Reliability and validity are crucial issues in research. **Reliability** is concerned with lowered quality of data due to random errors in measurement. **Validity** is concerned with whether variables are measuring what they purport to measure or are biased by other factors. A variable may have high validity but low reliability, in which case its correlations with other high validity variables will also have high validity. Strength of correlation, however, will be limited by reliability. Low correlations may be meaningful with valid but lower-reliability variables.

### Reliability: One Factor Tests

The reliability coefficient for a variable $u$ may be thought of as a correlation with an independent measure of itself, such as a proxy, an independent measure of the same concept, or a test-retest using the same measure. It is expressed by a correlation, like tau-b or Pearson’s $r$, whose square measures covariance as $r_u = 1 - e_u$ where $e_u$ is the proportion of random errors in measurement. In a test-retest or other empirical measure of a variable’s correlation with itself, it follows that $r_{uu} = r_u r_u = (1 - e_u)^2$. For two variables $u$ and $v$ that measure the same thing the maximum possible correlation is $r_{uv} = r_u r_v = (1 - e_u) (1 - e_v)$. This also shows that the correlation between any two variables is limited by their reliability. If one knew with certainty the reliabilities of $u$ and $v$, one could divide the observed correlation by the reliabilities, $r_{uv} / (1 - e_u) (1 - e_v)$ to get the true correlation. With this in mind, do not be discouraged by low correlations if your measurement reliabilities are low! As a guide, anthropologists familiar with ethnography and the coding of comparative variables have classified different variables prima facia in terms of the degree of inference involved in making a judgment about a given ethnographic case after reading the ethnography.

- high inference codes, e.g., closeness of father to children
- medium inference codes, e.g., post-marital residence.
- low inference codes, e.g., crops grown, which gender does a given task.
Codes that rate behaviors that are easily observable and sufficiently salient and that a
good ethnographer would hardly fail to report systematically (like a list of crops grown)
are usually low inference and of high reliability. At the other extreme are concepts that
are vague, like “closeness to father,” on topics that would involve the ethnographer and
the coder making inferences or subjective judgments.

For many variables the level of reliability is initially unknown but there may be ways to
estimate reliability if there are other variables measuring the same concept. We consider
here the case where you have a reasonable approximation to an interval scale of
measurement for each of your variables. This makes it possible to use the option
Analyze/Data Reduction/Factor in SPSS, choose your variables for reliability analysis,
and press OK to get the following tables:

- Total Variance Explained - % of variance accounted for by each component (i.e., factor)
- Component Matrix – the ‘eigen vectors’ or factor loadings.
- Communalties – if there is only one factors those are just the squares of the eigen values
  (if there are more factors, they are the sum of squares). These are the % of variance of each
  variable accounted for by the factor(s)

What you are looking for in a reliability analysis is an outcome where there is only one
factor, and the first column (‘Total’) in the Total Variance Explained table
(‘eigenvalues’) has a value of ~3 or more in the first row (i.e., for the first factor). The
eigenvalues in each of the other rows should be less than 1, which indicates random
variation. Now, the reliability of the total scale is the % of variance accounted for by
factor 1 in the Total Variance Explained scale, and the reliabilities of the individual
variables are those listed in the Communalties table. Negative values in the component
matrix are permitted. Now, if this is not the configuration of your data, then drop the
variable with the highest loading on factor 2 when you redo Analyze/Data
Reduction/Factor from the main menu, and keep doing so until either one variable
remains or you fit the assumptions of the one-factor model. Once you have a set of
variables that satisfies the one-factor model, you have estimates for the reliabilities of
your variables. You may use the one-factor model to produce a common-factor measure
(factor scores computed for each of your sample cases) that allows hypothesis testing
with a composite variable that is more reliable than any of the component variables.

**Validity: Third Factor Tests**

**Controlling for Reliability**

One way to validate a correlation between two variables is to show that it increases as
you control for reliability. This is not always possible, but for some variables constructed
in cross-cultural research the coders may have been asked to record their difficulty in
coding one or more of the variables studied. In such cases provide a reliability estimate
variable as an auxiliary code. They might have been asked to estimate of the relative
difficulty of making judgments for the variables they have coded. Then for a given code
and case, there is an auxiliar code such as the following (for a given topic):

- low reliability, difficult to code
medium reliability, occasionally difficult to code
high reliability, easy to code

If you are lucky enough to have reliability codes for one of your variables, run your cross tabulation with the reliability variable as a control, and compare the correlations for low, medium and high reliability codes. You should see quite a difference if the correlation is valid.

**Controlling for Third Factors: How to do it**

Earlier chapters provide the instructions for creating cross tabulations of pairs of variables. Analyze/Descriptive Statistics/Crosstabs in SPSS allows us to specify the variables pairs to be correlated, and under the Row and the Column window of the crosstabs menu is a third window for Control variables. This is where you specify one or more control variables. Once this is done, the output takes the form of a three-way table in which pairs of row and column variables are cross-tabulated repeatedly, once for each value of the control variable(s). If the Statistics button has been used to fill in the menu for desired correlation coefficients, separate correlations will be calculated for each of the repeated crosstabs.

**Controlling for Third Factors: What to Expect**

To think about third factor tests we have to put together what we learned from Chapter 5 about correlations, laws of probability, and measures of the statistical significance of correlations. What happens to a correlation between one pair of variables when we control for a third factor, the control variable? We can begin with the null hypothesis: What happens to a correlation in a smaller random sample of the cases on which it is based? Will the correlation be biased? We can use probability theory to derive the probabilities that the average of values on some numeric variable for the total sample space will differ by various magnitudes in a random subsample. Those differences will tend to form a normal distribution with a mean of zero. This means that random sample averages, although they may vary from sample to sample, will be an unbiased estimate of average of the population sampled.

If a control variable is statistically independent of two correlated variables, each category of the control variable will act as a random sample and the strength of correlation. In this case we expect that the correlation will replicate for each control value, assuming that both the correlated variables vary, and that there is a sufficient sample size for each control value to reliably estimate a correlation. If there are only a handful of cases or one of the variables correlated does not vary, a bivariate correlation cannot be estimated.

