Exploratory Convergence Analysis

The following code chunks implement the Phillips-Sul algorithm for identifying convergence clubs in the GDIM. There are four chunks, separated based on the parent-child sample restriction. This first chunk, the 'default', takes the maximum parental education and includes both sons and daughters. Each chunk contains five specifications, each using a different measure (based on Van der Weide et al. 2024):

- 1-beta corresponds to 1 minus the coefficient from regressing children's schooling on parents' schooling.
- 1-cor corresponds to 1 minus the correlation between children's and parents' schooling.
- MU050 corresponds to the expected educational rank of children born to parents from the bottom half.
- BHQ4 corresponds to the probability that children born to parents in the bottom half reach the top quartile.
- MIX corresponds to the share of children with strictly higher educational attainment than their parents (or with tertiary, conditional on one parent having attained tertiary).

The results appear to be very much contingent on the measure selected, so this requires some thought. For each specification in this first chunk, I report the cross-sectional variances ($H) for each cohort and the results of the log-t test ($global), as well as the convergence clubs ($clubs) with their associated log-t test parameters. For illustrative purposes, I include the plots of the transition paths for these first five runs (though I think they are of limited utility here).

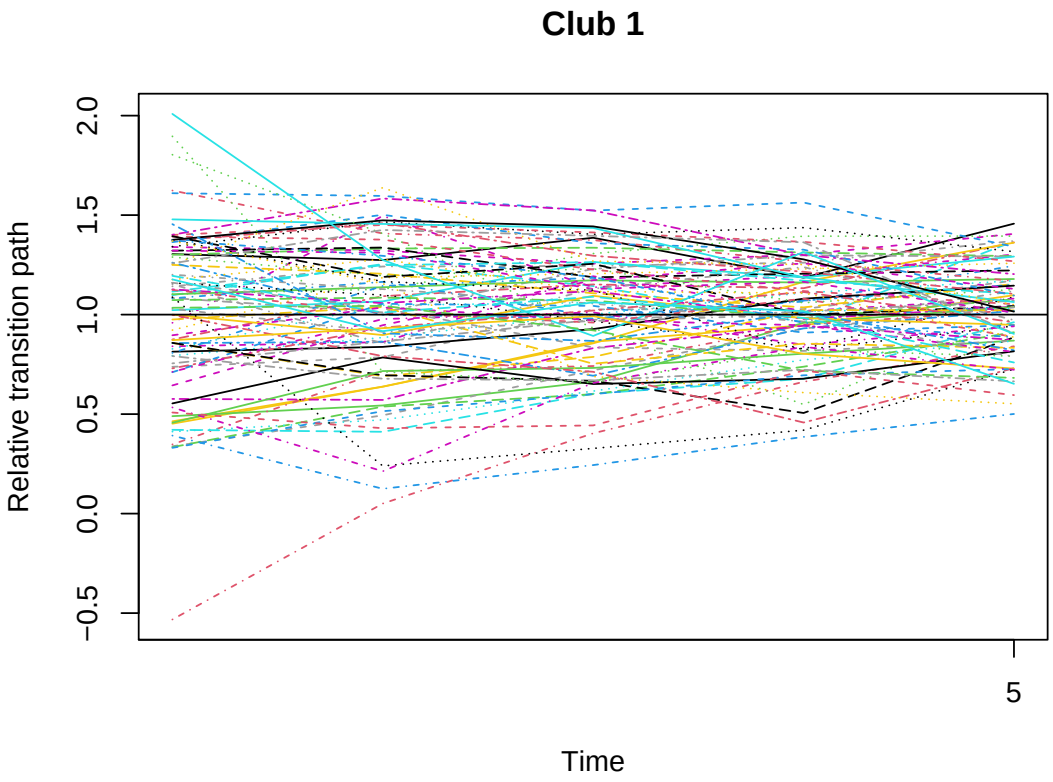
For the code underlying the functions, see https://github.com/renatodeangelis/multiple-mobility-regimes/blob/main/code/convergence_analysis.R

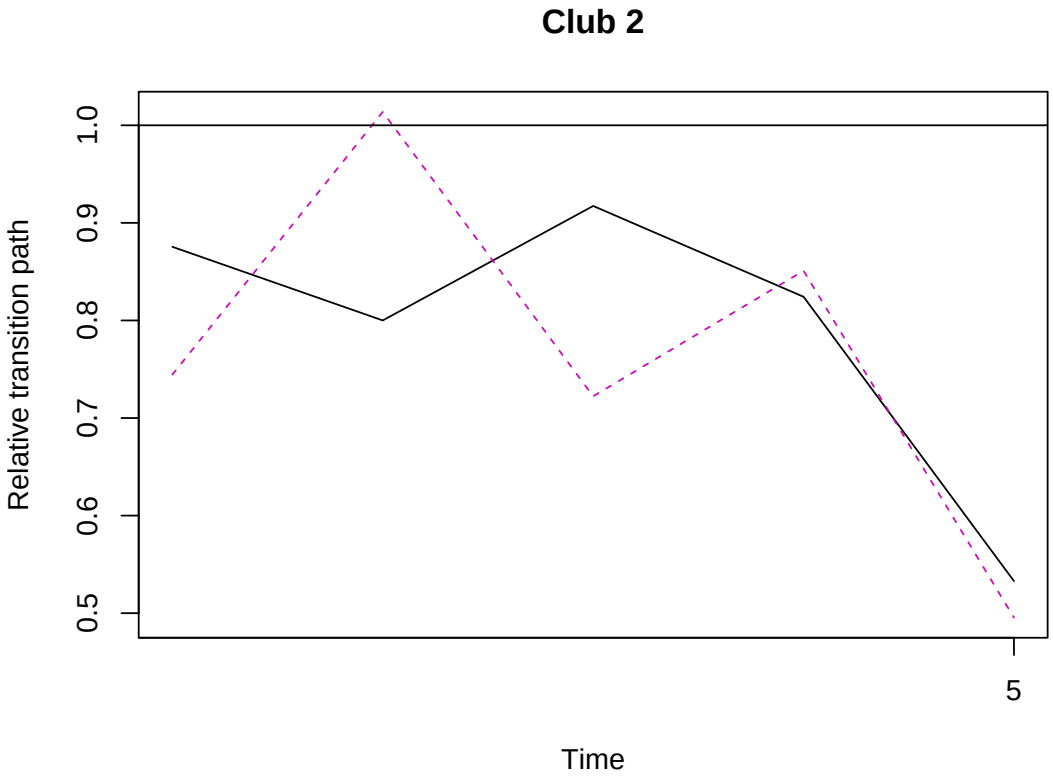
```
ige_max = run_ps(gdim_1940, dataCols = 2:6); ige_max
```

```
## $H
##       1940       1950       1960       1970       1980
## 0.15993013 0.11757227 0.07851149 0.05841110 0.05389858
##
## $global
##          beta       std.err        tvalue        pvalue
## -7.506355e-01  6.962573e-02 -1.078101e+01  2.116100e-27
##
## $clubs
## ============================================================================
## club 1
## ----------------------------------------------------------------------------
## Philippines, United Kingdom, Korea, Rep., Israel, Denmark, Cyprus,
## South Africa, Uzbekistan, Australia, Iceland, Finland, Jordan,
## Netherlands, Canada, France, Germany, Japan, Lithuania, Belgium,
## Greece, Spain, Belarus, Norway, United States, Italy, Taiwan, China,
## Switzerland, Poland, Ireland, Sweden, Brazil, Kyrgyz Republic,
## Slovenia, Liberia, Malawi, Chile, Ukraine, Estonia, Latvia, Kosovo,
## Slovak Republic, Czech Republic, Egypt, Arab Rep., Peru, Albania,
## Tunisia, Mexico, Indonesia, Russian Federation, Gabon, Mauritania,
## Tanzania, Bolivia, Uganda, Bosnia and Herzegovina, Serbia, Georgia,
## Croatia, Colombia, Moldova, Djibouti, Austria, Armenia, China,
## Portugal, Iraq, Panama, Morocco, Ecuador, Gambia, The, Rwanda, Niger,
```

```
## North Macedonia, Ghana, Burundi, Montenegro, Nigeria, Pakistan,
## Bulgaria, India, Timor-Leste, Togo, Hungary, Nepal, Guinea, Madagascar,
## Ethiopia, Guatemala
##
## beta:     -0.4062
## std.err:   0.0726
## tvalue:   -5.5916
## pvalue:    0
## cstar:     0
##
## ============================================================================
## club 2
## ----------------------------------------------------------------------------
## Romania, Mali
##
## beta:      3.5853
## std.err:   3.7849
## tvalue:    0.9473
## pvalue:    0.8282
## cstar:     0
##
## ============================================================================
## divergent
## ----------------------------------------------------------------------------
## Bhutan
```

```
plot(ige_max$clubs, avgTP = FALSE, main = "Transition paths for 1-beta")
```

