

Barcelona crime longitudinal data quality

Alexandru Cernat

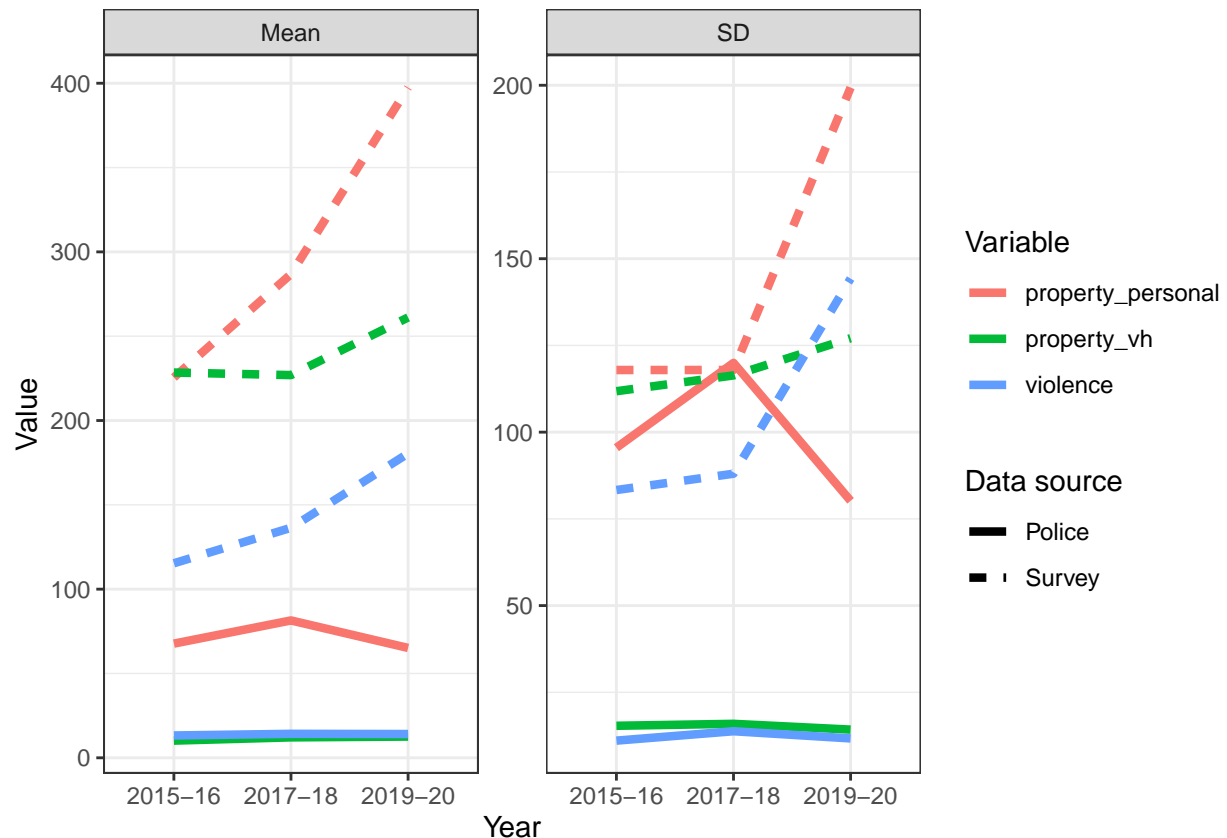
2021-03-11

Here I explore the Barcelona data that has three types of crimes: property vehicle, property personal and violence collected in surveys and official data over regions (76) and time (6 years). We group years by two in order to avoid having regions with 0s.

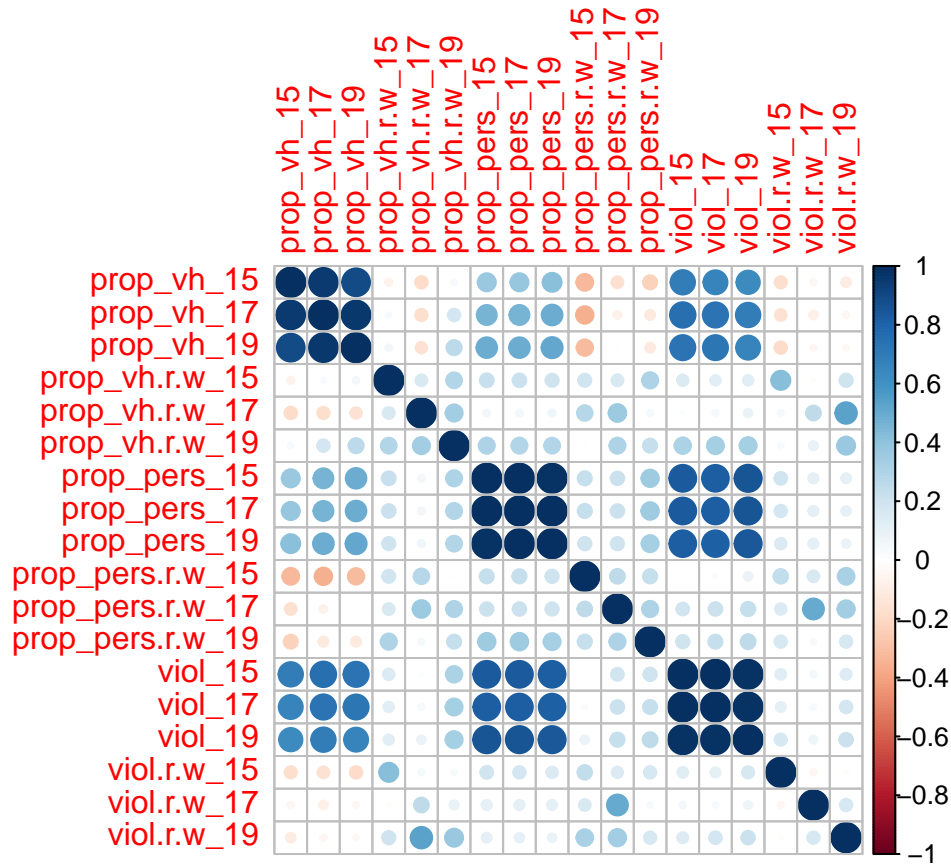
Here I concentrate on the weighted estimates from the survey (ending in “r.w”) and the official data.