The statistical significant of a correlation, however, as we say in Chapter 5, will decline the smaller the sample, generally as a linear function of the square root √N of the sample size N.

**Controlling for Third Factors: Using them for purposes of research**
Third factor validation tests, in a much broader sense, are at the frontiers of cross-cultural research. Most such research stops short with bivariate correlations, or sometimes predictions of a dependent variable from multiple independent variables. Rarely, however, do researchers use controls either to validate hypotheses by replication, to disconfirm hypotheses because they do not replicate, or to find new relationships by use of controls. Andrey Korotayev (e.g., 2001), however, is one of the few research that do so (see his article at http://eclectic.ss.uci.edu/~drwhite/worldcul/Korotayev.pdf).

In the following five examples, Korotayev takes use through:
   1 An Hypothesis Invalided by Third Factor Controls
   2 Discovery of a New Relationship or one thought to be Invalid
   3 Replication to Establish Validity of a Correlation
   4 When and how third variable control could not and should not be done
   5 Discovery of more specific conditions under which a correlation is valid

**EXAMPLE 1: An Hypothesis Invalided by Third Factor Controls**

In 1964 John Whiting proposed a theory which implied the presence of a significant positive correlation between polygyny and the practice of male genital mutilation. He tested this hypothesis and indeed found a significant correlation in the predicted direction. Later tests (first of all, Strauss and Orans 1975) confirmed the presence of this correlation. Let us test this hypothesis again.

Make now a crosstabulation and statistical analysis using v212p ("Polygyny) as the independent variable and v241d ("Male Genital Mutilations [dichotomized]") as the dependent one. If you follow correctly the algorithm specified above in Chapters 4 and 5, your results will look as follows:

Table X1

<table>
<thead>
<tr>
<th>Polygyny * Male Genital Mutilations (dichotomized) Cross tabulation (for the world-wide sample)</th>
<th>[ \text{Male Genital Mutilations (dichotomized)} ]</th>
<th>[ \text{Total} ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ \text{Polygyny} ]</td>
<td>[ 0 ) (absent) ]</td>
<td>[ 1 ) (present) ]</td>
</tr>
<tr>
<td>[ 0 ) (absent) ]</td>
<td>33</td>
<td>4</td>
</tr>
<tr>
<td>[ 89,2% ]</td>
<td>10,8%</td>
<td>100,0%</td>
</tr>
<tr>
<td>[ 1 ) (present) ]</td>
<td>102</td>
<td>44</td>
</tr>
<tr>
<td>[ 69,9% ]</td>
<td>30,1%</td>
<td>100,0%</td>
</tr>
<tr>
<td>[ \text{Total} ]</td>
<td>135</td>
<td>48</td>
</tr>
<tr>
<td>[ 73,8% ]</td>
<td>26,2%</td>
<td>100,0%</td>
</tr>
</tbody>
</table>

Note: \( p = 0.02 \) (by Fisher's Exact Test), \( \Phi = + 0.18 \)

Let us now interpret these results.
As we see, the correlation is not strong, but quite significant. So, the first impression is that our test has just confirmed Whiting's hypothesis.

However, let us control this result for a "third factor". We would suggest as this factor the influence of Christianity and Islam. To do this let us use v1806 ("Deep Islamization / Christianization").

How to do it? We should use the following very useful (as you will see soon) option:

**IN MENU LINE CHOOSE:**

**DATA → SELECT CASES**

You will see the following menu:

---

1 Why did we choose to consider only “deep” christianization / islamization? This is because it took the Christian Church or Islamic ‘ulama’ centuries to eradicate pre-Christian or pre-Islamic norms, values and practices (e.g. Bessmertnyj, 1989; Herlihy, 1993). One would not expect a superfluous christianization to produce any radical changes in kinship and marriage practices and norms.
Choose "If condition is satisfied" option and press the "If…” button. You will see the following:
Now let us move to the window the control variable (v1806 – you will find it at the very bottom of the variable list). Let us select now all the deeply Islamicized or Christianized cultures of our sample. Note that v1806 is coded in the following way:

0 = absent
1 = deep Islamization
2 = deep Christianization

So, to select all the deeply Islamicized or Christianized cultures of our sample we can make (using either the keyboard in the screen, or the actual keyboard) the following expression – v1806 > 0:
No press "Continue" and then – "OK".

Now let us re-do our test (now for the Islamic and Christian cultures only). To do this just go to "Crosstabs" option and press "OK" (as, if you did not close the SPSS file in between, all the settings for our test must remain intact).

If everything has been done correctly, the results should look as follows:
Table X2

<table>
<thead>
<tr>
<th>Polygyny * Male Genital Mutilations (dichotomized) Cross tabulation (for deeply Islamicized and Christianized cultures only)</th>
<th>Male Genital Mutilations (dichotomized)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 (absent)</td>
<td>1 (present)</td>
</tr>
<tr>
<td>Polygyny</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 (absent)</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>85,7%</td>
<td>14,3%</td>
</tr>
<tr>
<td>1 (present)</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>11,1%</td>
<td>88,9%</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>32,0%</td>
<td>68,0%</td>
</tr>
</tbody>
</table>

Note: $p = 0.001$ (by Fisher's Exact Test), $\Phi = + 0.72$

Thus, as soon as we take a subsample consisting of Islamic and Christian cultures only, the correlation between the polygyny and the presence of male genital mutilations becomes not only significant beyond any doubt, but also very strong.

We shall discuss this finding in more detail later. And now let us see what will happen if we leave in the sample the cultures which have experienced neither deep Islamization, nor deep Christianization.