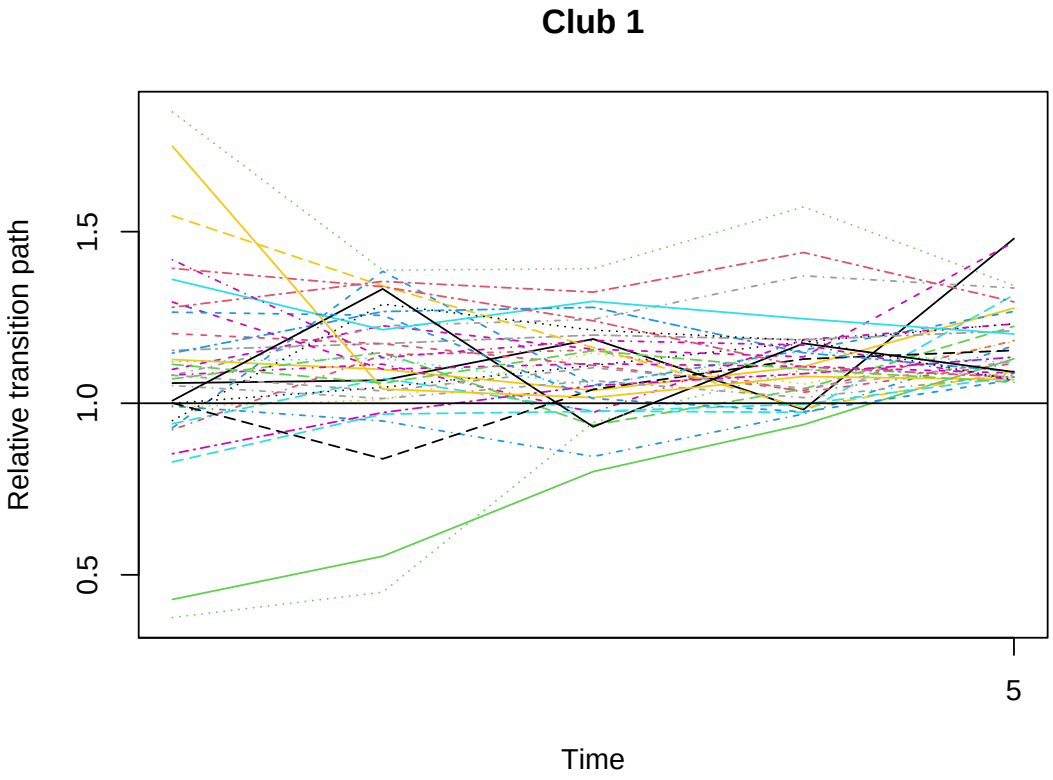

Club 1
Relative transition path
2.0
1.5
1.0
0.5
0.0
−0.5
5
Time

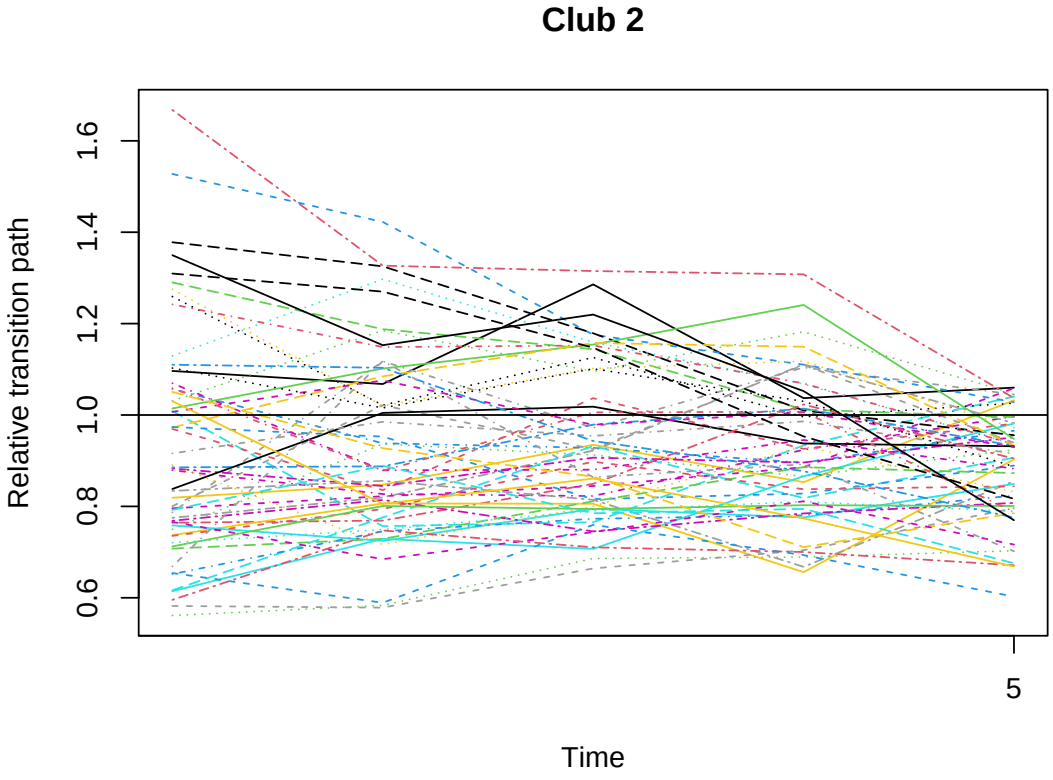

Club 2
Relative transition path
1.0
0.9
0.8
0.7
0.6
0.5
5
Time

```r
cor_max = run_ps(gdim_1940, measure = "1-cor", dataCols = 2:6); cor_max
```

```
## $H
##       1940       1950       1960       1970       1980
## 0.07565454 0.04745840 0.02941520 0.02927053 0.03235974
##
## $global
##         beta      std.err       tvalue       pvalue
##  -1.67787935   0.03361206 -49.91896987   0.00000000
##
## $clubs
## ========================================================================
## club 1
## ------------------------------------------------------------------------
## Philippines, Denmark, Djibouti, Australia, Cyprus, Uzbekistan, United
## Kingdom, Iceland, Finland, Japan, Germany, Canada, Timor-Leste, Norway,
## Netherlands, Slovenia, Korea, Rep., Albania, South Africa, Switzerland,
## Estonia, Kosovo, Mauritania, Lithuania, Latvia, Jordan, Gambia, The,
## Czech Republic, France, Morocco, Burundi, Rwanda, Bhutan, Belarus,
## Ukraine
##
## beta:     -0.6096
## std.err:   0.3737
## tvalue:   -1.6313
## pvalue:    0.0514
## cstar:     0
##
## ========================================================================
## club 2
## ------------------------------------------------------------------------
## Liberia, Israel, Kyrgyz Republic, Tunisia, United States, Niger,
## Portugal, Gabon, Slovak Republic, Spain, Malawi, Taiwan, China, Italy,
## Bosnia and Herzegovina, Tanzania, Poland, China, Belgium, Moldova,
## Armenia, Ethiopia, Iraq, Russian Federation, Egypt, Arab Rep., Ireland,
## Sweden, Serbia, Nepal, Greece, Austria, Georgia, Indonesia, Uganda,
## Mexico, Peru, Croatia, Chile, Brazil, Montenegro, Ecuador, Guinea,
## North Macedonia, Colombia, Bolivia, India, Togo, Pakistan, Ghana,
## Nigeria, Madagascar, Guatemala, Mali, Hungary, Panama, Romania,
## Bulgaria
##
## beta:     -0.3096
## std.err:   0.3345
## tvalue:   -0.9256
## pvalue:    0.1773
## cstar:     0
```

```r
plot(cor_max$clubs, avgTP = FALSE, main = "Transition paths for 1-cor")
```


Club 1
Relative transition path
0.5
1.0
1.5
5
Time

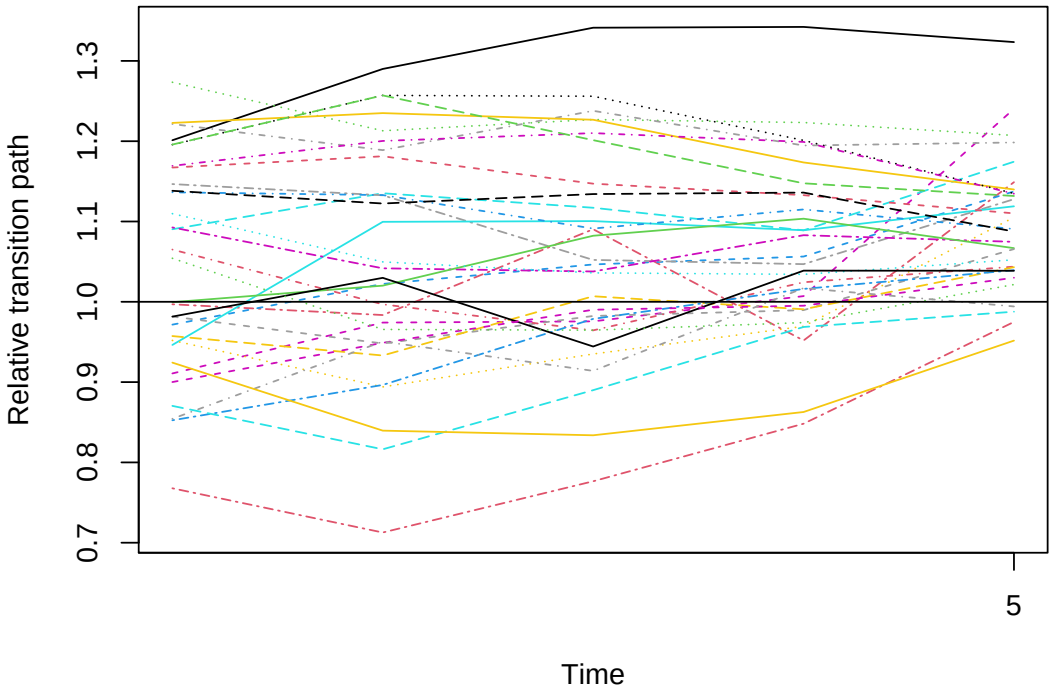

Club 2
Relative transition path
0.6
0.8
1.0
1.2
1.4
1.6
5
Time

```r
mu050_max = run_ps(gdim_1940, measure = "mu050", dataCols = 2:6); mu050_max
```