Descriptives

First some descriptives. Bellow we observe quite big differences by data source.

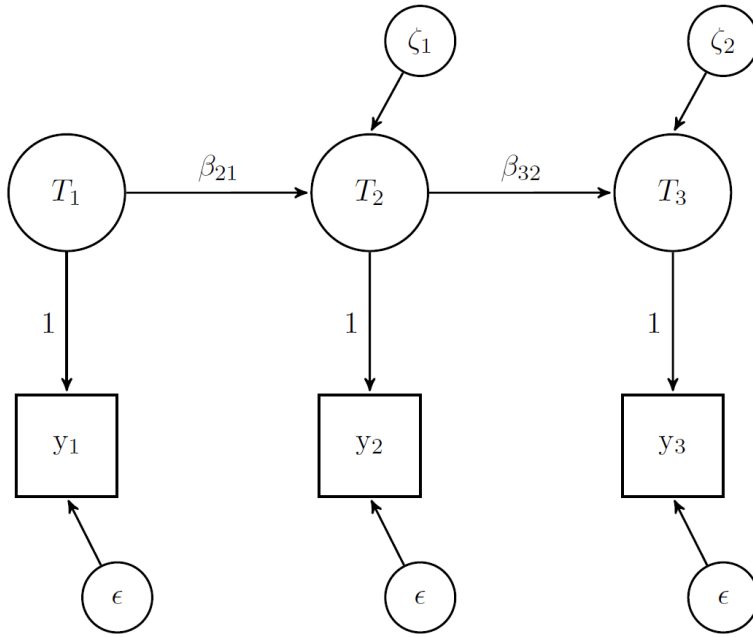


When we look at correlations we also see pretty striking patterns. First of all the consistency within measure is much higher for police data than survey data. Then, the relationship between of measures across data sources is very low. This could be problematic for any MTMM like modeling.



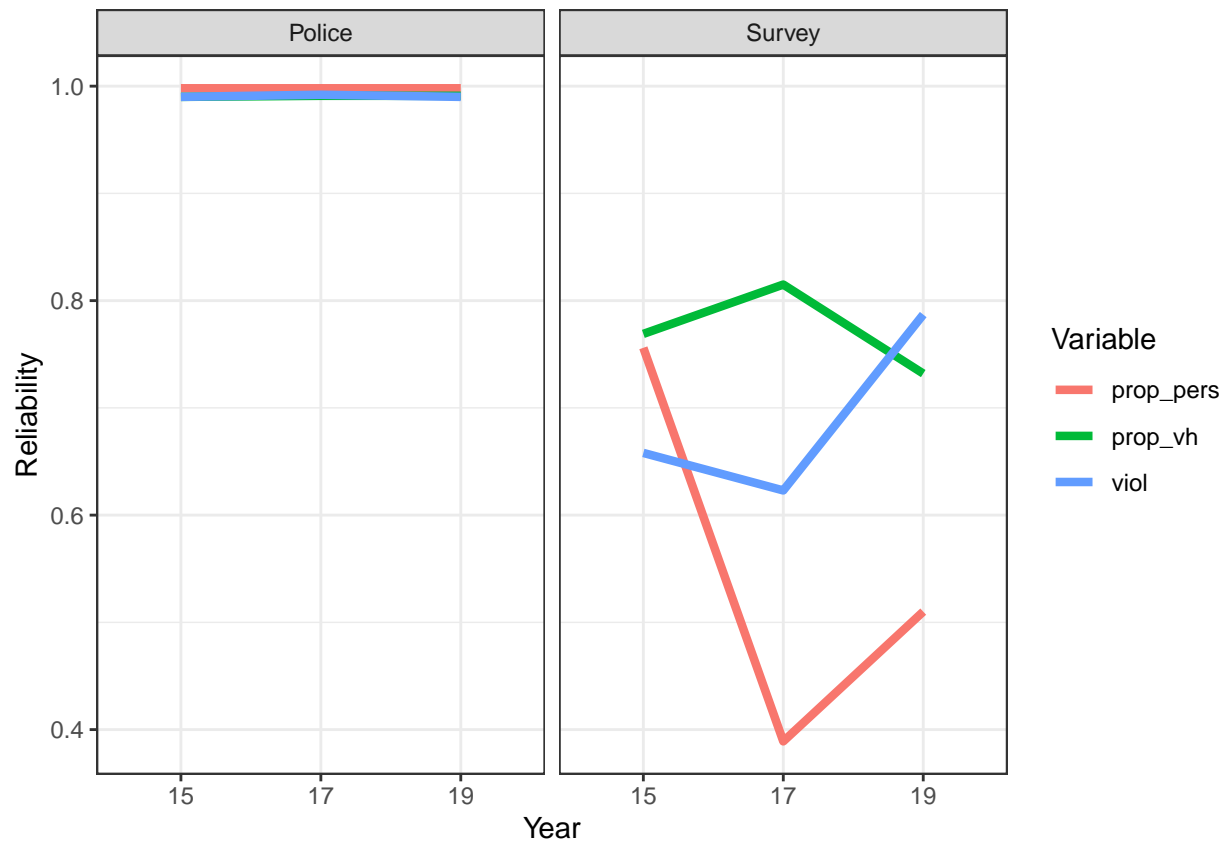
Quasi-simplex

A first way to look at the quality of the data is to use the quasi-simplex model. This assumes an auto-regressive model of true scores and estimates reliability by assuming equal variance of error over time (see for more details: <https://www.iser.essex.ac.uk/research/publications/working-papers/iser/2014-09.pdf>).