So first select this cultures (note that the respective expression could look now as v1806 = 0) and then re-do the test. You should get the following result (see Table X3):

Table X3

<table>
<thead>
<tr>
<th>Polygyny * Male Genital Mutilations (dichotomized) Cross tabulation (for cultures which have experienced neither deep Islamization, nor deep Christianization)</th>
<th>Male Genital Mutilations (dichotomized)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 (absent)</td>
<td>1 (present)</td>
</tr>
<tr>
<td>Polygyny</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 (absent)</td>
<td>27</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>90,0%</td>
<td>10,0%</td>
</tr>
<tr>
<td>1 (present)</td>
<td>100</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>78,1%</td>
<td>21,9%</td>
</tr>
</tbody>
</table>
So, as soon as we take out of the sample all the cultures which have experienced either deep Islamization, or deep Christianization, the correlation becomes not only extremely weak, but also insignificant. Note however, that it is still in the direction predicted by Whiting’s hypothesis, and hence, we can apply here a 1-tailed test which indicate 0.11 significance level of the correlation. Thus the correlation is still almost marginally significant.

Now let us delete from the sample all the Christian and Islamic cultures (even the superficially Islamized or Christianized ones).

To do this use variable v1807 "World Religions" (you can easily find it at the very end of the dataset S-dat01.sav). Note that v1807 "World Religions" is coded in the following way: 0 = absent, 1 = deep Islamization, 2 = deep Christianization, 3 = superficial Islamization, 4 = superficial Christianization, 5 = Mahayana Buddhism, 6 = Hinayana Buddhism, 7 = Vajrayana Buddhism, 8 = Hinduism.

So, to outselect all the Islamized and Christianized cultures you could use, for example, the following expression: v1807 = 0 | v1807 > 4 (v1807 = 0, or v1807 > 4). Then re-do the test. You should get the following result (see Table X4):

<table>
<thead>
<tr>
<th>Polygyny * Male Genital Mutilations (dichotomized) Cross tabulation (for non-Islamized / non-Christianized cultures)</th>
<th>Male Genital Mutilations (dichotomized)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 (absent)</td>
<td>1 (present)</td>
</tr>
<tr>
<td>Polygyny 0 (absent)</td>
<td>21</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>91,3%</td>
<td>8,7%</td>
</tr>
<tr>
<td>Polygyny 1 (present)</td>
<td>86</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>81,9%</td>
<td>18,1%</td>
</tr>
<tr>
<td>Total</td>
<td>107</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>83,6%</td>
<td>16,4%</td>
</tr>
</tbody>
</table>

Note: p = 0.36 (by Fisher's Exact Test, 2-tailed),
p = 0.22 (by Fisher's Exact Test, 2-tailed), Phi = + 0.097
As we see, now the correlation strength goes below 0.01 and becomes inequivocally insignificant.

This, of course, suggests that the observed correlation between the polygyny and male genital mutilation is in fact the result of the influence of Islam and Christianity on the social evolution of the world cultures. But how can this be?

Circumcision (though not enforced on the Muslims by their Holy Book) is still a virtual obligation among Muslims, as it has strong support in the Holy Tradition (al-Ha:di:th). The acceptance of polygyny (in conjunction with the fact that the Muslim societies of the region were stratified and the social status of women in traditional Islamic societies was low) led, almost inevitably, to the practice of at least occasional (“elite”) polygyny in the overwhelming majority of ethnohistorically attested Muslim societies (even if they were monogamous prior to the Islamization, as happened with the Albanians). Christianity, on the other hand, strictly prohibits polygyny (see e.g. Korotayev & Bondarenko 2000); but does not directly prohibit the circumcision (actually, it is hardly possible to find support for such a prohibition in any Christian texts considering that Jesus Christ himself was circumcised and the supposed date of his circumcision is still one of the most important Christian Holy Days). However, the Christian Church (unlike Islamic and Jewish religious authorities) does not impose circumcision in any way; as a result, in the Middle Ages the absence of “male genital mutilation” became an important marker distinguishing Christians from both Muslims and Jews (with whom the Christians were in a hostile relationship with for most of this period). Thus, for Christians, circumcision was, at this time, a virtual tabu. As a result, the diffusion of Christianity resulted in the simultaneous diffusion of a prohibition on polygyny and a virtual (and effective!) prohibition on circumcision. Conversely, the diffusion of Islam resulted in the simultaneous diffusion of precisely the opposite pattern (for more detail see Korotayev & de Munck 2003).

Often this is called Galton's Problem. In fact the "birth date" of this problem is identical with the conventional "birth date" of cross-cultural research. The point that at that very meeting of the Royal Anthropological Institute where Edward Tylor made (on November 14, 1888) his presentation producing first results of formal cross-cultural research Francis Galton (who, incidentally, chaired this meeting) made the following comment to Tylor's presentation:

“It was extremely desirable for the sake of those who may wish to study the evidence for Dr. Tylor’s conclusions, that full information should be given as to the degree in which the customs of the tribes and races which are compared together are independent. It might be, that some of the tribes had derived them from a common source, so that they were duplicate copies of the same original” (Tylor 1889:272)

Indeed, these words contained the gist of the respective problem – the functioning of historical networks can well produce significant correlations between such traits which
are not connected with each other functionally; hence, the functioning of these networks should, of course, be taken into account.

At the moment some cross-cultural researchers argue that the Galton problem is not serious at all. For example, Carol Ember and Melvin Ember maintain that Galton’s Problem is not serious, “because we believe that random sampling of cases is the best way to prevent sampling bias. Also, the sample societies in most cross-cultural studies usually speak mutually unintelligible language, which means that the speech communities involved have been separated for at least 1,000 years. If two related languages began to diverge 1,000 or more years ago, many other aspects of the cultures will also have diverged. So, such cases could hardly be duplicates of each other” (1998:678; see also 2001:89). But, as we have shown above, such cases could still be duplicates. In addition, even cultures coming from apparently different regional cultural clusters could be duplicates of each other. The question remains: should we really bother with Galton’s problem? We still think that researchers should be concerned about this effect.

