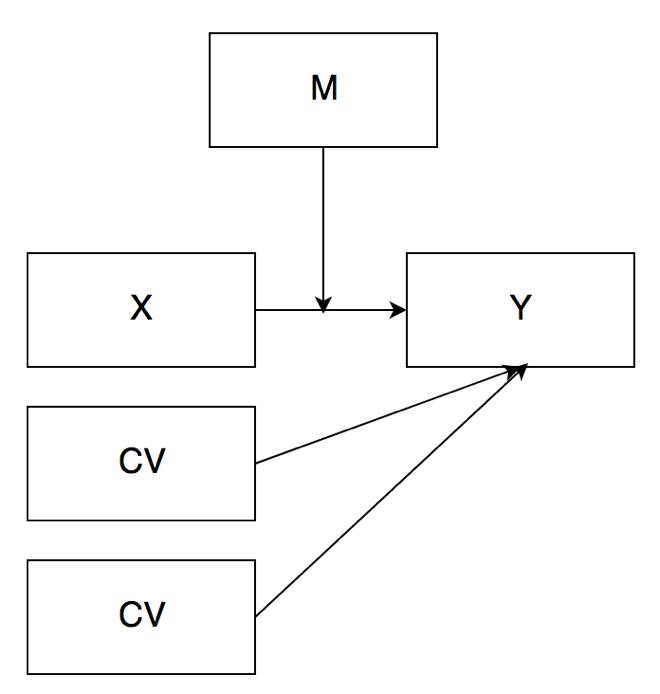
Type of Analysis:

Two-Way Interactions with Covariates (Model 1)

Model Visualization:



IV(s):

* Illiteracy

CV(s):

* Population
* Area

DV:

* Income

M:

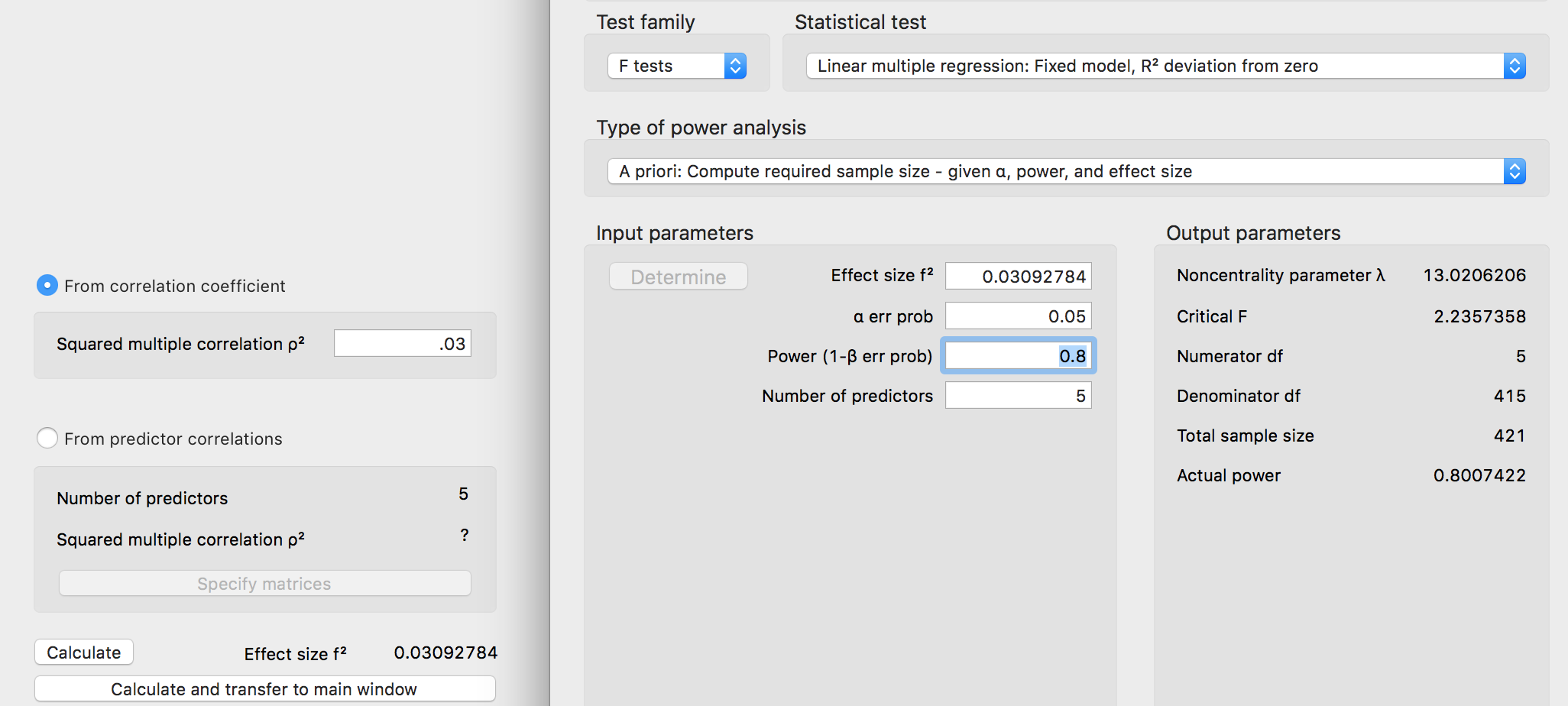
* Murder

Power:

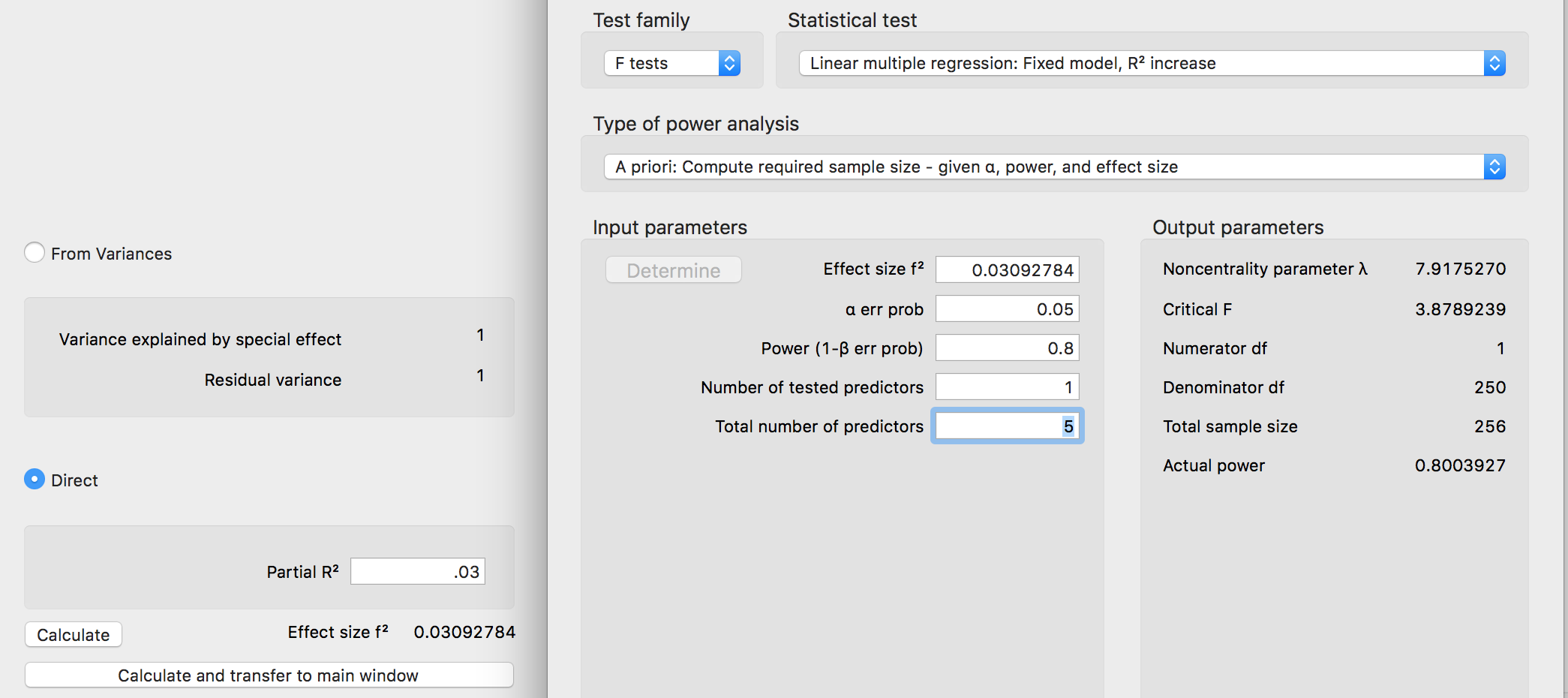
Figure out how many IVs going to be.