I estimate the models using **blavaan** which does in the background SEM using Stan. *I tried to use ML but it leads to negative variances (relative common occurrence for these models).*

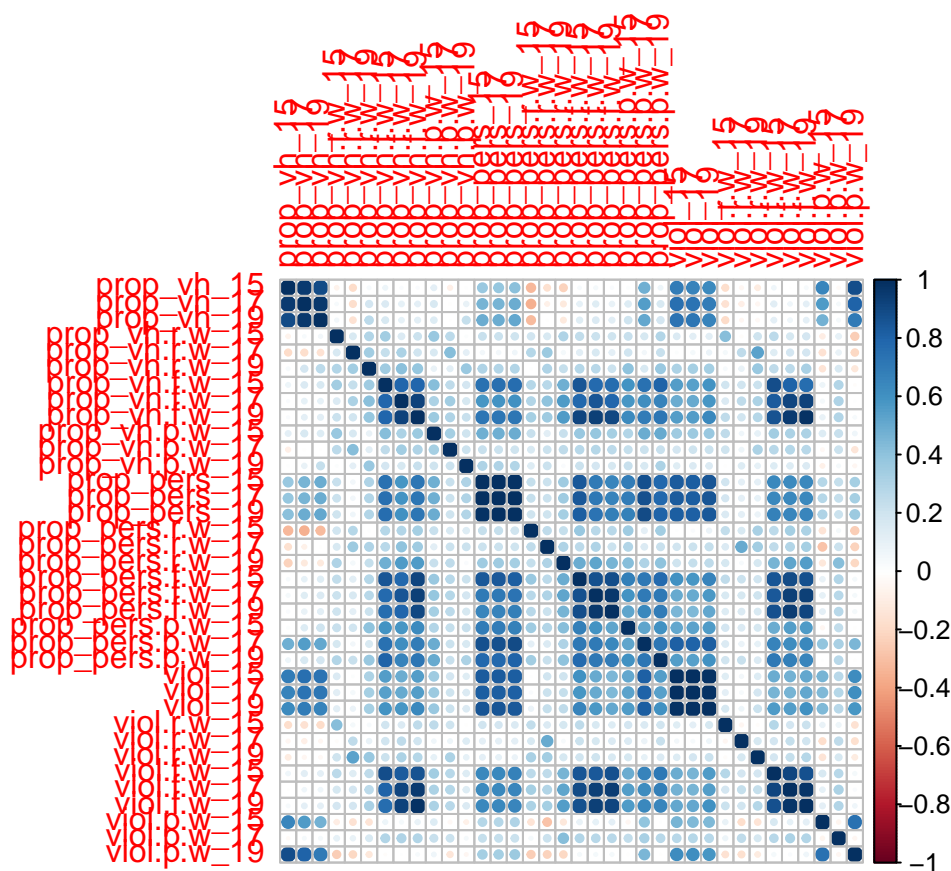
Here we plot the reliability by variable, data source and wave as estimated by quasi-simpex. Reliabilities are much lower for the survey data (as expected given the correlation matrices above).

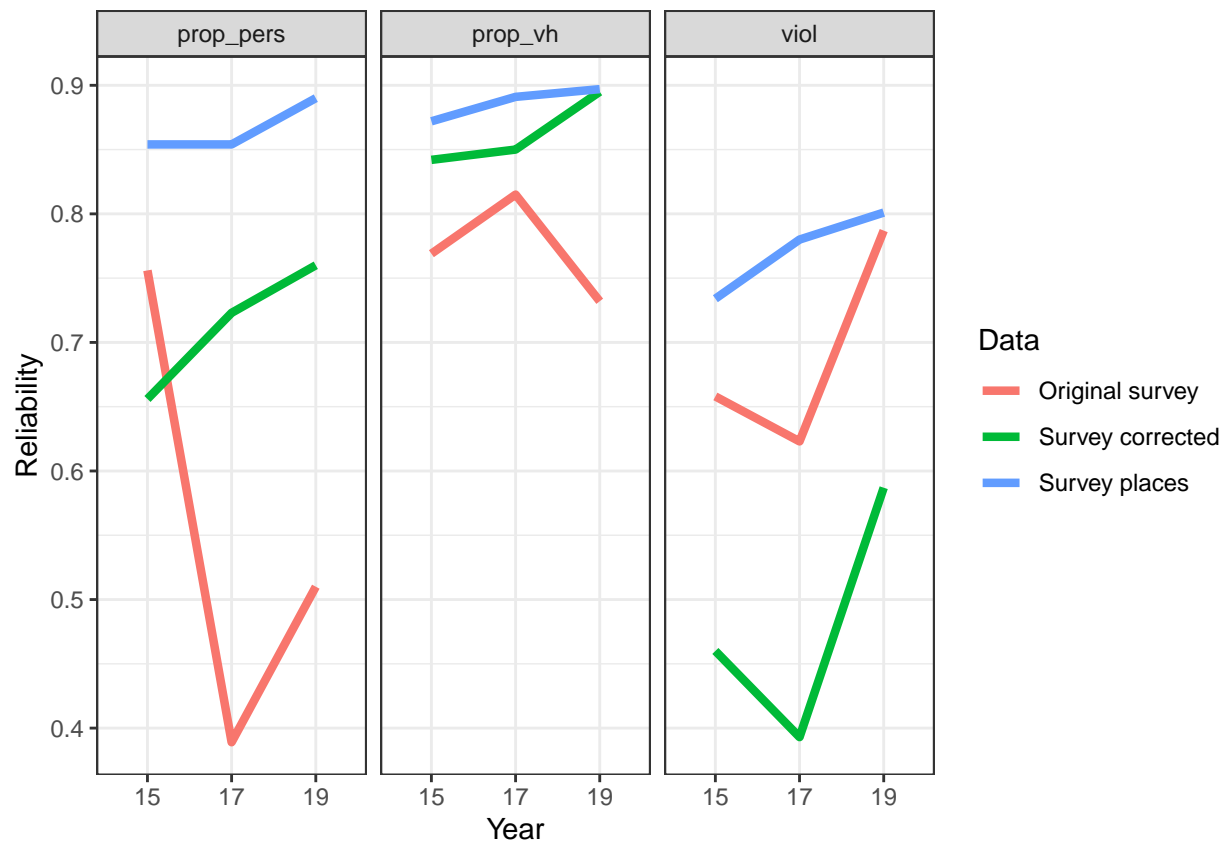


This is also obvious if we average reliability estimates.