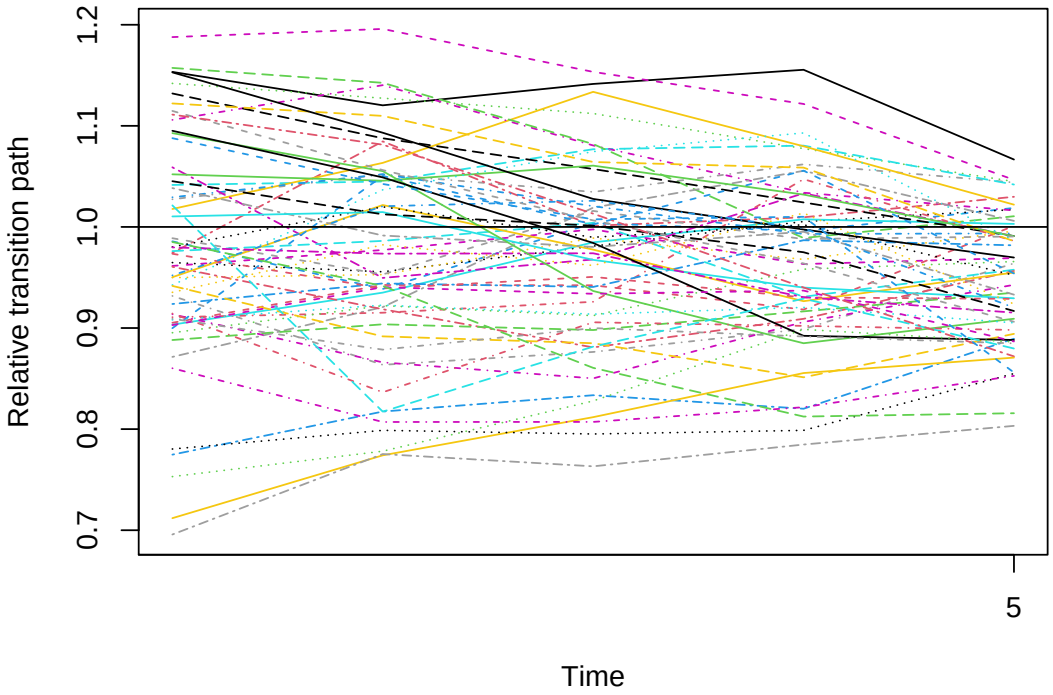
```
## $H
##        1940        1950        1960        1970        1980
## 0.014640077 0.014627945 0.012561407 0.010306980 0.009464907
##
## $global
##          beta       std.err        tvalue        pvalue
## -9.403569e-01  4.728617e-03 -1.988651e+02  0.000000e+00
##
## $clubs
## ============================================================================
## club 1
## ----------------------------------------------------------------------------
## Bhutan, Cyprus, Burundi, Niger, Denmark, Philippines, Malawi, Israel,
## Russian Federation, Timor-Leste, Guinea, Mauritania, Iceland, Ethiopia,
## Slovenia, Germany, Mali, Slovak Republic, Finland, Belgium, Tanzania,
## United Kingdom, Albania, Estonia, Japan, Netherlands, Indonesia,
## Ukraine, Korea, Rep., South Africa, Croatia
##
## beta:      0.5272
## std.err:   0.2692
## tvalue:    1.9582
## pvalue:    0.9749
## cstar:     0
##
## ============================================================================
## club 2
## ----------------------------------------------------------------------------
## Djibouti, Togo, Morocco, Uzbekistan, France, Latvia, Norway, Jordan,
## Canada, Lithuania, Rwanda, Portugal, Hungary, Serbia, Switzerland,
## Kosovo, Uganda, Kyrgyz Republic, Egypt, Arab Rep., Madagascar, Sweden,
## Taiwan, China, Nepal, Bosnia and Herzegovina, Gambia, The, Belarus,
## Italy, Montenegro, Poland, Bulgaria, Armenia, Moldova, Australia,
## Spain, Georgia, Czech Republic, Tunisia, India, Austria, Greece, Iraq,
## Guatemala, China, Gabon, Brazil, Mexico, North Macedonia, Chile,
## Liberia, Ireland, Peru, United States, Romania, Pakistan, Ecuador,
## Nigeria, Colombia, Bolivia, Ghana, Panama
##
## beta:     -0.2126
## std.err:   0.3824
## tvalue:   -0.5558
## pvalue:    0.2892
## cstar:     0
```

```r
plot(mu050_max$clubs, avgTP = FALSE, main = "Transition paths for mu050")
```