Illiteracy, Population, Area, Murder, Interaction

First way for overall R2



Second way for increase in R2



Data Screening:

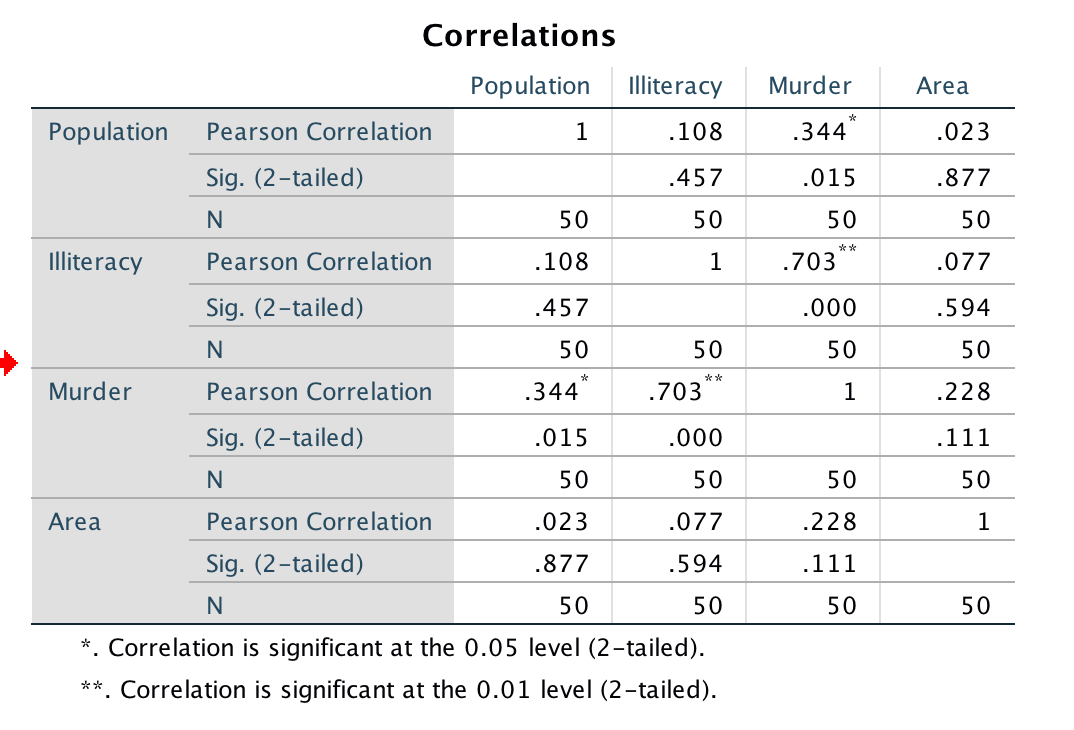
* Accurate Data

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Statistics** | | | | | | |
|  | | Population | Income | Illiteracy | Murder | Area |
| N | Valid | 50 | 50 | 50 | 50 | 50 |
| Missing | 0 | 0 | 0 | 0 | 0 |
| Mean | | 4246.42 | 4435.80 | 1.170 | 7.378 | 70735.88 |
| Std. Deviation | | 4464.491 | 614.470 | .6095 | 3.6915 | 85327.300 |
| Minimum | | 365 | 3098 | .5 | 1.4 | 1049 |
| Maximum | | 21198 | 6315 | 2.8 | 15.1 | 566432 |

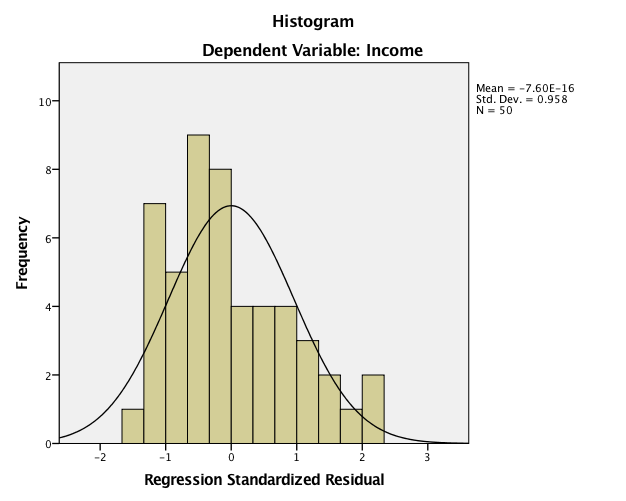
* Missing Data

No missing data see above.