Our practical advice is that cross cultural researchers should not try to escape "Galton's problem" using small samples allegedly containing "truly independent" cases only. Rather they should start with as large a cross-cultural data sets as can be obtained. After the initial tests it will be necessary to test for any network autocorrelation (“Galton”) effects.²

From what has been said, it must be apparent that we strongly favor treating the Galton problem as a network autocorrelation one (see e.g. Doe, Burton & White, 1981; 1982; 1984; White, Burton & Doe, 1981; Burton & White, 1987, p. 147; 1991). In so doing, researchers will be able to obtain optimum samples for testing their hypotheses and also to study communication networks and the historical diffusions that affected the distribution of the variables under consideration. In this case the “Galton problem” will appear not as a problem for cross-cultural comparison, but rather as "Galton opportunity".

**EXAMPLE 2: Discovery of a New Relationship, or one thought to be Invalid**

First theories proposed to explain determinants of postmarital residence connected it with the division of labor by gender. It was suggested that the high female contribution to subsistence favors matriloc residence, roughly equal contribution by both sexes would tend to lead to intermediate residence forms, whereas "patriloc residence seems to be [particularly] promoted by... any modification in the basic economy whereby masculine activities in the sex division of labor come to yield the principal means of subsistence" (Murdock, 1949, p. 206; see also e.g. Lippert, 1931, p. 237; Linton, 1936, p. 168–169; Eggan, 1950, p. 131; Service, 1962, pp. 120–122 etc.).

The first substantive cross-cultural tests of this theory supported it (Driver, 1956; Driver & Massey, 1957). However, Driver and Massey used samples limited to aboriginal North

² In fact, Harold E. Driver argued for a very similar approach (Driver 1956).
America, whereas all the subsequent cross-cultural tests using world-wide samples failed to find the predicted correlation between division of labor and postmarital residence (Hiatt 1970; M. Ember & C. R. Ember, 1971; Divale, 1974; 1975; 1984; see also Levinson & Malone, pp. 105–108; C. R. Ember & Levinson, 1991, p. 85). On the other hand, no world-wide cross-cultural test has confirmed the existence of the predicted relationship, which seems to justify a recent bold statement by the Embers and Pasternak: "We find no relationship between contribution to subsistence and residence" (Pasternak, C.R.Ember, & M. Ember, 1997, p. 223).

Let us re-test now this hypothesis using variables v217s ("Marital Residence [5-point scale]") and v885 ("Female Contribution to Subsistence: Ethnographic Atlas"). Note that both variables have a very high number of values. This is especially true for Female Contribution to Subsistence which is counted as per cent, and hence, represents a 100-point scale. With such variables cross-tabs would be excessively large, unmanageable and virtually useless. Thus, in such cases the results of cross-cultural statistical analyses could be better presented with scatter plots accompanied by statistical notes. So, let us start with making a scattergram for the relationship between the two variables in question. To do this, follow the instructions specified above in Chapter 3. Fit "sunflowers", but do not fit the Lowess line. If you have followed correctly the instructions specified above in Chapter 3, you will get the following graph (see Diagram A1):

Diagram A1

---

3 However, three of these studies confirmed the existence of the predicted relationship between division of labor and residence for Native North American cultures (White, 1967; M. Ember & C. R. Ember, 1971; Divale, 1974).
Note that the Marital Residence scale has the following points: – 1 = viri-/patrilocal, – 0.5 = patrilocal with matrilocal alternative, or neolocal with patrilocal alternative, 0 = bilocal/neolocal/no common residence, + 0.5 = uxori-/matrilocal with patrilocal alternative, or neolocal with matrilocal alternative, + 1 = uxori-/matrilocal postmarital residence.

The immediate impression is that indeed the relationship between the two variables in question is almost perfectly random. But, of course, this is still just an impression.

So, below we should present the results of statistical analysis of respective correlation. This might be better done as a note to the scatterplot above. As was mentioned above, there is no sense to make in such cases any crosstabs; hence, it appears to make statistical analysis separately from crosstabs. This is perfectly possible in SPSS. To do this go to the menu line and choose:

*Analyze → Correlate → Bivariate*
Now move the variables the correlation between which you would like to analyze (in our case they are v217s "Marital Residence [5-point scale]" and v885 "Female Contribution to Subsistence: Ethnographic Atlas") to the Variables box. Unselect Pearson, tick Kendall's tau-b, Spearman, and One-tailed:
Now press OK. The output will look as follows:
These results could be presented in the following way:

**NOTE:**  
Kendall's Tau-b = + 0.07, \( p = 0.14 \) (1-tailed)  
Spearman's Rho = + 0.09, \( p = 0.15 \) (1-tailed)

Such a note is normally placed immediately below the respective diagram or cross-tab.

As we see, in our test the correlation between female contribution to subsistence and matrilocal residence has turned out to be very weak and insignificant. These results could, of course, be well interpreted as once again rejecting Lippert – Murdock hypothesis. However, in fact, the situation here is much more complicated. To start, let us fit now the Lowess line in Diagram A1 above (to do this follow instructions specified in Chapter 3). The result should look as follows:
Now, first of all, it is easy to see that we observe a marked trend from patrilocal to matrilocal with the growth of female contribution in the left part of the diagram. Note that the positive correlation here cases is very strong. For the range 1–22% $Rho = + 0.6$, $p < 0.001$ (you can re-test this yourself using the following expression in the Select Cases – If window: v885 < 23). Indeed, it looks that as soon as women start to contribute substantially to subsistence, this makes the transition to non-unilocal or matrilocal residence much more likely.

However, after female contribution reaches a certain threshold level, something happens. The correlation first disappears, and then becomes reversed! Note that for the right-hand parts of the diagrams above we observe a significant negative correlation between female contribution and matrilocality. Thus, for the cultures with female contribution $\geq 50\%$ $Rho = -0.35$, $p = 0.04$ (re-test this yourself).

Thus, what could look at the first glance as an insignificant positive correlation between
female contribution to subsistence and matrilocality starts looking like a significant curvilinear relationship. But what could account for the fact that after a certain threshold level the female contribution to subsistence stops to be correlated significantly with matrilocality, whereas with further growth of this contribution a negative correlation appears? Of course, against this background it seems reasonable to look for a determinant of patrilocality/non-matrilocality whose value would grow with the growth of female contribution to subsistence, gradually neutralizing and reversing the matrilocal trend.