Club 1


Relative transition path
0.7
0.8
0.9
1.0
1.1
1.2
1.3
5
Time

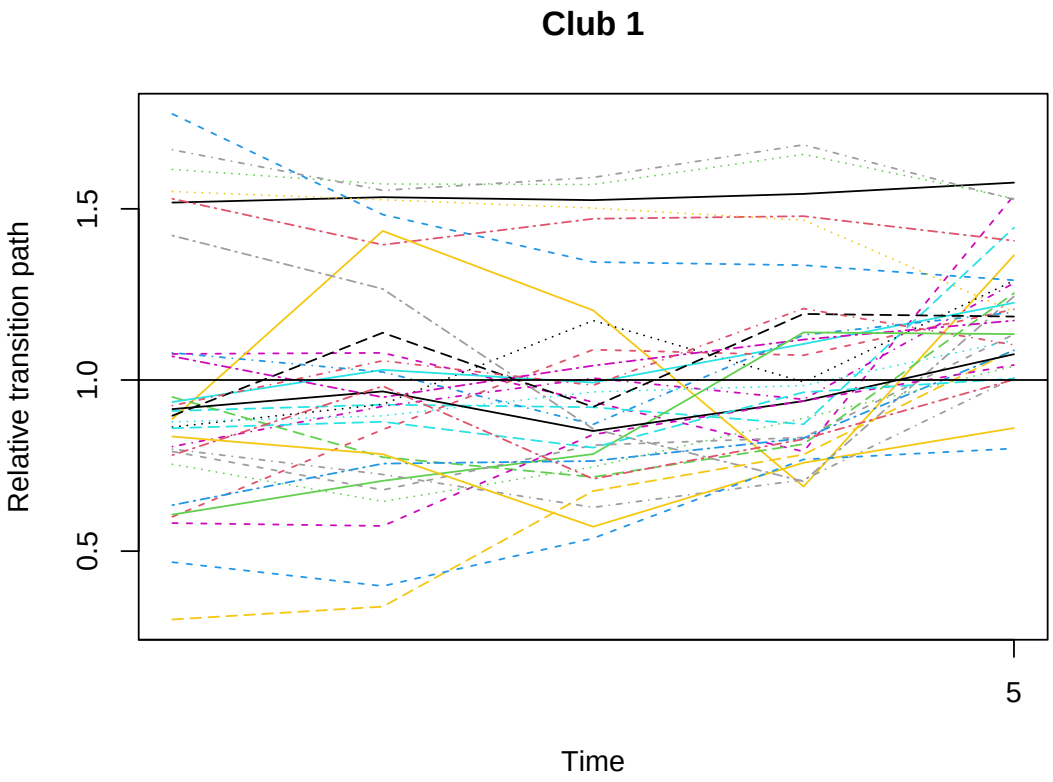
Club 2

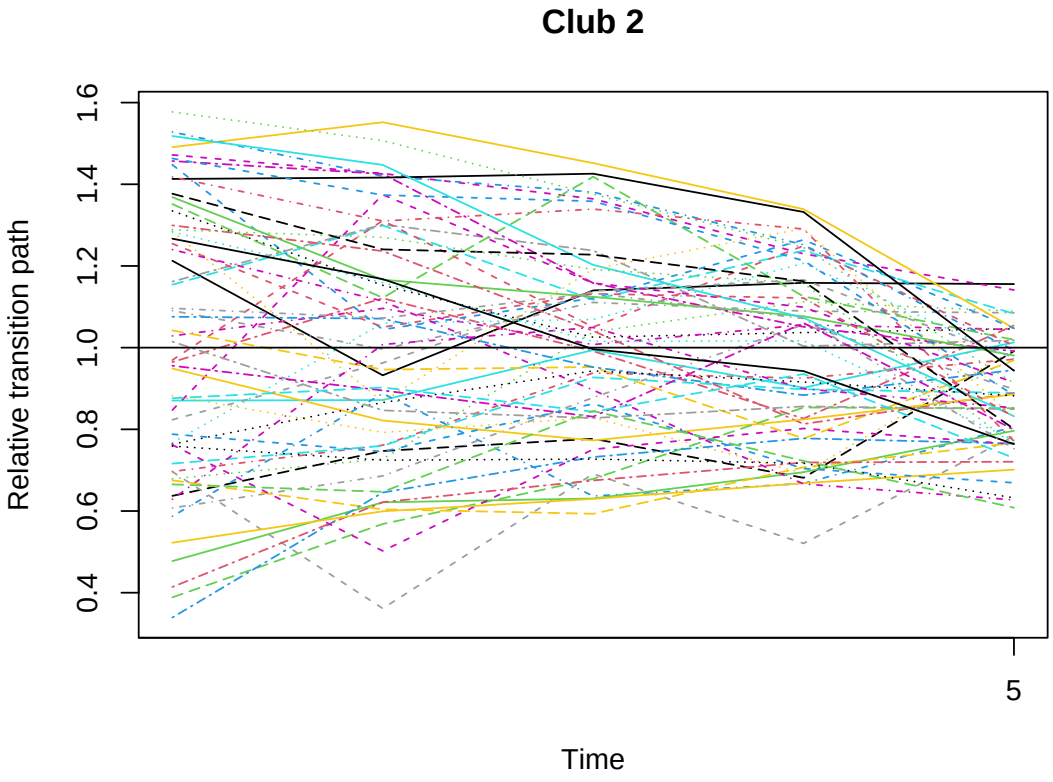

Relative transition path
0.7
0.8
0.9
1.0
1.1
1.2
5
Time

```r
bhq4_max = run_ps(gdim_1940, measure = "bhq4", dataCols = 2:6); bhq4_max
```

```
## $H
##       1940       1950       1960       1970       1980
## 0.12009201 0.09171445 0.06374575 0.05702253 0.04606147
##
## $global
##          beta       std.err        tvalue        pvalue
## -8.763890e-01  1.520874e-01 -5.762403e+00  4.146230e-09
##
## $clubs
## ========================================================================
## club 1
## ------------------------------------------------------------------------
## Bhutan, Cyprus, Djibouti, Niger, Denmark, Gambia, The, Philippines,
## Burundi, Netherlands, Ukraine, Slovenia, Mauritania, Germany, Bosnia
## and Herzegovina, Timor-Leste, United Kingdom, Japan, Estonia, Taiwan,
## China, Belgium, Kosovo, Australia, South Africa, Israel, Sweden,
## Portugal, Spain, Croatia, France, Serbia, North Macedonia, Bolivia
##
## beta:      0.9399
## std.err:   0.7885
## tvalue:    1.192
## pvalue:    0.8834
## cstar:     0
##
## ========================================================================
## club 2
## ------------------------------------------------------------------------
## Slovak Republic, Morocco, Korea, Rep., Czech Republic, Tunisia, Russian
## Federation, Ethiopia, Kyrgyz Republic, Lithuania, Canada, Liberia,
## Uzbekistan, Switzerland, Latvia, Montenegro, Malawi, Italy, Rwanda,
## Jordan, Finland, Moldova, Hungary, Poland, Norway, Mali, Iceland,
## Guinea, Austria, Albania, China, Indonesia, Iraq, Ireland, Greece,
## Peru, United States, Gabon, Tanzania, Belarus, Georgia, Nigeria,
## Mexico, Colombia, Romania, Nepal, Togo, Bulgaria, Ecuador, Ghana,
## Madagascar, Uganda, Egypt, Arab Rep., Armenia, Panama, Chile,
## Guatemala, India, Pakistan, Brazil
##
## beta:     -3e-04
## std.err:   0.5748
## tvalue:   -5e-04
## pvalue:    0.4998
## cstar:     0
```

```r
plot(bhq4_max$clubs, avgTP = FALSE, main = "Transition paths for bhq4")
```


Club 1
Relative transition path