group	var	reliability	reliability_source
Police	prop_pers	1.00	0.99
Police	prop_vh	0.99	0.99
Police	viol	0.99	0.99
Survey	prop_pers	0.55	0.67
Survey	prop_vh	0.77	0.67
Survey	viol	0.69	0.67

Given this and the point David made in a recent email let's have a look at the survey data about places where crimes happen ("f.w" - "Survey places") and looking only at crimes reported to the police ("p.w" - "Survey corrected").



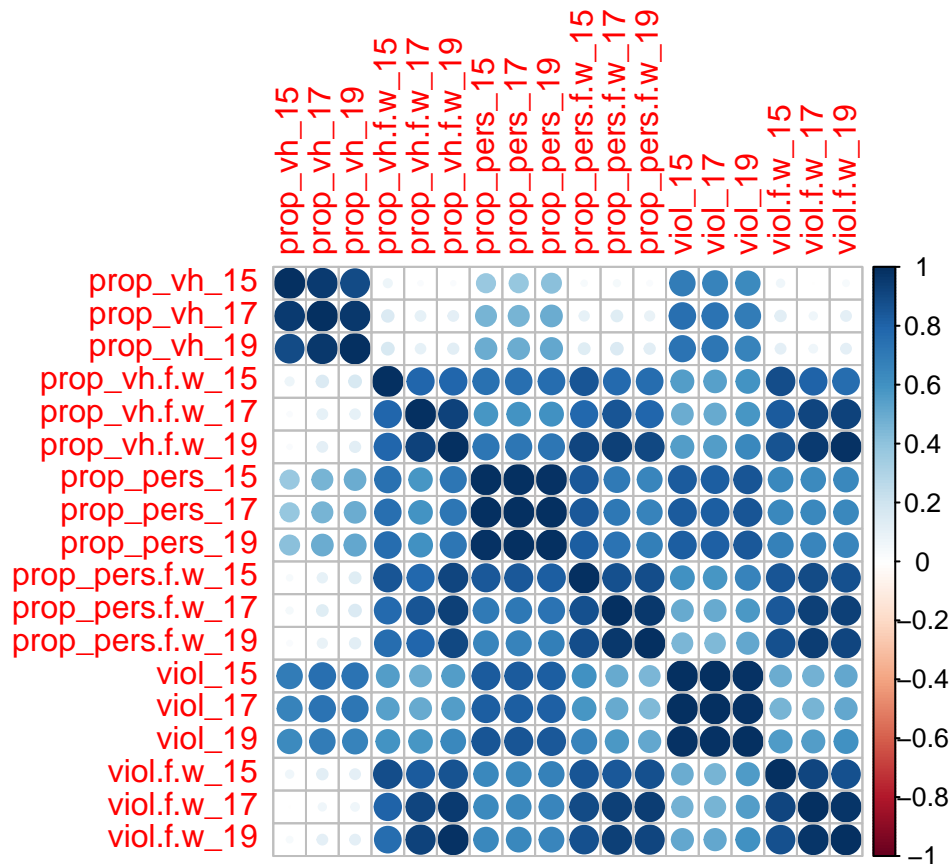


var	group	reliability	reliability_source
prop_pers	Original survey	0.55	0.67
prop_pers	Survey corrected	0.71	0.69
prop_pers	Survey places	0.87	0.84
prop_vh	Original survey	0.77	0.67
prop_vh	Survey corrected	0.86	0.69
prop_vh	Survey places	0.89	0.84
viol	Original survey	0.69	0.67
viol	Survey corrected	0.48	0.69
viol	Survey places	0.77	0.84

Overall seems that the “p.w” measures have better quality so we’ll use them in the next step.

Longitudinal variance decomposition

Next we will expand the quasi-simplex. We will make a measurement model at each wave that includes the measure of interest from the police and the corrected survey data in addition to include the simplex change in time. The statistic of interest here would be the standardized loading on trait which can be seen as “validity”.