One evident candidate is general non-sororal polygyny. The general reasoning here would look as follows.

Though the growth of female contribution to subsistence tends to lead to matrilocal residence, it at the same time makes polygyny more and more attractive for men. An average intensive plow agriculturalist in a culture with a very low female contribution to subsistence would never even consider seriously the possibility of having five wives (as he would not simply be able to feed all of them [together with their children]). Yet, this would not constitute a serious problem for a hoe horticulturalist within a culture with a very high female contribution to subsistence. The former, acquiring 5 wives gets first of all 5 mouths which he will have to feed; whereas the latter, getting 5 wives, first of all acquires 10 hands which may feed the horticulturalist himself. Hence, it is hardly surprising that a considerable number of previous cross-cultural tests have shown that there is a significant positive correlation between female contribution to subsistence and polygyny (Heath, 1958; Osmond, 1965; Lee, 1979; Burton & Reitz, 1981; Schlegel & Barry, 1986; White, Burton & Dow, 1981; White & Burton, 1988; Low, 1988).4

If general polygyny develops in sororal form, it can well be quite compatible with matrilocal residence. However, it does not appear to solve completely the problem of maximization of wife number for many men. A woman may not have sisters at all, and sisters’ number is limited in any case. Hence, with a very high female contribution to subsistence any more or less influential and wealthy mail would be inclined to prefer non-sororal polygyny to the sororal one. Hence, it is not surprising that sororal polygyny is associated with the female contribution to subsistence much less significantly than the non-sororal one (for cross-cultural evidence see Korotayev 2001, 20035).

This was already Murdock (1949) who noticed the negative association between non-sororal polygyny and matrilocal residence, on the one hand, and the positive relationship between polygyny and patrilocality, on the other hand:

"Polygyny... is practically impossible, except in the sororal form, under matrilocal

\[\text{footnote text}\]

4 As in the ethnographic record societies with high female contribution to subsistence were normally characterized by a rather high level of warfare frequency and intensity, the problem of getting more than one wife was usually facilitated by skewed sex ratio. In addition to this a differential marriage age normally developed within such a context (girls get married immediately after puberty, whereas males can often only marry after getting a full social status which may take place \textit{e.g.} well after the age of 30).

5 In general, this part of the textbook has been prepared on the basis of these two papers.
residence. It is, however, particularly congenial to patrilocal residence, where women are isolated from their kinsmen and tend to be economically and socially inferior to men. Hence anything which favors polygyny likewise favors the development of patrilocal residence" (Murdock, 1949, p. 206).

But could not the growing general non-sororal polygyny cause the transition from matrilocal to patrilocal residence? On the one hand, the growth of general non-sororal polygyny in matrilocal society implies at least partial destruction of matrilocality just by definition. If an average number of wives per husband exceeds 2 (and such cases are well known [see e.g. Thomas, 1910, p. 15]), the marriage will stop being matrilocal for at least half of the women. On the other hand, note that a very substantial proportion of matrilocal cultures have patrilocality as a frequent alternative residence pattern. In the rest of matrilocal societies it is an infrequent (but still real) alternative. This is extremely rare when in the matrilocal societies patrilocality is never practiced by anyone under any possible conditions.

As non-sororal polygyny is incompatible with matrilocal residence, but perfectly compatible with patrilocal one, one would expect that against the background of growing non-sororal polygyny the men intending to establish finally a non-sororal polygynous household (first of all, of course the members of social elites among whom this is more likely to be a norm than among the commoners) would tend to opt for patrilocal rather than matrilocal residence. Incidentally, it is remarkable that in the matrilocal societies with patrilocality alternative and at least occasional non-sororal polygyny these are elite families (which unlike the commoner household are almost always polygynous) that would tend to have patrilocal residence (see e.g. Divale, 1974, p. 83; Butinov, 1985). However, with the transformation of occasional non-sororal polygyny into general one the commoners would start opting for patrilocal residence too. Thus the growth of general non-sororal polygyny would tend to destroy matrilocality.

Note, that though in the passage cited above Murdock does not imply the causal link between the general non-sororal polygyny and patrilocality (and he was understood this way by some other cross-culturalists), elsewhere he describes the mechanism through which the transition to the general non-sororal polygyny could cause just the transition from matrilocality to patrilocality; actually, as we shall see soon, he considers the general non-sororal polygyny as the main factor causing the transition from matrilocality to patrilocality (though he does not appear to have noticed that this would complicate the interrelation between the female contribution and residence):

We are now in a position to examine the exact mechanics by which a transition to the patrilineate occurs in a previously matrilocal and matrilineal community. For demonstrative purposes we may conceive of such a community as a small settlement containing two matri-clans, each localized on one side of the main village thoroughfare. Before a change takes place, a man simply moves across the street when he marries, and settles in a hut belonging to his wife. He carries on all his economic activities in the same environing territory as before his marriage, and his closest relatives live just over the way, where he can visit them at any time and
cooperate with them in the ways to which he became accustomed as a bachelor.

Let it be assumed that there now appears some factor which places a premium upon patrilocal residence – perhaps the introduction of cattle, or slaves, or shell money, accompanied by the idea that personal prestige can be enhanced through polygyny. One man after another, as he acquires wealth, is able to persuade other men to allow their daughters to remove to his home in marriage in return for the payment of a bride-price, and one man after another begins to leave some of his property to his own sons instead of bequeathing it all to his sisters' sons. Bit by bit, ties with patrilineal kinsmen are strengthened, while those with matrilineal relatives undergo a diminution in importance. Interpersonal relationships are readjusted gradually, naturally, and without strain.

Almost before the population of the village realizes that anything particularly significant has happened, they discover that the houses on one side of the street are now occupied by patrilineally related males with their wives and children, and that a similar group lives across the way. Patrilocal residence has become firmly established, patrilineal inheritance is accepted, and the former matri-clans have been transformed into incipient patri-clans (Murdock, 1949, p. 216).