0.5
1.0
1.5
5
Time

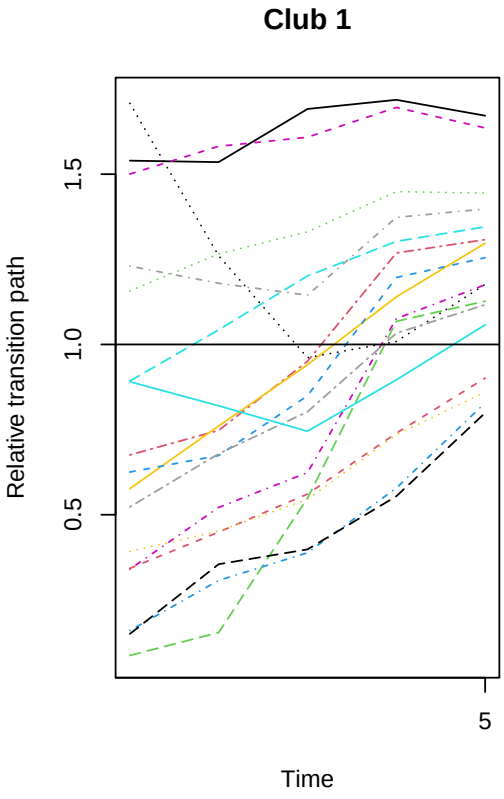

Club 2
Relative transition path
0.4
0.6
0.8
1.0
1.2
1.4
1.6
5
Time

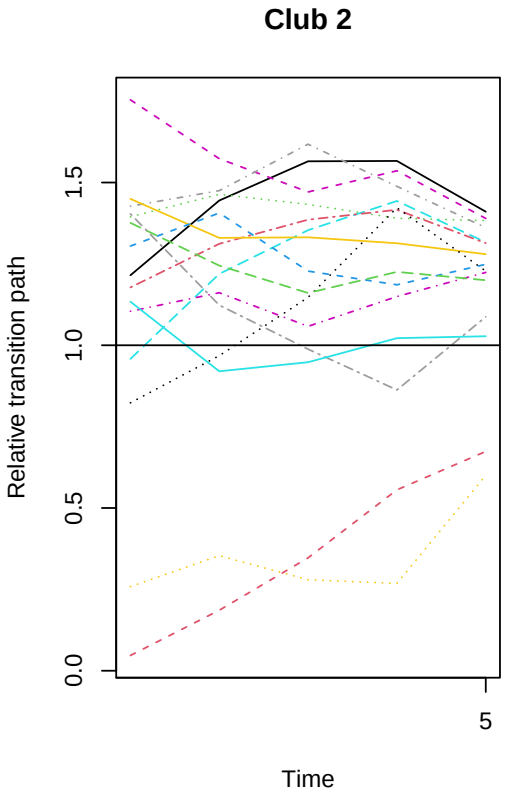
```
mix_max = run_ps(gdim_1940, measure = "mix", dataCols = 2:6); mix_max
```

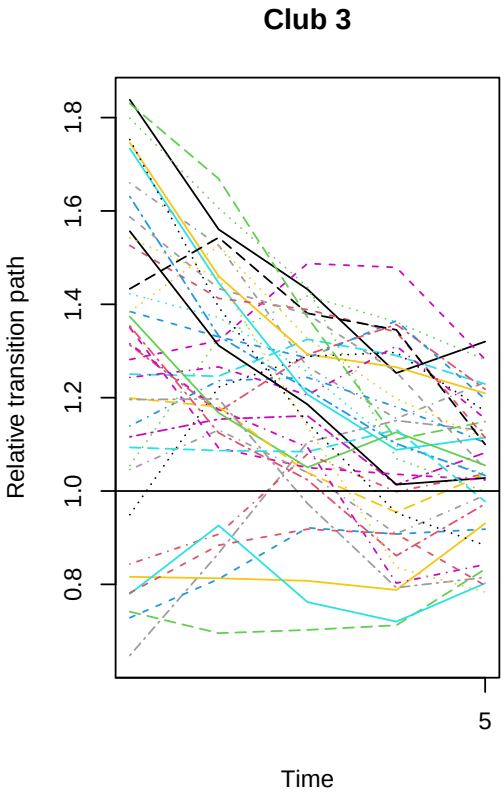
```
## $H
##       1940       1950       1960       1970       1980
## 0.26815923 0.17933818 0.13460611 0.12185733 0.08671455
##
## $global
##        beta     std.err      tvalue      pvalue
## -0.66420917  0.26135961 -2.54136116  0.00552109
##
## $clubs
## ========================================================================
## club 1
## ------------------------------------------------------------------------
## Taiwan, China, Korea, Rep., Brazil, Portugal, Colombia, Egypt, Arab
## Rep., Bolivia, Indonesia, Poland, Tunisia, Timor-Leste, Morocco, India,
## Guatemala, Pakistan, Nepal, Djibouti
##
## beta:      1.1996
## std.err:   0.203
## tvalue:    5.911
## pvalue:    1
## cstar:     0
##
## ========================================================================
## club 2
## ------------------------------------------------------------------------
## Spain, Canada, Ireland, Cyprus, Mexico, Chile, Netherlands, Albania,
## South Africa, Denmark, Norway, North Macedonia, Slovenia, Gambia, The,
## Guinea
##
## beta:      0.3797
## std.err:   0.6085
## tvalue:    0.624
## pvalue:    0.7337
## cstar:     0
##
## ========================================================================
## club 3
## ------------------------------------------------------------------------
## Ukraine, Greece, Jordan, Russian Federation, United Kingdom, France,
## Sweden, Belgium, Peru, Australia, Japan, Ecuador, Lithuania, Israel,
## Romania, Panama, Italy, Bosnia and Herzegovina, United States, Finland,
## Croatia, China, Belarus, Georgia, Latvia, Iceland, Moldova, Kosovo,
## Switzerland, Montenegro, Austria, Nigeria, Estonia, Serbia, Germany,
## Kyrgyz Republic, Ghana, Madagascar, Bulgaria
##
## beta:     -0.9046
## std.err:   0.6901
## tvalue:   -1.3109
## pvalue:    0.095
## cstar:     0
##
## ========================================================================
```