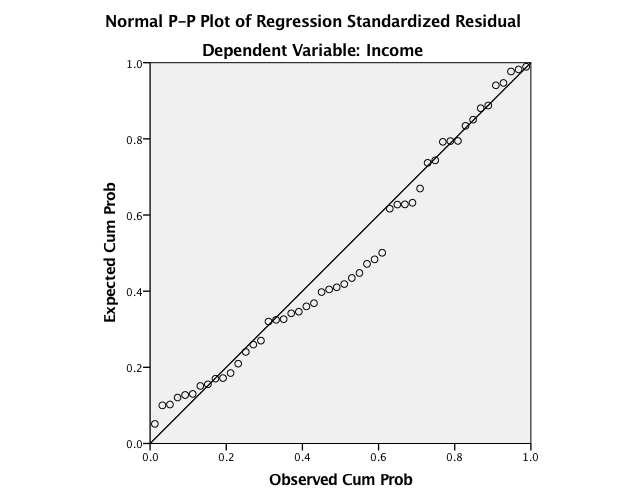
* Outliers
  + Mahalanobis
    - DF = 4
    - Cut off equals = 18.47
    - P < .001
  + Cooks
    - 4/(N – k – 1)
    - 4/(50 – 4 – 1) = .089
  + Leverage
    - (2K + 2)/N
    - (2\*4 + 2)/50 = .200
  + A couple outliers found but included in the analysis.
* Assumptions:
  + Additivity



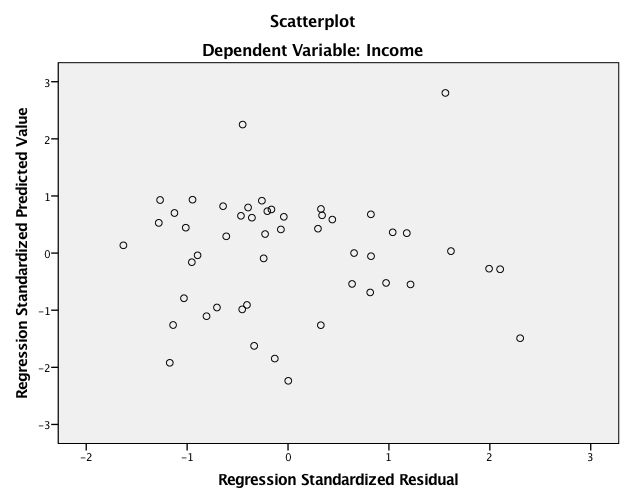
* + Normality



* + Linearity



* + Homogeneity/Homoscedasticity



Analysis:

Run MATRIX procedure:  
  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* PROCESS Procedure for SPSS Version 3.00 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  
  
          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com  
    Documentation available in Hayes (2018). www.guilford.com/p/hayes3  
  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  
Model  : 1  
    Y  : Income  
    X  : Illitera  
    W  : Murder  
  
Covariates:  
 Populati Area  
  
Sample  
Size:  50  
  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  
OUTCOME VARIABLE:  
 Income  
  
Model Summary  
          R       R-sq        MSE          F        df1        df2          p  
      .7344      .5393 193705.631    10.3023     5.0000    44.0000      .0000

*F*(5, 44) = 10.30, *p* < .001, *R2* = .54 (.12 is the interaction)  
  
Model  
              coeff         se          t          p       LLCI       ULCI  
constant  4253.3340   123.8231    34.3501      .0000  4003.7822  4502.8858  
Illitera  -114.7787   172.0363     -.6672      .5081  -461.4987   231.9413  
Murder     -35.9093    27.0115    -1.3294      .1906   -90.3480    18.5294  
Int\_1     -115.5641    34.4392    -3.3556      .0016  -184.9726   -46.1556  
Populati      .0323      .0155     2.0745      .0439      .0009      .0636  
Area          .0032      .0008     4.1430      .0002      .0016      .0047

Main effect:

Illiteracy *b* = -114.78, *t*(44) = -0.67, *p* = .508, not a significant predictor of income

Murder, not significant

Interpretation: as illiteracy/murder increases, income decreases

Interaction:

*b* = -115.56, *t*(44) = -3.36, *p* = .002 … difficult to interpret 🡪 use simple slopes to understand this effect

CVs:

Population: significant, as population increases income increases

Area: significant, as area increases income increases

Product terms key:  
 Int\_1    :        Illitera x        Murder  
  
Test(s) of highest order unconditional interaction(s):  
       R2-chng          F        df1        df2          p  
X\*W      .1179    11.2600     1.0000    44.0000      .0016  
----------  
    Focal predict: Illitera (X)  
          Mod var: Murder   (W)

Addition of the interaction was a significant change to the model, *F*(1,44) = 11.26, *p* = .002, *R2* change = .12

Conditional effects of the focal predictor at values of the moderator(s):  
  
     Murder     Effect         se          t          p       LLCI       ULCI  
    -3.6915   311.8307   259.6889     1.2008      .2363  -211.5433   835.2048  
      .0000  -114.7787   172.0363     -.6672      .5081  -461.4987   231.9413  
     3.6915  -541.3881   155.1795    -3.4888      .0011  -854.1353  -228.6410

Simple slopes:

-1SD below mean (Murder = -3.69 below mean) *b* = 311.83, *t*(44) = 1.20, *p* = .236

For low murder rates, Illiteracy does not predict income.

