 = 23.53 %
Cases in the intersection/Total number of cases Y < 0.5:  8 / 17 = 47.06 %

Case Names:
Leb89 Mal92 Dji94 GuB98 Sie99 Con99 Sen04 Ivo07
-------------------

Shaky Typical Cases (IS*~MIN_TS and Y > 0.5) :
-------------------

Boolean Expression: ~P + S + IP + A~IP + A~I~S

Cases in the intersection/Total number of cases:  3 / 34 = 8.82 %
Cases in the intersection/Total number of cases Y > 0.5:  3 / 17 = 17.65 %

Case Names:
Sal92 Bos95 Lib03
-------------------

Shaky Deviant Cases(IS*~MIN_TS and Y < 0.5) :
-------------------

Boolean Expression: ~P + S + IP + A~IP + A~I~S

Cases in the intersection/Total number of cases:  1 / 34 = 2.94 %
Cases in the intersection/Total number of cases Y < 0.5:  1 / 17 = 5.88 %

Case Names:
Ind93
-------------------

Possible Typical Cases (~IS*MAX_TS and Y > 0.5) :
-------------------

Boolean Expression: ~AIP*~IA + ~AIP*IP + ~AIP*~PS + ~AIS*~IA + ~AIS*IP + ~AIS*~PS + ~IA*~IPS + IP*~IPS + ~IPS*~PS +
~AIP*TJ*~TR + ~AIS*TJ*~TR + ~IPS*TJ*~TR
```

```
Cases in the intersection/Total number of cases: 0 / 34 = 0 %
Cases in the intersection/Total number of cases Y > 0.5:  0 / 17 = 0 %

Case Names:
No cases in this intersection
-------------------

Possible Deviant Cases (~IS*MAX_TS and Y < 0.5) :
-------------------

Boolean Expression: ~AIP*~IA + ~AIP*IP + ~AIP*~PS + ~AIS*~IA + ~AIS*IP + ~AIS*~PS + ~IA*~IPS + IP*~IPS + ~IPS*~PS +
~AIP*TJ*~TR + ~AIS*TJ*~TR + ~IPS*TJ*~TR

Cases in the intersection/Total number of cases: 0 / 34 = 0 %
Cases in the intersection/Total number of cases Y < 0.5:  0 / 17 = 0 %

Case Names:
No cases in this intersection
-------------------

Extreme Deviant Coverage Cases (~IS*~MAX_TS and Y > 0.5) :
-------------------

Boolean Expression: ~AIP*IA*~IP*PS*~TJ + ~AIP*IA*~IP*PS*TR + ~AIS*IA*~IP*PS*~TJ + ~AIS*IA*~IP*PS*TR + IA*~IP*~IPS*PS
*~TJ + IA*~IP*~IPS*PS*TR

Cases in the intersection/Total number of cases:  0 / 34 = 0 %
Cases in the intersection/Total number of cases Y > 0.5:  0 / 17 = 0 %

Case Names:
No cases in this intersection
-------------------

Irrelevant Cases (~IS*~MAX_TS and Y < 0.5) :
-------------------

Boolean Expression: ~AIP*IA*~IP*PS*~TJ + ~AIP*IA*~IP*PS*TR + ~AIS*IA*~IP*PS*~TJ + ~AIS*IA*~IP*PS*TR + IA*~IP*~IPS*PS
*~TJ + IA*~IP*~IPS*PS*TR

Cases in the intersection/Total number of cases:  8 / 34 = 23.53 %
Cases in the intersection/Total number of cases Y < 0.5:  8 / 17 = 47.06 %

Case Names:
Cam91 Rwa93 Ang94 Phi96 Sie96 Taj97 Bur00 Sud05
-------------------
```

 # Obtaining cluster diagnostics

```
Consistencies:
---------------
                                  ~PS*~TJ ~PS*TR*IA PS*TR*IP PS*IA*IP ~TJ*~TR*~IA
Pooled                              0.852     0.960    0.865    0.856       0.847
Between Africa (18)                 0.808     0.934    0.812    0.835       0.926
Between America (2)                 1.000     1.000    1.000    1.000       1.000
Between Asia & Pacific (8)          0.950     0.967    0.851    0.840       0.734
Between Europe (4)                  1.000     1.000    1.000    1.000       1.000
Between Middle East & West Asia (2) 0.740     1.000    1.000    0.811       1.000


Distances:
----------
                       ~PS*~TJ ~PS*TR*IA PS*TR*IP PS*IA*IP ~TJ*~TR*~IA
From Between to Pooled   0.053     0.012     0.04    0.042       0.049


Coverages:
----------
                                  ~PS*~TJ ~PS*TR*IA PS*TR*IP PS*IA*IP ~TJ*~TR*~IA
Pooled                              0.405     0.312    0.519    0.517       0.256
Between Africa (18)                 0.507     0.289    0.525    0.512       0.411
Between America (2)                 0.211     0.519    0.452    0.519       0.047
Between Asia & Pacific (8)          0.204     0.317    0.526    0.509       0.218
Between Europe (4)                  0.411     0.196    0.508    0.555       0.063
Between Middle East & West Asia (2) 0.922     0.662    0.710    0.740       0.327
```