If our (i.e. Murdock's and ours) suggestion is correct, one would expect that if we control for the general non-sororal polygyny factor the positive correlation between the female contribution to subsistence and matrilocality will re-surface throughout the world-wide cross-cultural samples.

In order to make this control let us omit from the sample all the general non-sororal polygyny cases. In order to do this we should leave in the sample only the cases lacking general non-sororal polygyny (to select cases use variable v212nsp "General Non-Sororal Polygyny").

After selecting cases re-do the scatterplot, fit Lowess line, calculate Kendall's Tau-b, Spearman's Rho and respective significance measures. The results should look as follows (see Diagram A2):
Diagram A2

NOTE: \[ \tau_b = +0.14, \ p = 0.03, \ \text{1-tailed} \]
\[ \rho = +0.2, \ p = 0.03, \ \text{1-tailed} \]

Now re-do these calculations for cultures with female contribution ≥ 45% (to do this you could use the following expression in the Select – If window: v212nsp = 0 & v885 >= 45). The result will be as follows:

\[ \tau_b = +0.37, \ p = 0.009, \ \text{1-tailed} \]
\[ \rho = +0.46; \ p = 0.007, \ \text{1-tailed} \]

Thus, finally, unlike our predecessors we DO FIND a significant association between the labor division and postmarital residence (hidden, however, behind the general non-sororal
polygyny factor). In fact, our findings imply the following model of relationships between the three main variables in question which explains why the growth of female contribution to subsistence (while being a factor of matrilocality) may not lead to it (see Diagram A3):

Diagram A3

---

**EXAMPLE 3: Replication to Establish Validity of a Correlation**

Note that the general non-sororal polygyny factor may help to explain an apparent paradox already mentioned above: though all the previous attempts to find a significant correlation between labor division and postmarital residence failed, all such attempts with respect to aboriginal North American samples were successful. We tried to replicate this result with *Ethnographic Atlas* samples and, indeed, the previous results were completely replicated: though the correlation between the two variables for the world-wide sample is insignificant it is definitely significant for the native North American sample. C. Ember (1975) explained this paradox in the following way: in the ethnographic record most native North American societies are hunter-gatherers (and native North America is an exceptional ethnographic mega-region in this respect). At the meantime C. Ember finds a significant correlation between labor division and postmarital residence just among the hunter-gatherers. And, according to her, it is this which accounts for a significant correlation between the two variables among native North American cultures (C. Ember, 1975, p. 202). However, we have failed to find a significant correlation between the two variables for the *Ethnographic Atlas* hunter-gatherers in the predicted direction. If anything, there is a significant curvilinear relationship. Thus, this factor cannot explain the significant correlation (in the predicted direction) between the two variables for the *Ethnographic Atlas* native North American cultures. However, this apparent paradox disappears entirely as soon as we take into consideration the general non-sororal polygyny factor. Indeed, unlike in the rest of the world the general polygyny developed in North America mainly in sororal form (which does not destroy matrilocality [actually, it is positively associated with matrilocality]). Hence, we may say that for the Native North America the general non-sororal polygyny factor was actually controlled in a natural way (*i.e.* not artificially). That is why the fact that we find a significant correlation between labor division and postmarital residence does not appear surprising at all.
Test now the correlation between the contribution of agriculture to subsistence (using variable v207 DEPENDENCE ON AGRICULTURE) and population density using variable v64. POPULATION DENSITY). Calculate Spearman's Rho and Kendall's Tau-b with corresponding significance measures (1-tailed). Of course, we have all grounds to expect here a rather strong and significant positive correlation. Indeed, in most parts of the populated world the agriculture is the most effective way to increase the output of useful biomass from the given territory. Normally, the agriculture would produce from the given square mile much more calories than alternative subsistence modes (hunting, gathering, or even fishing and animal husbandry). Hence, the higher is the reliance on agriculture within the given territory, the more dense population can the given territory sustain.

The results should be as follows:

<table>
<thead>
<tr>
<th>Correlation Coefficient</th>
<th>Population Density</th>
<th>Dependence on Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kendall's tau_b</td>
<td>Population Density</td>
<td>Correlation Coefficient</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sig. (1–tailed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>1,000</td>
<td>,537*</td>
</tr>
<tr>
<td></td>
<td>184</td>
<td>,0000001</td>
</tr>
<tr>
<td>Dependance on Agriculture</td>
<td>Correlation Coefficient</td>
<td>Sig. (1–tailed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>,537*</td>
<td>1,000</td>
</tr>
<tr>
<td></td>
<td>184</td>
<td>,0000001</td>
</tr>
<tr>
<td>Spearman's rho</td>
<td>Population Density</td>
<td>Correlation Coefficient</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sig. (1–tailed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>1,000</td>
<td>,665*</td>
</tr>
<tr>
<td></td>
<td>184</td>
<td>,0000001</td>
</tr>
<tr>
<td>Dependance on Agriculture</td>
<td>Correlation Coefficient</td>
<td>Sig. (1–tailed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>,665*</td>
<td>1,000</td>
</tr>
<tr>
<td></td>
<td>184</td>
<td>,0000001</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the .01 level (1-tailed).

Just as we expected, the correlation between the two variables is rather strong and significant beyond any doubt.

Now, let us control this correlation for the influence of those variables which we used for controls above (that is, world religion influence and non-sororal polygyny). What are our expectations now? Will these controls lead to disappearance of the correlation, its becoming significantly stronger, significantly weaker? In fact, here the most reasonable expectation would be just not to expect that the control for the variables above would produce any significant effect. Indeed, it is difficult to expect that, say, deep Christianization or transition from general non-sororal polygyny to occasional sororal one could somehow seriously influence the relationship between the reliance on agriculture
and population density.

So let us calculate now the correlation separately for (1) cultures which experienced deep Christianization / Islamization, (2) the ones which experienced none, (3) societies with general non-sororal polygyny, (4) the ones without it.