Property vehicle

```
## blavaan (0.3-15) results of 2000 samples after 8000 adapt/burnin iterations
##
##   Number of observations              73
##
##   Number of missing patterns          1
##
##   Statistic              MargLogLik      PPP
##   Value                  -645.804      0.000
##
## Latent Variables:
##           Estimate Post.SD pi.lower pi.upper Std.lv Std.all
## t1 =~
##   prop_vh_15      1.000      0.627      0.959
##   prop_vh.f.w_15  1.000      0.627      0.258
## t2 =~
##   prop_vh_17      1.000      0.685      0.994
##   prop_vh.f.w_17  1.000      0.685      0.254
## t3 =~
##   prop_vh_19      1.000      0.680      0.974
##   prop_vh.f.w_19  1.000      0.680      0.257
##   Rhat      Prior
##
##   NA
```

```

##      NA
##
##      NA
##      NA
##
##      NA
##      NA
##
## Regressions:
##           Estimate Post.SD pi.lower pi.upper Std.lv Std.all
## t2 ~
## t1           1.069   0.069   0.936   1.204   0.978   0.978
## t3 ~
## t2           0.970   0.041   0.89    1.052   0.978   0.978
## Rhat Prior
##
## 1.000 normal(0,10)
##
## 1.000 normal(0,10)
##
## Intercepts:
##           Estimate Post.SD pi.lower pi.upper Std.lv Std.all
## .prop_vh_15      2.112   0.077   1.961   2.264   2.112   3.233
## .prop_vh.f.w_15  7.445   0.282   6.887   8.001   7.445   3.064
## .prop_vh_17      2.267   0.081   2.106   2.426   2.267   3.290
## .prop_vh.f.w_17  7.662   0.319   7.032   8.292   7.662   2.845
## .prop_vh_19      2.319   0.082   2.157   2.481   2.319   3.322
## .prop_vh.f.w_19  7.622   0.307   7.018   8.22    7.622   2.880
## t1              0.000           0.000   0.000
## .t2             0.000           0.000   0.000
## .t3             0.000           0.000   0.000
## Rhat Prior
## 1.001 normal(0,32)
## 1.000 normal(0,32)
## 1.001 normal(0,32)
## 1.000 normal(0,32)
## 1.001 normal(0,32)
## 1.000 normal(0,32)
##      NA
##      NA
##      NA
##
## Variances:
##           Estimate Post.SD pi.lower pi.upper Std.lv Std.all
## .prop_vh_15      0.034   0.018     0    0.066   0.034   0.079
## .prop_vh.f.w_15  5.514   0.950   3.96   7.647   5.514   0.933
## .prop_vh_17      0.005   0.005     0    0.019   0.005   0.012
## .prop_vh.f.w_17  6.786   1.161   4.856   9.371   6.786   0.935
## .prop_vh_19      0.025   0.017     0    0.057   0.025   0.052
## .prop_vh.f.w_19  6.542   1.115   4.714   9.029   6.542   0.934
## t1              0.393   0.077   0.265   0.566   1.000   1.000
## .t2             0.020   0.019     0    0.063   0.043   0.043
## .t3             0.020   0.017     0    0.054   0.044   0.044
## Rhat Prior

```

```
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
```

Property personal

```
## blavaan (0.3-15) results of 2000 samples after 8000 adapt/burnin iterations
```

```
##
##      Number of observations              73
##
##      Number of missing patterns          1
##
##      Statistic              MargLogLik      PPP
##      Value                  -579.389      0.000
##
## Latent Variables:
##      Estimate Post.SD pi.lower pi.upper Std.lv Std.all
##      t1 =~
##      prop_pers_15      1.000      0.852      0.996
##      prp_prs.f.w_15    1.000      0.852      0.321
##      t2 =~
##      prop_pers_17      1.000      0.896      0.999
##      prp_prs.f.w_17    1.000      0.896      0.330
##      t3 =~
##      prop_pers_19      1.000      0.780      0.996
##      prp_prs.f.w_19    1.000      0.780      0.268
##      Rhat      Prior
##
##      NA
##      NA
##
##      NA
##      NA
##
##      NA
##      NA
##
##
## Regressions:
##      Estimate Post.SD pi.lower pi.upper Std.lv Std.all
##      t2 ~
##      t1      1.048      0.018      1.013      1.083      0.996      0.996
##      t3 ~
##      t2      0.867      0.015      0.838      0.896      0.996      0.996
##      Rhat      Prior
##
##      1.000      normal(0,10)
##
```



```

##      1.000      normal(0,10)
##
## Intercepts:
##           Estimate Post.SD pi.lower pi.upper Std.lv Std.all
## .prop_pers_15      3.771   0.100   3.573   3.962   3.771   4.407
## .prp_prs.f.w_15     6.154   0.310   5.543   6.751   6.154   2.315
## .prop_pers_17      3.904   0.105   3.695   4.106   3.904   4.351
## .prp_prs.f.w_17     6.842   0.316   6.208   7.459   6.842   2.523
## .prop_pers_19      3.812   0.091   3.629   3.989   3.812   4.864
## .prp_prs.f.w_19     7.072   0.342   6.386   7.74    7.072   2.427
##      t1            0.000
##      .t2            0.000
##      .t3            0.000
##      Rhat      Prior
##      1.000      normal(0,32)
##      1.000      normal(0,32)
##      1.000      normal(0,32)
##      1.000      normal(0,32)
##      1.000      normal(0,32)
##      1.000      normal(0,32)
##      1.000      normal(0,32)
##      NA
##      NA
##      NA
##
## Variances:
##           Estimate Post.SD pi.lower pi.upper Std.lv Std.all
## .prop_pers_15      0.006   0.004      0   0.014   0.006   0.008
## .prp_prs.f.w_15     6.341   1.076   4.565   8.757   6.341   0.897
## .prop_pers_17      0.002   0.002      0   0.006   0.002   0.002
## .prp_prs.f.w_17     6.551   1.115   4.717   9.08    6.551   0.891
## .prop_pers_19      0.006   0.004      0   0.013   0.006   0.009
## .prp_prs.f.w_19     7.884   1.362   5.65   10.977   7.884   0.928
##      t1            0.726   0.125   0.522   1.009   1.000   1.000
##      .t2            0.006   0.005      0   0.015   0.007   0.007
##      .t3            0.005   0.004      0   0.013   0.008   0.008
##      Rhat      Prior
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]

```

Violence

```

## blavaan (0.3-15) results of 2000 samples after 8000 adapt/burnin iterations
##
##      Number of observations      73
##
##      Number of missing patterns      1