Average (Murder = 0 below mean, so is the mean) *b* = -114.78, *t*(44) = -0.67, *p* = .508

For average murder rates, illiteracy does not predict income.

+1SD above mean (Murder = 3.69 above the mean) *b* = -541.39, *t*(44) = -3.49, *p* = .001

For high murder rates, illiteracy negatively predicts income, as illiteracy increases, income decreases.

What happens when the interaction is “significant”, but none of the simple slopes are “significant”?

* Implies that there are differences in slopes but that the main effect is not significant.

Moderator value(s) defining Johnson-Neyman significance region(s):  
      Value    % below    % above  
     1.6585    60.0000    40.0000  
  
Conditional effect of focal predictor at values of the moderator:  
     Murder     Effect         se          t          p       LLCI       ULCI  
    -5.9780   576.0634   327.2436     1.7604      .0853   -83.4596  1235.5865  
    -5.2930   496.9020   306.4449     1.6215      .1121  -120.7037  1114.5078  
    -4.6080   417.7406   286.0799     1.4602      .1513  -158.8216   994.3029  
    -3.9230   338.5792   266.2479     1.2717      .2102  -198.0139   875.1724  
    -3.2380   259.4178   247.0775     1.0499      .2995  -238.5394   757.3751  
    -2.5530   180.2564   228.7349      .7881      .4349  -280.7334   641.2463  
    -1.8680   101.0950   211.4358      .4781      .6349  -325.0304   527.2205  
    -1.1830    21.9336   195.4574      .1122      .9112  -371.9891   415.8564  
     -.4980   -57.2278   181.1496     -.3159      .7536  -422.3147   307.8591  
      .1870  -136.3892   168.9372     -.8073      .4238  -476.8634   204.0851  
      .8720  -215.5506   159.3031    -1.3531      .1829  -536.6083   105.5071  
     1.5570  -294.7120   152.7357    -1.9296      .0601  -602.5339    13.1099  
     1.6585  -306.4403   152.0502    -2.0154      .0500  -612.8806      .0000  
     2.2420  -373.8734   149.6396    -2.4985      .0163  -675.4554   -72.2914  
     2.9270  -453.0348   150.2294    -3.0156      .0042  -755.8054  -150.2642  
     3.6120  -532.1962   154.4629    -3.4455      .0013  -843.4990  -220.8934  
     4.2970  -611.3576   162.0548    -3.7725      .0005  -937.9611  -284.7541  
     4.9820  -690.5190   172.5624    -4.0016      .0002 -1038.2995  -342.7386  
     5.6670  -769.6804   185.4909    -4.1494      .0002 -1143.5168  -395.8440  
     6.3520  -848.8418   200.3723    -4.2363      .0001 -1252.6699  -445.0137  
     7.0370  -928.0032   216.8047    -4.2804      .0001 -1364.9490  -491.0575  
     7.7220 -1007.1646   234.4622    -4.2956      .0001 -1479.6973  -534.6320  
  
Data for visualizing the conditional effect of the focal predictor:  
Paste text below into a SPSS syntax window and execute to produce plot.  
  
DATA LIST FREE/  
   Illitera   Murder     Income     .  
BEGIN DATA.  
     -.6095    -3.6915  4557.4300  
      .0000    -3.6915  4747.5012  
      .6095    -3.6915  4937.5723  
     -.6095      .0000  4684.9019  
      .0000      .0000  4614.9405  
      .6095      .0000  4544.9791  
     -.6095     3.6915  4812.3739  
      .0000     3.6915  4482.3799  
      .6095     3.6915  4152.3859  
END DATA.  
GRAPH/SCATTERPLOT=  
 Illitera WITH     Income   BY       Murder   .  
  
\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* ANALYSIS NOTES AND ERRORS \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  
  
Level of confidence for all confidence intervals in output:  
  95.0000  
  
W values in conditional tables are the mean and +/- SD from the mean.  
  
NOTE: The following variables were mean centered prior to analysis:  
          Murder   Illitera  
  
NOTE: Variables names longer than eight characters can produce incorrect output.  
      Shorter variable names are recommended.  
  
------ END MATRIX -----