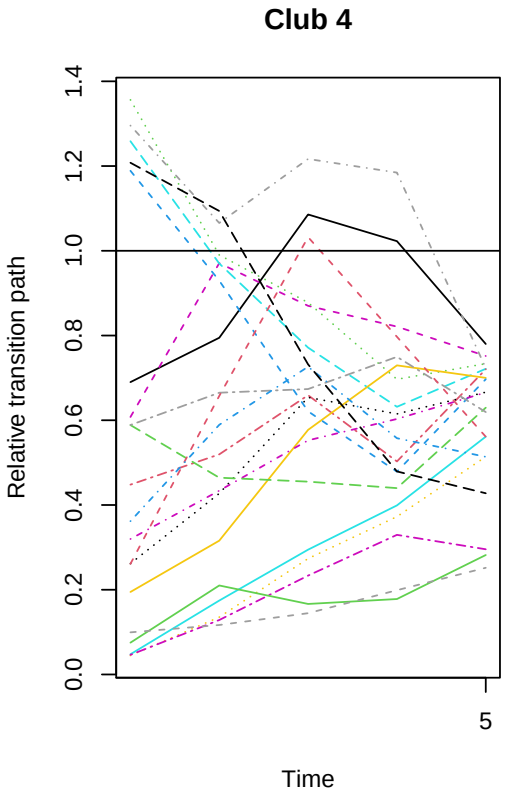
```
## club 4
## ------------------------------------------------------------------------
## Iraq, Gabon, Hungary, Philippines, Slovak Republic, Uganda, Rwanda,
## Armenia, Togo, Malawi, Czech Republic, Niger, Mauritania, Tanzania,
## Ethiopia, Liberia, Uzbekistan, Bhutan, Mali, Burundi
##
## beta:      0.6121
## std.err:   0.6203
## tvalue:    0.9868
## pvalue:    0.8381
## cstar:     0
```

```
plot(mix_max$clubs, avgTP = FALSE, main = "Transition paths for mix")
```


Club 1
Relative transition path
0.5
1.0
1.5
5
Time


Club 2
Relative transition path
0.0
0.5
1.0
1.5
5
Time


Club 3
Relative transition path
0.8
1.0
1.2
1.4
1.6
1.8
5
Time


Club 4
Relative transition path
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
5
Time

The following results use average parental education, rather than the parental maximum.

```
ige_avg = run_ps(gdim_1940, parent = "avg", dataCols = 2:6); ige_avg
```

```
## $H
##      1940      1950      1960      1970      1980
## 0.8283705 0.5450486 0.3172394 0.1935977 0.1681044
##
## $global
##        beta     std.err      tvalue      pvalue
## -0.23516834  0.14424338 -1.63035797  0.05151293
##
## $clubs
## ========================================================================
## club 1
## ------------------------------------------------------------------------
## Philippines, Israel, United Kingdom, Korea, Rep., Cyprus, South Africa,
## Denmark, Iceland, Finland, Australia, France, Netherlands, Jordan,
## Canada, Germany, Uzbekistan, Lithuania, Belarus, Greece, United States,
## Belgium, Japan, Spain, Taiwan, China, Sweden, Ireland, Norway, Kyrgyz
## Republic, Italy, Switzerland, Poland, Chile, Kosovo, Russian
## Federation, Slovenia, Brazil, Albania, Ukraine, Latvia, Mexico, Peru,
## Slovak Republic, Indonesia, Estonia, Czech Republic, Bolivia, Egypt,
## Arab Rep., Bosnia and Herzegovina, Serbia, Moldova, Austria, Georgia,
## Croatia, Tanzania, Liberia, Malawi, Panama, Tunisia, Colombia, Armenia,
## China, Ecuador, North Macedonia, Gabon, Nigeria, Montenegro,
## Mauritania, Rwanda, Uganda, Portugal, Ghana, Hungary, Bulgaria, Iraq,
## Djibouti, Morocco, Gambia, The, Romania, Burundi, Niger, Timor-Leste,
## India, Togo, Pakistan, Madagascar, Guinea, Guatemala, Nepal, Ethiopia,
## Mali, Bhutan
##
## beta:     -0.2352
## std.err:   0.1442
## tvalue:   -1.6304
## pvalue:    0.0515
## cstar:     0
```

```
cor_avg = run_ps(gdim_1940, parent = "avg",
                 measure = "1-cor", dataCols = 2:6); cor_avg
```

```
## $H
##       1940       1950       1960       1970       1980
## 0.08250437 0.05038865 0.03356405 0.03243422 0.03414733
##
## $global
##         beta      std.err       tvalue       pvalue
##   -1.5272565    0.0126237 -120.9832626    0.0000000
##
## $clubs
## ========================================================================
## club 1
## ------------------------------------------------------------------------
## Philippines, Denmark, Djibouti, Iceland, Cyprus, Australia, United
## Kingdom, Finland, Timor-Leste, Germany, Japan, Uzbekistan, Netherlands,
## Norway, Canada, Kosovo, Slovenia, Albania, South Africa, Switzerland,
```

```
## Korea, Rep., Gambia, The, Belarus, Mauritania, France, Czech Republic,
## Bhutan, Morocco, Kyrgyz Republic, Lithuania, Rwanda, Israel, Burundi,
## Ukraine, Jordan, Estonia, Liberia, United States, Latvia, Spain,
## Tunisia, Niger, Poland, Portugal, Taiwan, China, Gabon, Slovak
## Republic, Italy, Malawi, Bosnia and Herzegovina, Austria, Sweden,
## Ireland
##
## beta:     -0.3242
## std.err:   0.2619
## tvalue:   -1.2381
## pvalue:    0.1078
## cstar:     0
##
## ========================================================================
## club 2
## ------------------------------------------------------------------------
## Ethiopia, Egypt, Arab Rep., Tanzania, Russian Federation, Moldova,
## China, Nepal, Belgium, Greece, Georgia, Armenia, Serbia, Iraq, Mexico,
## Indonesia, Peru, Nigeria, Brazil, Guinea, Uganda, Chile, Bolivia, Togo,
## Croatia, Ecuador, Pakistan, Colombia, Ghana, North Macedonia,
## Montenegro, India, Mali, Guatemala, Madagascar, Panama, Hungary,
## Romania, Bulgaria
##
## beta:      0.2241
## std.err:   0.6396
## tvalue:    0.3504
## pvalue:    0.637
## cstar:     0
```

```
mu050_avg = run_ps(gdim_1940, parent = "avg",
                   measure = "mu050", dataCols = 2:6); mu050_avg
```

```
## $H
##        1940        1950        1960        1970        1980
## 0.014057227 0.014444490 0.012599809 0.010303856 0.009610945
##
## $global
##        beta     std.err      tvalue      pvalue
##  -0.9626727   0.0193626 -49.7181594   0.0000000
##
## $clubs
## ========================================================================
## club 1
## ------------------------------------------------------------------------
## Bhutan, Cyprus, Burundi, Niger, Denmark, Israel, Philippines, Malawi,
## Iceland, Timor-Leste, Guinea, Russian Federation, Mauritania, Slovenia,
## Ethiopia, Germany, Mali, Finland, Slovak Republic, Djibouti, France,
## Uzbekistan, Tanzania, Albania, Japan, United Kingdom, Belgium,
## Indonesia, Estonia, Bosnia and Herzegovina, Montenegro, Korea, Rep.,
## South Africa, Croatia
##
## beta:      0.5053
## std.err:   0.2938
## tvalue:    1.7199
## pvalue:    0.9573
```

```
## cstar:     0
##
## ========================================================================
## club 2
## ------------------------------------------------------------------------
## Morocco, Togo, Lithuania, Netherlands, Jordan, Norway, Switzerland,
## Kosovo, Rwanda, Canada, Portugal, Sweden, Kyrgyz Republic, Hungary,
## Ukraine, Uganda, Serbia, Egypt, Arab Rep., Latvia, Nepal, Taiwan,
## China, Madagascar, Gambia, The, Belarus, Poland, Italy, Bulgaria,
## Australia, Armenia, Spain, Czech Republic, Tunisia, Moldova, Austria,
## India, Georgia, Greece, Iraq, Guatemala, Mexico, Brazil, China, Gabon,
## Nigeria, North Macedonia, Peru, Ireland, Liberia, United States, Chile,
## Pakistan, Ecuador, Romania, Colombia, Bolivia, Ghana, Panama
##
## beta:     -0.1665
## std.err:   0.2991
## tvalue:   -0.5567
## pvalue:    0.2889
## cstar:     0
```

```
bhq4_avg = run_ps(gdim_1940, parent = "avg",
                  measure = "bhq4", dataCols = 2:6); bhq4_avg
```

```
## $H
##       1940       1950       1960       1970       1980
## 0.11033826 0.08785875 0.06449501 0.05636123 0.04774131
##
## $global
##          beta       std.err        tvalue        pvalue
## -9.175769e-01  9.939429e-02 -9.231686e+00  1.332022e-20
##
## $clubs
## ========================================================================
## club 1
## ------------------------------------------------------------------------
## Bhutan, Cyprus, Djibouti, Niger, Denmark, Gambia, The, Philippines,
## Bosnia and Herzegovina, Burundi, Netherlands, Ukraine, Slovenia,
## Mauritania, Germany, Timor-Leste, Kosovo, United Kingdom, Japan,
## Israel, Sweden, Taiwan, China, Estonia, South Africa, Korea, Rep.,
## Montenegro, France, Spain, Belgium, Croatia, North Macedonia, Bolivia
##
## beta:      1.0765
## std.err:   0.9116
## tvalue:    1.1809
## pvalue:    0.8812
## cstar:     0
##
## ========================================================================
## club 2
## ------------------------------------------------------------------------
## Morocco, Slovak Republic, Tunisia, Switzerland, Lithuania, Australia,
## Czech Republic, Canada, Kyrgyz Republic, Ethiopia, Russian Federation,
## Finland, Jordan, Uzbekistan, Liberia, Portugal, Iceland, Poland,
## Malawi, Rwanda, Norway, Hungary, Mali, Austria, Italy, Moldova, Guinea,
## Indonesia, Serbia, Latvia, Albania, Iraq, Ireland, China, United
```

```
## States, Nigeria, Belarus, Peru, Tanzania, Greece, Mexico, Georgia,
## Bulgaria, Colombia, Nepal, Ecuador, Gabon, Madagascar, Romania, Togo,
## Egypt, Arab Rep., Ghana, Uganda, Panama, Armenia, Guatemala, Chile,
## India, Pakistan, Brazil
##
## beta:     -0.0317
## std.err:   0.4449
## tvalue:   -0.0713
## pvalue:    0.4716
## cstar:     0
```

```
mix_avg = run_ps(gdim_1940, parent = "avg",
                 measure = "mix", dataCols = 2:6); mix_avg
```

```
## $H
##       1940       1950       1960       1970       1980
## 0.26785192 0.17877944 0.13401083 0.12062781 0.08456775
##
## $global
##        beta     std.err      tvalue      pvalue
## -0.62478061  0.26979361 -2.31577244  0.01028535
##
## $clubs
## ============================================================================
## club 1
## ----------------------------------------------------------------------------
## Taiwan, China, Korea, Rep., Brazil, Spain, Portugal, Colombia, Ireland,
## Canada, Chile, Jordan, Egypt, Arab Rep., Cyprus, France, Greece,
## Mexico, Bolivia, South Africa, Ukraine, Peru, Netherlands, Indonesia,
## Belgium, Denmark, United Kingdom, Albania, Sweden, Russian Federation,
## Tunisia, Ecuador, Norway, Poland, Israel, Australia, North Macedonia,
## Morocco, Japan, Panama, Timor-Leste, India, Finland, China, Lithuania,
## Romania, Bosnia and Herzegovina, Italy, United States, Nigeria,
## Croatia, Kosovo, Slovenia, Georgia, Latvia, Belarus, Iceland, Moldova,
## Switzerland, Montenegro, Austria, Ghana, Guatemala, Pakistan, Nepal,
## Estonia, Germany, Serbia, Philippines, Kyrgyz Republic, Madagascar,
## Djibouti, Iraq, Gabon, Bulgaria, Malawi, Slovak Republic, Uganda,
## Hungary, Gambia, The, Rwanda, Armenia, Togo, Liberia, Guinea, Czech
## Republic, Niger, Mauritania, Ethiopia, Mali
##
## beta:     -0.3702
## std.err:   0.34
## tvalue:   -1.0889
## pvalue:    0.1381
## cstar:     0
##
## ============================================================================
## club 2
## ----------------------------------------------------------------------------
## Tanzania, Uzbekistan, Bhutan, Burundi
##
## beta:      1.4321
## std.err:   0.3174
## tvalue:    4.5123
## pvalue:    1
```

```
## cstar:     0
```