```

```

##
##      Statistic                MargLogLik      PPP
##      Value                   -570.826      0.000
##
## Latent Variables:
##      Estimate Post.SD pi.lower pi.upper Std.lv Std.all
##      t1 =~
##      viol_15      1.000      0.551      0.994
##      viol.f.w_15  1.000      0.551      0.195
##      t2 =~
##      viol_17      1.000      0.600      0.990
##      viol.f.w_17  1.000      0.600      0.194
##      t3 =~
##      viol_19      1.000      0.553      0.995
##      viol.f.w_19  1.000      0.553      0.184
##      Rhat      Prior
##
##      NA
##      NA
##
##      NA
##      NA
##
##      NA
##      NA
##
## Regressions:
##      Estimate Post.SD pi.lower pi.upper Std.lv Std.all
##      t2 ~
##      t1      1.083      0.028      1.028      1.138      0.994      0.994
##      t3 ~
##      t2      0.916      0.023      0.871      0.962      0.994      0.994
##      Rhat      Prior
##
##      1.000      normal(0,10)
##
##      1.000      normal(0,10)
##
## Intercepts:
##      Estimate Post.SD pi.lower pi.upper Std.lv Std.all
##      .viol_15      2.477      0.065      2.349      2.606      2.477      4.470
##      .viol.f.w_15  5.659      0.333      4.996      6.303      5.659      2.004
##      .viol_17      2.499      0.071      2.357      2.638      2.499      4.124
##      .viol.f.w_17  5.932      0.365      5.217      6.659      5.932      1.922
##      .viol_19      2.533      0.065      2.402      2.661      2.533      4.556
##      .viol.f.w_19  6.357      0.350      5.656      7.039      6.357      2.118
##      t1      0.000      0.000      0.000      0.000
##      .t2      0.000      0.000      0.000      0.000
##      .t3      0.000      0.000      0.000      0.000
##      Rhat      Prior
##      1.000      normal(0,32)
##      1.000      normal(0,32)
##      1.000      normal(0,32)
##      1.000      normal(0,32)

```

```

##      1.000      normal(0,32)
##      1.000      normal(0,32)
##      NA
##      NA
##      NA
##
## Variances:
##      Estimate Post.SD pi.lower pi.upper Std.lv Std.all
##      .viol_15      0.004   0.003      0      0.009   0.004   0.011
##      .viol.f.w_15    7.672   1.283   5.567  10.577   7.672   0.962
##      .viol_17      0.007   0.002   0.003   0.012   0.007   0.020
##      .viol.f.w_17    9.168   1.565   6.626  12.732   9.168   0.962
##      .viol_19      0.003   0.003      0      0.009   0.003   0.010
##      .viol.f.w_19    8.703   1.472   6.262  11.958   8.703   0.966
##      t1            0.304   0.053   0.217   0.422   1.000   1.000
##      .t2            0.004   0.003      0      0.011   0.012   0.012
##      .t3            0.004   0.003      0      0.009   0.012   0.012
##      Rhat      Prior
##      1.001 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.001 gamma(1,.5)[sd]
##      1.001 gamma(1,.5)[sd]

```

Include stable method effect

Additionally, we can expand this model and include a stable method effect. Now the standardized loading on the method effect is “systematic bias” while the standardized loading on trait can be seen as “reliability” I think. These models are getting hard to estimate so we need to trade lightly.

Property vehicle

```

## blavaan (0.3-15) results of 2000 samples after 8000 adapt/burnin iterations
##
##      Number of observations      73
##
##      Number of missing patterns      1
##
##      Statistic      MargLogLik      PPP
##      Value      -3048.089      0.010
##
## Latent Variables:
##      Estimate Post.SD pi.lower pi.upper Std.lv Std.all
##      t1 =~
##      prop_vh_15      1.000      1.748      0.115
##      prop_vh.p.w_15    1.000      1.748      0.067
##      t2 =~
##      prop_vh_17      1.000      3.163      0.208
##      prop_vh.p.w_17    1.000      3.163      0.113

```

```

## t3 =~
##   prop_vh_19      1.000      7.679      0.495
##   prop_vh.p.w_19  1.000      7.679      0.212
## pol =~
##   prop_vh_15      1.000     15.482      1.018
##   prop_vh_17      1.000     15.482      1.019
##   prop_vh_19      1.000     15.482      0.997
## surv =~
##   prop_vh.p.w_15  1.000     14.210      0.547
##   prop_vh.p.w_17  1.000     14.210      0.508
##   prop_vh.p.w_19  1.000     14.210      0.393
##   Rhat      Prior
##
##   NA
##   NA
##
##   NA
##   NA
##
##   NA
##   NA
##
##   NA
##   NA
##   NA
##
##   NA
##   NA
##   NA
##
##
## Regressions:
##           Estimate Post.SD pi.lower pi.upper Std.lv Std.all
## t2 ~
## t1      1.236     5.592  -12.229   13.151   0.683   0.683
## t3 ~
## t2      2.365     2.309   -1.242    7.703   0.974   0.974
##   Rhat      Prior
##
##   1.056  normal(0,10)
##
##   1.022  normal(0,10)
##
## Covariances:
##           Estimate Post.SD pi.lower pi.upper Std.lv Std.all
## t1 ~~
## pol      -10.070    20.019  -56.578   17.758  -0.372  -0.372
## surv       0.268     8.948  -18.158   18.928   0.011   0.011
## pol ~~
## surv      29.819    36.609  -41.821  104.529   0.136   0.136
##   Rhat      Prior
##
##   1.045  beta(1,1)
##   1.019  beta(1,1)
##