The results will look as follows (see Table X1):

Table X1. Correlations between reliance on agriculture and population density for various sub-samples

<table>
<thead>
<tr>
<th></th>
<th>Cultures which experienced deep Christianization / Islamization</th>
<th>Cultures which did not experience deep Christianization / Islamization</th>
<th>Cultures with general non-sororal polygyny</th>
<th>Cultures without general non-sororal polygyny</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kendall's Tau-b</td>
<td>Correlation Coefficient</td>
<td>+ 0.51</td>
<td>+ 0.53</td>
<td>+ 0.55</td>
</tr>
<tr>
<td></td>
<td>Sig. (1-tailed)</td>
<td>0.001</td>
<td>0.000001</td>
<td>0.000001</td>
</tr>
<tr>
<td>Spearman's Rho</td>
<td>Correlation Coefficient</td>
<td>+ 0.61</td>
<td>+ 0.66</td>
<td>+ 0.66</td>
</tr>
<tr>
<td></td>
<td>Sig. (1-tailed)</td>
<td>0.001</td>
<td>0.000001</td>
<td>0.000001</td>
</tr>
</tbody>
</table>

As we see, indeed, no miracle has happened. Just as we expected, such factors as world religion influence, or polygyny type do not affect the correlation between reliance on agriculture and population density in any significant way – in all subsamples we find significant correlation in the predicted direction and with very similar strength (with all the difference falling well within standard error limits).

EXAMPLE 4: When and how third variable control could not and should not be done

To start with, let us first test the correlation between postmarital residence pattern and female ownership or control of use of dwellings. We have all grounds to expect that the latter variable would correlate positively with matrilocal residence, and do negatively with patrilocality. Indeed, there all grounds to expect that when a woman lives in one house since her birth (whereas her husband comes to live in her family's house after the marriage) she would tend to have significantly more ownership and control rights over it than with the patrilocal pattern when she comes to leave in her husband family's house.

7 The difference in significance level for the cultures, which experienced deep Christianization / Islamization, is explained first of all just by a very small size of respective sample.
Let us test this hypothesis using variables v217f "Marital Residence (5-point scale)" and v591 "Ownership or Control of use of Dwellings". Now make a cross tabulation and statistical notes for this correlation. The results should look as follows (see Table X2):

### Table X2

<table>
<thead>
<tr>
<th>Marital Residence (5-point scale)</th>
<th>Ownership or Control of Use of Dwellings</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 (solely by men)</td>
<td>2 (mostly owned by men)</td>
</tr>
<tr>
<td>-1.0 (viri-/patrilocal)</td>
<td>18</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>100.0%</td>
<td></td>
</tr>
<tr>
<td>-0.5 (patrilocal with matrilocal alternative, or neolocal with patrilocal alternative)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>100.0%</td>
<td></td>
</tr>
<tr>
<td>0 (bilocal / neolocal / no common residence)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>100.0%</td>
<td></td>
</tr>
<tr>
<td>+0.5 (matrilocal with patrilocal alternative, or neolocal with matrilocal alternative)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+1.0 (uxori-/matrilocal)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>100.0%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>21</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>32.3%</td>
<td>13.8%</td>
</tr>
</tbody>
</table>

NOTES: Kendall's Tau-b = + 0.38, \( p = 0.0002 \) (1-tailed)
Spearman's Rho = + 0.41, \( p = 0.0003 \) (1-tailed)

Just as we expected, we do observe a significant correlation between the two variables in
the predicted direction (though, perhaps, we would expect this correlation to be a bit stronger).

Now imagine that someone comes out with a sort of idealist "Freudist" theory claiming that the marital residence has no independent effect on the female ownership and control over dwellings. It is suggested that the real key variable here is FEMALE BODY TYPE CONSIDERED MOST ATTRACTIVE (v1248), which according to some obscure and sophisticated "Freudian" logic determines (through, say, "libido type") both marital residence and female ownership of dwellings. The theory is evidently and plainly absurd. However, imagine that its author insists that it is true and suggests to test it by controlling the correlation between Marital Residence (5-point scale) and Ownership or Control of use of Dwellings for v1248. FEMALE BODY TYPE CONSIDERED MOST ATTRACTIVE.

Let us follow this suggestion and test the correlation separately for cultures where plump or fat female body is considered to be most attractive (values 1 and 2 of v1248) and the rest of societies (preferring moderate degrees of fatness, or slim / slender female bodies, values 3 and 4).8

The results will look as follows:

Table X3. Correlations between Marital Residence (5-point scale) and Ownership or Control of use of Dwellings for two sub-samples (version 1)

<table>
<thead>
<tr>
<th></th>
<th>Cultures where plump or fat female body is considered to be most attractive</th>
<th>Cultures where plump or fat female body is NOT considered to be most attractive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kendall's Tau-b</td>
<td>0.36</td>
<td>0.34</td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (1-tailed)</td>
<td>0.07</td>
<td>0.15</td>
</tr>
<tr>
<td>Spearman's Rho</td>
<td>0.43</td>
<td>0.38</td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (1-tailed)</td>
<td>0.07</td>
<td>0.16</td>
</tr>
</tbody>
</table>

These results, of course, might appear surprising. Indeed, after having been controlled for such an apparently irrelevant third variable as "Female body type considered most attractive" the correlation between marital residence and female control over dwellings has virtually disappeared (just as has been predicted by the absurd "Freudian" theory spelled out above). Note that many cross-cultural scholars (as well as scholars in other fields) still take the 0.05 critical level of significance very seriously and would tend to consider statistical test results producing $p > 0.05$ as sufficient grounds to reject respective theory. So, should we reject our initial quite logical theory explaining why

---

8 Hence, to select the first subsample we can use expression v1248 < 3. And what expression can we use to select the second subsample?
matrilocality should correlate positively with female control over dwellings in favor of the patently absurd "Freudian" staff?

As one could expect, the answer to this question is nothing but emphatical "No". But why?