These results restrict the parent set to fathers, while keeping all children.

```
ige_dad_all = run_ps(gdim_1940, parent = "dad", child = "all",
                     dataCols = 2:6); ige_dad_all
```

```
## $H
##       1940       1950       1960       1970       1980
## 0.15763232 0.12354313 0.08485020 0.05952900 0.05486177
##
## $global
##          beta       std.err        tvalue        pvalue
## -6.292264e-01  1.051907e-01 -5.981770e+00  1.103631e-09
##
## $clubs
## ========================================================================
## club 1
## ------------------------------------------------------------------------
## Philippines, United Kingdom, South Africa, Denmark, Iceland, Korea,
## Rep., Israel, Uzbekistan, Cyprus, Finland, Australia, Jordan, France,
## Lithuania, Canada, Germany, Sweden, Netherlands, Ireland, United
## States, Spain, Belgium, Belarus, Japan, Norway, Switzerland, Ukraine,
## Poland, Russian Federation, Taiwan, China, Slovenia, Latvia, Chile,
## Greece, Italy, Slovak Republic, Kyrgyz Republic, Estonia, Liberia,
## Brazil, Malawi, Mexico, Czech Republic, Indonesia, Kosovo, Gabon,
## Moldova, Albania, Georgia, Egypt, Arab Rep., Peru, Tunisia, Bosnia and
## Herzegovina, Tanzania, Uganda, Bolivia, Austria, Armenia, Mauritania,
## Croatia, Colombia, China, Serbia, Panama, Rwanda, Ecuador, Nigeria,
## Morocco, Portugal, Iraq, Montenegro, Gambia, The, Ghana, Burundi,
## Djibouti, North Macedonia, Pakistan, India, Hungary, Niger,
## Timor-Leste, Togo, Nepal, Madagascar, Guatemala
##
## beta:     -0.0536
## std.err:   0.0945
## tvalue:   -0.5667
## pvalue:    0.2855
## cstar:     0
##
## ========================================================================
## club 2
## ------------------------------------------------------------------------
## Bulgaria, Guinea, Romania, Mali
##
## beta:      0.2056
## std.err:   1.4538
## tvalue:    0.1414
## pvalue:    0.5562
## cstar:     0
##
## ========================================================================
## club 3
## ------------------------------------------------------------------------
## Ethiopia, Bhutan
##
```

```
## beta:     -2.22
## std.err:   4.1196
## tvalue:   -0.5389
## pvalue:    0.295
## cstar:     0
```

```
cor_dad_all = run_ps(gdim_1940, parent = "dad", child = "all",
                     measure = "1-cor", dataCols = 2:6); cor_dad_all
```

```
## $H
##       1940       1950       1960       1970       1980
## 0.06567883 0.04627308 0.02752990 0.02533348 0.02732965
##
## $global
##           beta        std.err         tvalue         pvalue
##  -1.473482e+00   6.267501e-02  -2.350988e+01  1.616125e-122
##
## $clubs
## ============================================================================
## club 1
## ----------------------------------------------------------------------------
## Denmark, Philippines, Iceland, United Kingdom, Djibouti, Uzbekistan,
## Germany, South Africa
##
## beta:      2.1992
## std.err:   1.3599
## tvalue:    1.6172
## pvalue:    0.9471
## cstar:     0
##
## ============================================================================
## club 2
## ----------------------------------------------------------------------------
## Cyprus, Australia, Finland, Timor-Leste, Lithuania, Norway, Slovenia,
## Canada, Switzerland, Japan, Netherlands, Ukraine, Belarus, France,
## Korea, Rep., Latvia, Albania, Estonia, Mauritania, Kosovo, Gambia, The,
## Jordan, Slovak Republic, Israel, Czech Republic, Morocco, Rwanda,
## Poland, Gabon, Burundi, Portugal, United States, Spain, Tunisia,
## Sweden, Liberia, Bhutan, Niger, Moldova, Kyrgyz Republic, Ireland,
## Bosnia and Herzegovina, Russian Federation, Malawi, Armenia, China,
## Georgia, Taiwan, China, Tanzania, Austria, Belgium, Italy, Ethiopia,
## Iraq, Egypt, Arab Rep., Uganda, Indonesia, Serbia, Mexico, Nigeria,
## Nepal, Peru, Chile, Brazil, Colombia, Montenegro, Ecuador, Guinea,
## Croatia, Greece, Pakistan, Bolivia, India, Ghana, North Macedonia,
## Togo, Panama, Madagascar, Mali, Guatemala, Hungary, Romania
##
## beta:     -0.9453
## std.err:   0.0482
## tvalue:   -19.6224
## pvalue:    0
## cstar:     0
##
## ============================================================================
## divergent
## ----------------------------------------------------------------------------
```

```
## Bulgaria
```

```
mu050_dad_all = run_ps(gdim_1940, parent = "dad", child = "all",
                   measure = "mu050", dataCols = 2:6); mu050_dad_all
```

```
## $H
##        1940        1950        1960        1970        1980
## 0.012990271 0.013110682 0.011070918 0.009510313 0.008883998
##
## $global
##          beta       std.err        tvalue        pvalue
##   -1.06533027    0.01010693 -105.40588216    0.00000000
##
## $clubs
## ========================================================================
## club 1
## ------------------------------------------------------------------------
## Bhutan, Cyprus, Niger, Burundi, Denmark, Israel, Russian Federation,
## Malawi, Iceland, Mauritania, Guinea, Timor-Leste, Philippines, Germany,
## Ethiopia, Finland, Slovenia, Slovak Republic, Mali, Tanzania, United
## Kingdom, Albania, Belgium, Indonesia, Japan, South Africa
##
## beta:      0.6341
## std.err:   0.4761
## tvalue:    1.3317
## pvalue:    0.9085
## cstar:     0
##
## ========================================================================
## club 2
## ------------------------------------------------------------------------
## France, Lithuania, Djibouti, Uzbekistan, Morocco, Portugal, Norway,
## Estonia, Togo, Hungary, Poland, Switzerland, Rwanda, Madagascar,
## Canada, Sweden, Jordan, Latvia, Netherlands, Bosnia and Herzegovina,
## Kyrgyz Republic, Korea, Rep., Uganda, Serbia, Egypt, Arab Rep., Kosovo,
## Australia, Moldova, Nepal, Taiwan, China, Bulgaria, Italy, Montenegro,
## Belarus, Spain, Ukraine, Gambia, The, Georgia, Czech Republic, Croatia,
## Armenia, Austria, China, Tunisia, Nigeria, India, Gabon, Iraq, Brazil,
## Guatemala, Ireland, United States, North Macedonia, Greece, Mexico,
## Ecuador, Peru, Chile, Pakistan, Romania, Liberia, Colombia, Bolivia,
## Panama, Ghana
##
## beta:     -0.4252
## std.err:   0.2894
## tvalue:   -1.4693
## pvalue:    0.0709
## cstar:     0
```

```
bhq4_dad_all = run_ps(gdim_1940, parent = "dad", child = "all",
                   measure = "bhq4", dataCols = 2:6); bhq4_dad_all
```

```
## $H
##       1940       1950       1960       1970       1980
## 0.09149774 0.07418295 0.04954864 0.04397264 0.03726447
##
```

```
## $global
##          beta       std.err        tvalue        pvalue
## -9.497192e-01  1.086345e-01 -8.742336e+00  1.141699e-18
##
## $clubs
## ========================================================================
## club 1
## ------------------------------------------------------------------------
## Cyprus, Bhutan, Djibouti, Niger, Gambia, The, United Kingdom,
## Philippines, Denmark, Bosnia and Herzegovina, Slovenia, Mauritania,
## Germany, Netherlands, Burundi, Ukraine, Timor-Leste, Slovak Republic,
## Lithuania, Israel, Portugal, Japan, Australia, Korea, Rep., Poland,
## Russian Federation, Sweden, Spain, South Africa, Kosovo, Taiwan, China,
## France, Belgium, Croatia, Hungary, Montenegro, Serbia, Italy, North
## Macedonia, Georgia, Bulgaria
##
## beta:      0.9464
## std.err:   0.9051
## tvalue:    1.0456
## pvalue:    0.8521
## cstar:     0
##
## ========================================================================
## club 2
## ------------------------------------------------------------------------
## Czech Republic, Switzerland, Estonia, Finland, Moldova, Morocco,
## Canada, Kyrgyz Republic, Tunisia, Iceland, Malawi, Belarus, Norway,
## Ethiopia, Uzbekistan, Austria, Mali, Liberia, Latvia, Ireland, Guinea,
## Rwanda, Gabon, Tanzania, Jordan, Nigeria, United States, Indonesia,
## Albania, China, Peru, Iraq, Ecuador, Mexico, Colombia, Greece,
## Madagascar, Romania, Ghana, Armenia, Panama, Nepal, Bolivia, Chile
##
## beta:      0.1023
## std.err:   0.3441
## tvalue:    0.2974
## pvalue:    0.6169
## cstar:     0
##
## ========================================================================
## club 3
## ------------------------------------------------------------------------
## Egypt, Arab Rep., Togo, Uganda, Brazil, Pakistan, Guatemala, India
##
## beta:      2.3041
## std.err:   2.4634
## tvalue:    0.9353
## pvalue:    0.8252
## cstar:     0
```

```
mix_dad_all = run_ps(gdim_1940, parent = "dad", child = "all",
                     measure = "mix", dataCols = 2:6); mix_dad_all
```

```
## $H
##       1940       1950       1960       1970       1980
## 0.27549385 0.18227629 0.13655856 0.12149774 0.08693671
```

```
##
## $global
##         beta      std.err       tvalue       pvalue
## -0.639274321  0.246116293 -2.597448197  0.004695964
##
## $clubs
## ================================================================================
## club 1
## --------------------------------------------------------------------------------
## Taiwan, China, Korea, Rep., Brazil, Ireland, Portugal, Spain, Cyprus,
## Colombia, Canada, South Africa, Chile, Mexico, Ukraine, Greece, Jordan,
## Netherlands, Poland, Bolivia, Egypt, Arab Rep., Denmark, Indonesia,
## Belgium, Sweden, Russian Federation, Albania, United Kingdom, Norway,
## France, Australia, Panama, Peru, Lithuania, Ecuador, Italy, Tunisia,
## Romania, Finland, Japan, Israel, Bosnia and Herzegovina, Croatia,
## Morocco, Slovenia, Timor-Leste, China, United States, Latvia, North
## Macedonia, Moldova, India, Iceland, Georgia, Belarus, Switzerland,
## Montenegro, Nigeria, Kosovo, Serbia, Estonia, Austria, Guatemala,
## Philippines, Pakistan, Kyrgyz Republic, Ghana, Germany, Nepal,
## Madagascar, Djibouti, Hungary, Uganda, Slovak Republic, Rwanda,
## Armenia, Malawi, Gambia, The, Togo, Czech Republic, Guinea, Mauritania,
## Ethiopia
##
## beta:     -0.1322
## std.err:   0.3734
## tvalue:   -0.354
## pvalue:    0.3617
## cstar:     0
##
## ================================================================================
## club 2
## --------------------------------------------------------------------------------
## Bulgaria, Iraq, Gabon, Niger, Tanzania, Liberia, Uzbekistan, Bhutan,
## Mali, Burundi
##
## beta:     -0.0273
## std.err:   0.2561
## tvalue:   -0.1064
## pvalue:    0.4576
## cstar:     0
```