```

```

##      1.009      beta(1,1)
##
## Intercepts:
##      Estimate Post.SD pi.lower pi.upper Std.lv Std.all
##      .prop_vh_15      10.138      1.803      6.451      13.644      10.138      0.666
##      .prop_vh.p.w_15      38.188      3.018      32.376      44.127      38.188      1.470
##      .prop_vh_17      12.042      1.766      8.486      15.497      12.042      0.793
##      .prop_vh.p.w_17      39.561      3.323      32.926      45.987      39.561      1.415
##      .prop_vh_19      12.481      1.688      9.089      15.798      12.481      0.804
##      .prop_vh.p.w_19      45.067      4.251      36.712      53.315      45.067      1.245
##      t1      0.000
##      .t2      0.000
##      .t3      0.000
##      pol      0.000
##      surv      0.000
##      Rhat      Prior
##      1.004      normal(0,32)
##      1.001      normal(0,32)
##      1.004      normal(0,32)
##      1.002      normal(0,32)
##      1.004      normal(0,32)
##      1.002      normal(0,32)
##      NA
##      NA
##      NA
##      NA
##      NA
##
## Variances:
##      Estimate Post.SD pi.lower pi.upper Std.lv Std.all
##      .prop_vh_15      8.839      8.904      0.006      26.737      8.839      0.038
##      .prop_vh.p.w_15      469.374      101.079      304.15      700.177      469.374      0.695
##      .prop_vh_17      5.966      3.929      0.01      12.547      5.966      0.026
##      .prop_vh.p.w_17      568.670      113.766      380.671      818.471      568.670      0.728
##      .prop_vh_19      1.175      1.871      0.001      6.315      1.175      0.005
##      .prop_vh.p.w_19      1047.273      169.757      755.431      1423.391      1047.273      0.800
##      t1      3.056      7.528      0.004      21.016      1.000      1.000
##      .t2      5.335      5.322      0.007      17.417      0.533      0.533
##      .t3      3.004      4.554      0.002      17.024      0.051      0.051
##      pol      239.695      54.273      147.095      355.226      1.000      1.000
##      surv      201.912      78.699      41.173      365.176      1.000      1.000
##      Rhat      Prior
##      1.018      gamma(1,.5)[sd]
##      1.001      gamma(1,.5)[sd]
##      1.019      gamma(1,.5)[sd]
##      1.004      gamma(1,.5)[sd]
##      1.003      gamma(1,.5)[sd]
##      1.003      gamma(1,.5)[sd]
##      1.027      gamma(1,.5)[sd]
##      1.026      gamma(1,.5)[sd]
##      1.040      gamma(1,.5)[sd]
##      1.035      gamma(1,.5)[sd]
##      1.002      gamma(1,.5)[sd]

```

Property personal

** WARNING ** blavaan (0.3-15) did NOT converge after 8000 adapt+burnin iterations
 ## ** WARNING ** Proceed with caution

```
##
##   Number of observations                73
##
##   Number of missing patterns           1
##
##   Statistic                MargLogLik      PPP
##   Value                   -6039.737      0.000
##
## Latent Variables:
##           Estimate  Post.SD pi.lower pi.upper  Std.lv  Std.all
##   t1 =~
##     prop_pers_15      1.000                13.812   0.180
##     prp_prs.p.w_15     1.000                13.812   0.533
##   t2 =~
##     prop_pers_17      1.000                53.971   1.057
##     prp_prs.p.w_17     1.000                53.971   0.903
##   t3 =~
##     prop_pers_19      1.000                10.999   0.149
##     prp_prs.p.w_19     1.000                10.999   0.251
##   pol =~
##     prop_pers_15      1.000                66.852   0.869
##     prop_pers_17      1.000                66.852   1.309
##     prop_pers_19      1.000                66.852   0.905
##   surv =~
##     prp_prs.p.w_15     1.000                10.861   0.419
##     prp_prs.p.w_17     1.000                10.861   0.182
##     prp_prs.p.w_19     1.000                10.861   0.248
##   Rhat      Prior
##
##     NA
##     NA
##
##     NA
##     NA
##
##     NA
##     NA
##
##     NA
##     NA
##     NA
##
##     NA
##     NA
##     NA
##
##     NA
##     NA
##     NA
##
## Regressions:
##           Estimate  Post.SD pi.lower pi.upper  Std.lv  Std.all
##   t2 ~
##     t1              -3.907    8.595  -23.236   2.449   -1.000   -1.000
```

```

##      t3 ~
##      t2          -0.168    0.418   -0.862    0.238   -0.824   -0.824
##      Rhat      Prior
##
##      2.570    normal(0,10)
##
##      5.731    normal(0,10)
##
## Covariances:
##      Estimate Post.SD pi.lower pi.upper Std.lv Std.all
##      t1 ~~
##      pol      611.079  576.176 -198.678 1340.293   0.662   0.662
##      surv     -11.402   18.720  -51.922   22.222  -0.076  -0.076
##      pol ~~
##      surv     487.318  625.878  -75.309 1583.793   0.671   0.671
##      Rhat      Prior
##
##      4.694      beta(1,1)
##      1.213      beta(1,1)
##
##      5.079      beta(1,1)
##
## Intercepts:
##      Estimate Post.SD pi.lower pi.upper Std.lv Std.all
##      .prop_pers_15  52.569   7.979   36.678   67.978  52.569   0.683
##      .prp_prs.p.w_15 19.455   2.911   13.781   25.162  19.455   0.751
##      .prop_pers_17  62.370  10.049   42.457   81.695  62.370   1.221
##      .prp_prs.p.w_17 23.187   4.513   14.262   31.966  23.187   0.388
##      .prop_pers_19  52.172   6.895   38.491    65.41  52.172   0.706
##      .prp_prs.p.w_19 38.325   4.858   28.787   47.824  38.325   0.874
##      t1            0.000         0.000   0.000   0.000   0.000   0.000
##      .t2            0.000         0.000   0.000   0.000   0.000   0.000
##      .t3            0.000         0.000   0.000   0.000   0.000   0.000
##      pol            0.000         0.000   0.000   0.000   0.000   0.000
##      surv            0.000         0.000   0.000   0.000   0.000   0.000
##      Rhat      Prior
##      1.002    normal(0,32)
##      1.003    normal(0,32)
##      1.002    normal(0,32)
##      1.003    normal(0,32)
##      1.001    normal(0,32)
##      1.001    normal(0,32)
##      NA
##      NA
##      NA
##      NA
##      NA
##
## Variances:
##      Estimate Post.SD pi.lower pi.upper Std.lv Std.all
##      .prop_pers_15  33.914   6.469   22.995   48.339  33.914   0.006
##      .prp_prs.p.w_15 385.699  66.001  274.858  530.219 385.699   0.574
##      .prop_pers_17   1.289   2.027    0.001    7.217   1.289   0.000
##      .prp_prs.p.w_17 453.368  74.555  327.437  617.53 453.368   0.127