These results restrict the set solely to father-son mobility.

```
ige_dad_son = run_ps(gdim_1940, parent = "dad", child = "son",
                     dataCols = 2:6); ige_dad_son
```

```
## $H
##       1940       1950       1960       1970       1980
## 0.30992855 0.13450949 0.09752915 0.05324649 0.04728688
##
## $global
##        beta     std.err      tvalue      pvalue
## -0.05118538  0.23169179 -0.22092011  0.41257732
##
## $clubs
```

```
## ========================================================================
## club 1
## ------------------------------------------------------------------------
## Iceland, South Africa, Korea, Rep., United Kingdom, Cyprus,
## Philippines, Israel, Germany, Switzerland, Jordan, Lithuania,
## Australia, Liberia, Finland, Belgium, Netherlands, Ukraine, Canada,
## Uzbekistan, France, Sweden, Belarus, Denmark, Slovenia, Kosovo, Slovak
## Republic, Norway, Ireland, Latvia, United States, Italy, Bosnia and
## Herzegovina, Greece, Russian Federation, Japan, Kyrgyz Republic, Egypt,
## Arab Rep., Taiwan, China, Poland, Mauritania, Nigeria, Georgia, Chile,
## Indonesia, Spain, Moldova, Tunisia, Bolivia, Morocco, Malawi, Albania,
## Mexico, China, Peru, Gabon, Brazil, Estonia, Gambia, The, Uganda,
## Croatia, Czech Republic, Tanzania, Panama, Iraq, Austria, North
## Macedonia, Serbia, Armenia, Rwanda, Ecuador, Colombia, Ghana, Romania,
## Portugal, Djibouti, India, Nepal, Pakistan, Timor-Leste, Bulgaria,
## Burundi, Togo, Hungary, Niger, Montenegro, Guinea, Ethiopia,
## Madagascar, Guatemala, Bhutan, Mali
##
## beta:     -0.0512
## std.err:   0.2317
## tvalue:   -0.2209
## pvalue:    0.4126
## cstar:     0
```

```
cor_dad_son = run_ps(gdim_1940, parent = "dad", child = "son",
                 measure = "1-cor", dataCols = 2:6); cor_dad_son
```

```
## $H
##       1940       1950       1960       1970       1980
## 0.07431768 0.04650838 0.03023011 0.03186575 0.02919250
##
## $global
##          beta       std.err        tvalue        pvalue
## -1.444232e+00  1.532717e-01 -9.422689e+00  2.198408e-21
##
## $clubs
## ========================================================================
## club 1
## ------------------------------------------------------------------------
## Iceland, Philippines, Djibouti, United Kingdom, Switzerland, Cyprus,
## Germany, Denmark, South Africa, Liberia, Mauritania, Slovenia, Ukraine,
## Timor-Leste, Australia, Uzbekistan, Korea, Rep., Georgia, Gambia, The,
## Kosovo, Lithuania, Latvia, Norway, Netherlands, Finland, Belarus,
## Slovak Republic, Albania, Canada, Morocco, Bosnia and Herzegovina,
## Japan, Jordan, Rwanda, Israel, France, Burundi, China, Belgium, Bhutan,
## Gabon, Moldova, Ethiopia, Estonia, Niger, Nigeria, United States,
## Tunisia, Russian Federation, Sweden, Portugal, Italy, Taiwan, China,
## Poland, Ireland, Iraq, Kyrgyz Republic, Egypt, Arab Rep., Malawi, Czech
## Republic, Tanzania, Armenia, Indonesia, Austria, Nepal, Mexico, Guinea,
## Spain, Uganda
##
## beta:     -0.8533
## std.err:   0.5537
## tvalue:   -1.5412
## pvalue:    0.0616
```

```
## cstar:     0
##
## ========================================================================
## club 2
## ------------------------------------------------------------------------
## North Macedonia, Romania, Peru, Bolivia, Serbia, Pakistan, Croatia,
## Brazil, India, Ecuador, Colombia, Togo, Ghana, Greece, Madagascar,
## Chile, Hungary, Panama, Guatemala, Montenegro, Mali, Bulgaria
##
## beta:      0.6988
## std.err:   1.1057
## tvalue:    0.632
## pvalue:    0.7363
## cstar:     0
```

```
mu050_dad_son = run_ps(gdim_1940, parent = "dad", child = "son",
                  measure = "mu050", dataCols = 2:6); mu050_dad_son
```

```
## $H
##       1940       1950       1960       1970       1980
## 0.02181729 0.02485889 0.02501371 0.02321401 0.01996742
##
## $global
##          beta       std.err        tvalue        pvalue
## -1.068208e+00  1.245502e-01 -8.576525e+00  4.889126e-18
##
## $clubs
## ========================================================================
## club 1
## ------------------------------------------------------------------------
## Bhutan, Niger, Ethiopia, Djibouti
##
## beta:      0.1435
## std.err:   0.4632
## tvalue:    0.3097
## pvalue:    0.6216
## cstar:     0
##
## ========================================================================
## club 2
## ------------------------------------------------------------------------
## Togo, Malawi, Burundi, Mauritania, Mali, Slovak Republic, Uzbekistan,
## Denmark, Israel, Japan, Italy, Bulgaria, Georgia
##
## beta:      0.4012
## std.err:   0.7844
## tvalue:    0.5115
## pvalue:    0.6955
## cstar:     0
##
## ========================================================================
## club 3
## ------------------------------------------------------------------------
## Nepal, Timor-Leste, Morocco, Liberia, Uganda, Nigeria, Guinea,
## Tanzania, Cyprus, Gambia, The, Russian Federation, Iceland, Germany,
```

```
## Philippines, Madagascar, Switzerland, Indonesia, India, Egypt, Arab
## Rep., Kosovo, Iraq, Netherlands, France, Belgium, United Kingdom,
## Korea, Rep., Guatemala, Tunisia, Bosnia and Herzegovina, Rwanda, Gabon,
## Sweden, Ghana, Jordan, Albania, Hungary, Norway, Slovenia, Taiwan,
## China, China, Portugal, Lithuania, Moldova, Finland, Belarus, North
## Macedonia, South Africa, Kyrgyz Republic, Latvia, Bolivia, Croatia,
## Austria, Mexico, Ukraine, Greece, Canada, Pakistan, Australia,
## Montenegro, Ecuador, Chile, Czech Republic, Peru
##
## beta:     -0.2538
## std.err:   0.1683
## tvalue:   -1.5086
## pvalue:    0.0657
## cstar:     0
##
## ========================================================================
## club 4
## ------------------------------------------------------------------------
## Serbia, Ireland, Estonia, Poland, Romania, Armenia, Spain, United
## States, Brazil, Colombia, Panama
##
## beta:      0.3428
## std.err:   0.7502
## tvalue:    0.4569
## pvalue:    0.6761
## cstar:     0
```

```
bhq4_dad_son = run_ps(gdim_1940, parent = "dad", child = "son",
                  measure = "bhq4", dataCols = 2:6); bhq4_dad_son
```

```
## $H
##      1940      1950      1960      1970      1980
## 0.1721866 0.1778891 0.1683203 0.1516089 0.1135152
##
## $global
##          beta       std.err        tvalue        pvalue
## -0.7488058542  0.2173482785 -3.4451887972  0.0002853303
##
## $clubs
## ========================================================================
## club 1
## ------------------------------------------------------------------------
## Gambia, The, Liberia, Bhutan, Italy, Burundi, Mauritania, Netherlands,
## Japan, Germany, Uzbekistan, United Kingdom, Philippines, Ukraine,
## Switzerland, South Africa, Slovenia, Denmark, Australia, Georgia,
## Israel, Croatia, Spain
##
## beta:      1.4021
## std.err:   0.9862
## tvalue:    1.4217
## pvalue:    0.9224
## cstar:     0
##
## ========================================================================
## club 2
```

```
## ------------------------------------------------------------------------
## Togo, Ethiopia, Timor-Leste, Malawi, Mali, Nigeria, Morocco, Kosovo,
## Korea, Rep., Tanzania, Slovak Republic, Taiwan, China, Madagascar,
## Iceland, Belgium, Lithuania, Norway, Czech Republic, Russian
## Federation, Sweden, France, Finland, Hungary, North Macedonia, Peru
##
## beta:      0.8339
## std.err:   0.5256
## tvalue:    1.5866
## pvalue:    0.9437
## cstar:     0
##
## ========================================================================
## club 3
## ------------------------------------------------------------------------
## Cyprus, Nepal, Iraq, Gabon, Ghana, Bosnia and Herzegovina, Guinea,
## Indonesia, Uganda, Rwanda, Moldova, China, Austria, Canada, Kyrgyz
## Republic, Jordan, Egypt, Arab Rep., Portugal, Belarus, Mexico, India,
## Tunisia, Latvia, Ireland, Chile, Estonia, Ecuador, Guatemala, Bolivia,
## Greece, United States, Poland, Armenia, Romania, Montenegro, Colombia,
## Albania, Bulgaria, Pakistan, Serbia, Panama, Brazil
##
## beta:      0.4891
## std.err:   0.8477
## tvalue:    0.577
## pvalue:    0.718
## cstar:     0
##
## ========================================================================
## divergent
## ------------------------------------------------------------------------
## Niger, Djibouti
```

```
mix_dad_son = run_ps(gdim_1940, parent = "dad", child = "son",
                measure = "mix", dataCols = 2:6); mix_dad_son
```

```
## $H
##       1940       1950       1960       1970       1980
## 0.18953241 0.11851077 0.08783787 0.08175440 0.06700693
##
## $global
##          beta       std.err        tvalue        pvalue
## -9.840482e-01  1.651281e-01 -5.959301e+00  1.266597e-09
##
## $clubs
## ========================================================================
## club 1
## ------------------------------------------------------------------------
## Taiwan, China, Korea, Rep., Ireland, Brazil, Bolivia, Chile, South
## Africa, Cyprus, Mexico, Spain, Colombia, Egypt, Arab Rep., Jordan,
## Morocco, Netherlands, Portugal, Canada, Indonesia, Greece, Ukraine,
## Tunisia, Belgium, Peru, India, Albania, Italy, Russian Federation,
## France, Australia, Timor-Leste, Denmark, Ecuador, United Kingdom,
## Panama, Sweden, Nigeria, Japan, Romania, Poland, Norway, Nepal, China,
## North Macedonia, Bosnia and Herzegovina, Israel, Finland, Croatia,
```

```
## Djibouti, Kosovo, Lithuania, Switzerland, Togo, United States,
## Guatemala, Ghana, Latvia, Niger, Belarus, Uganda, Serbia, Slovenia,
## Moldova, Austria, Gambia, The, Montenegro, Kyrgyz Republic, Madagascar,
## Malawi, Germany, Pakistan, Armenia, Ethiopia, Mauritania, Czech
## Republic
##
## beta:     -0.3364
## std.err:   0.2712
## tvalue:   -1.2404
## pvalue:    0.1074
## cstar:     0
##
## ========================================================================
## club 2
## ------------------------------------------------------------------------
## Iraq, Philippines, Iceland, Liberia, Georgia, Gabon, Estonia, Tanzania,
## Slovak Republic, Bulgaria, Hungary, Rwanda, Guinea, Uzbekistan, Mali,
## Burundi, Bhutan
##
## beta:      0.3853
## std.err:   0.4786
## tvalue:    0.8051
## pvalue:    0.7896
## cstar:     0
```