```

```

##      .prop_pers_19      66.192    45.004      0.04    138.33    66.192    0.012
##      .prp_prs.p.w_19 1699.358    267.875 1241.078 2281.625 1699.358    0.884
##      t1                190.768    156.558      0.648    438.725    1.000    1.000
##      .t2                1.100      2.036      0      6.648    0.000    0.000
##      .t3                38.825     41.991      0.012    121.946    0.321    0.321
##      pol                4469.227 1163.417   2872.12  6848.471    1.000    1.000
##      surv               117.969    153.721      0.003    413.131    1.000    1.000
##      Rhat      Prior
##      1.011 gamma(1,.5)[sd]
##      1.004 gamma(1,.5)[sd]
##      1.000 gamma(1,.5)[sd]
##      1.022 gamma(1,.5)[sd]
##      1.001 gamma(1,.5)[sd]
##      1.008 gamma(1,.5)[sd]
##      2.812 gamma(1,.5)[sd]
##      1.022 gamma(1,.5)[sd]
##      1.002 gamma(1,.5)[sd]
##      2.027 gamma(1,.5)[sd]
##      3.913 gamma(1,.5)[sd]

```

Violence

```

## ** WARNING ** blavaan (0.3-15) did NOT converge after 8000 adapt+burnin iterations
## ** WARNING ** Proceed with caution

```

```

##
##      Number of observations                73
##
##      Number of missing patterns                1
##
##      Statistic                        MargLogLik      PPP
##      Value                        -7188.764      0.000
##
## Latent Variables:
##      Estimate  Post.SD  pi.lower  pi.upper      Std.lv  Std.all
##      t1 =~
##      viol_15      1.000                2.742    0.255
##      viol.p.w_15  1.000                2.742    0.081
##      t2 =~
##      viol_17      1.000                0.917    0.092
##      viol.p.w_17  1.000                0.917    0.071
##      t3 =~
##      viol_19      1.000                1.760    0.173
##      viol.p.w_19  1.000                1.760    0.018
##      pol =~
##      viol_15      1.000                9.942    0.925
##      viol_17      1.000                9.942    0.995
##      viol_19      1.000                9.942    0.978
##      surv =~
##      viol.p.w_15  1.000                3.301    0.097
##      viol.p.w_17  1.000                3.301    0.255
##      viol.p.w_19  1.000                3.301    0.034
##      Rhat      Prior
##

```



```

##      NA
##      NA
##
##      NA
##      NA
##
##      NA
##      NA
##
##      NA
##      NA
##      NA
##
##      NA
##      NA
##      NA
##
## Regressions:
##           Estimate Post.SD pi.lower pi.upper   Std.lv Std.all
## t2 ~
## t1      -0.077    5.858  -15.344    9.85   -0.230  -0.230
## t3 ~
## t2      1.228    2.618   -0.11    9.553    0.640    0.640
## Rhat Prior
##
## 1.798 normal(0,10)
##
## 1.826 normal(0,10)
##
## Covariances:
##           Estimate Post.SD pi.lower pi.upper   Std.lv Std.all
## t1 ~~
## pol      4.397   20.349  -46.74   31.576    0.161    0.161
## surv     -2.566    5.914  -20.319    3.475   -0.283   -0.283
## pol ~~
## surv     18.992   24.755   -6.74   86.808    0.579    0.579
## Rhat Prior
##
## 2.869 beta(1,1)
## 1.775 beta(1,1)
##
## 1.818 beta(1,1)
##
## Intercepts:
##           Estimate Post.SD pi.lower pi.upper   Std.lv Std.all
## .viol_15      13.146    1.246   10.782   15.618   13.146    1.223
## .viol.p.w_15   14.986    4.022    7.276   22.74   14.986    0.441
## .viol_17      14.104    1.543   11.178   17.165   14.104    1.411
## .viol.p.w_17    9.862    1.609    6.67   13.022    9.862    0.761
## .viol_19      13.985    1.330   11.458   16.613   13.985    1.376
## .viol.p.w_19   29.770   10.624    8.489   50.872   29.770    0.307
## t1            0.000          0.000    0.000    0.000    0.000
## .t2           0.000          0.000    0.000    0.000    0.000
## .t3           0.000          0.000    0.000    0.000    0.000

```

```

##      pol      0.000      0.000      0.000
##      surv      0.000      0.000      0.000
##      Rhat      Prior
##      1.012      normal(0,32)
##      1.007      normal(0,32)
##      1.011      normal(0,32)
##      1.001      normal(0,32)
##      1.012      normal(0,32)
##      1.001      normal(0,32)
##      NA
##      NA
##      NA
##      NA
##      NA
##
## Variances:
##      Estimate Post.SD pi.lower pi.upper Std.lv Std.all
##      .viol_15      0.418      0.411      0.001      1.456      0.418      0.004
##      .viol.p.w_15 1142.639 167.983 862.058 1528.793 1142.639 0.989
##      .viol_17      0.868      0.873      0.001      2.997      0.868      0.009
##      .viol.p.w_17 155.586 27.554 109.47 217.934 155.586 0.928
##      .viol_19      2.211      1.650      0.004      5.259      2.211      0.021
##      .viol.p.w_19 9364.763 1124.782 7407.947 11801.219 9364.763 0.998
##      t1      7.519      9.308      0.028      33.908      1.000      1.000
##      .t2      0.796      0.888      0.001      3.056      0.947      0.947
##      .t3      1.828      1.598      0.003      5.024      0.590      0.590
##      pol      98.848 43.400 33.3 199.292 1.000 1.000
##      surv      10.900 15.967 0.006 58.349 1.000 1.000
##      Rhat      Prior
##      1.005 gamma(1,.5)[sd]
##      1.003 gamma(1,.5)[sd]
##      1.029 gamma(1,.5)[sd]
##      1.009 gamma(1,.5)[sd]
##      1.020 gamma(1,.5)[sd]
##      1.003 gamma(1,.5)[sd]
##      1.177 gamma(1,.5)[sd]
##      1.062 gamma(1,.5)[sd]
##      1.011 gamma(1,.5)[sd]
##      1.831 gamma(1,.5)[sd]
##      1.491 gamma(1,.5)[sd]

```