To start with, let us recollect how the correlation matrices on the basis of which we composed summary table X3 above looked like. For example, the respective correlation matrix for "cultures where plump or fat female body is considered to be most attractive" looked as follows:

<table>
<thead>
<tr>
<th>Correlations</th>
<th>Marital Residence (5-point scale)</th>
<th>Ownership or Control of use of Dwellings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kendall's $\tau_b$</td>
<td>Marital Residence (5-point scale)</td>
<td>Correlation Coefficient</td>
</tr>
<tr>
<td>Sig. (1-tailed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ownership or Control of use of Dwellings</td>
<td>Correlation Coefficient</td>
<td>.363</td>
</tr>
<tr>
<td>Sig. (1-tailed)</td>
<td></td>
<td>.072</td>
</tr>
<tr>
<td>N</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>Spearman's rho</td>
<td>Marital Residence (5-point scale)</td>
<td>Correlation Coefficient</td>
</tr>
<tr>
<td>Sig. (1-tailed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ownership or Control of use of Dwellings</td>
<td>Correlation Coefficient</td>
<td>.432</td>
</tr>
<tr>
<td>Sig. (1-tailed)</td>
<td></td>
<td>.070</td>
</tr>
<tr>
<td>N</td>
<td></td>
<td>13</td>
</tr>
</tbody>
</table>

Note that this matrix contains a parameter which we ignored in Table X3 above. This parameter is denoted with "N" (Number) and informs us of the number of cases used for the calculation of a respective correlation. As we will see this below, this parameter is very important, and, in fact, in tables of X3 type it is better to include the respective information; hence, such tables are better to be presented in the following way (see Table X4):

Table X4. Correlations between Marital Residence (5-point scale) and Ownership or Control of use of Dwellings for two sub-samples (version 2)

<table>
<thead>
<tr>
<th></th>
<th>Cultures where plump or fat female body is considered to be most attractive</th>
<th>Cultures where plump or fat female body is NOT considered to be most attractive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kendall's Correlation</td>
<td>+ 0.36</td>
<td>+ 0.34</td>
</tr>
</tbody>
</table>
Now the situation has clarified. So, what has happened? The data on female ownership of dwellings were coded by Martin Whyte (1978). However, he coded the information not for the whole standard cross-cultural sample, but only for the half of it. What is more, he failed to find relevant information on some of cultures of his subsample, there were also a few missing cases for marital residence variable; and so the size of the sample which we used was originally not large (65 cases).

However, the sample size started contracting in a really catastrophic way when we tried to introduce a control for v1248. The respective data were coded by Judith Anderson et al. (1992). They managed to find relevant data for a still smaller sample (just 58 cases). Note that for many cases of their subsample we have no data on female ownership of dwellings. And when we further split the remaining cases into two subsamples, we get just what we get.

In fact, the results of the third variable control in our last test are just the one which we would expect if the third variable did not affect in any significant way the correlation between the first two variables. Indeed, the correlation strength in both subsamples is virtually identical with the one in the general sample (all the differences being well within the standard error limits). The real difference is just the difference in sample sizes.

Note that, in general, with the given correlation strength the smaller is the sample size the lower is significance level. Hence, by reducing the sample size (even if this reduction is done in a perfectly random way), you will sooner or later "make" any correlation insignificant. Our correlation in general sample was not initially particular strong and significant, hence, the random reduction of the sample size to c. 10 cases was bound to make the correlations insignificant, and, of course, this cannot be used to disregard a valid hypothesis in favor of a patently absurd theory.

So, what are our recommendations? Be very careful with third variable controls, when one of the following conditions is observed:

1) the original sample size is very small (especially, when N < 50);

2) the correlation strength and significance are low, especially, when 0.01 < p < 0.05. E.g., with such an original significance level, if you try to test the correlation significance in 6 mega regions of the world (which implies the splitting of the original sample in 6 subsamples), you are bound to get insignificant correlations in a few subsamples, which
should not be used *per se* as evidence against hypothesis in question.\(^9\)

In fact in our case another third variable control could be really meaningful and useful.

**EXAMPLE 5: Discovery of more specific conditions under which a correlation is valid**

As was mentioned above, what was really surprising for us with the test of correlation between postmarital residence and female ownership of dwellings, was that it turned out to be no as strong as we expected. Let us think what could affect the correlation strength in a world-wide cross-cultural sample.

First, let us recollect why we expected to find here a strong and significant correlation: when a woman lives in one house since her birth (whereas her husband comes to live in her family's house after the marriage) she would tend to have significantly more ownership and control rights over it than with the patrilocal pattern when she comes to leave in her husband family's house. Note, however, that this reasoning would be really relevant for sedentary cultures only. In cultures with a fully migratory pattern (and especially for hunter-gatherers) even within a matrilocal context the dwelling where the woman resides now is not the one where she was born. It is likely to has been constructed anew after the last movement to a new camp (and very likely with a considerable contribution on the part of the woman's husband) – within such a context, one would hardly expect a significant correlation between marital residence patterns and female control over dwellings.

Hence, we have all grounds to expect that the settlement pattern could be a powerful third factor in our case. We have sufficient grounds to expect that if we take it into account, we will find a really strong correlation between marital residence and female ownership / control over dwellings among the sedentary societies, and a very weak correlation (or no correlation at all) among the cultures with migratory settlement patterns.

So let us do this third factor control using as a control variable v61 "Fixity of Settlement". This variable has the following values:

1 = Migratory
2 = Seminomadic- fixed then migratory
3 = Rotating among 2+ fixed
4 = Semisedentary- fixed core, some migratory
5 = Impermanent- periodically moved

\(^9\) Note that this is not valid for the third variable control presented in example 1. Yes, the correlation was originally quite weak (\(\Phi = +0.18, p = 0.02\)). Yes, one of subsamples which we got was very small \((N = 25)\). Note, however, that if the third variable did not affect the correlation in a significant way, we would expect that the correlation should disappear just in the smaller sample \((N = 25)\), whereas it would still remain significant in a MUCH larger sample \((N = 158)\). However, we observed the precisely opposite pattern – it was the large sample where the correlation became virtually insignificant, whereas in the small sample it became strong and significant beyond any doubt. This, of course, suggests that the third variable do affect the correlation between the first two.
6 = Permanent

So, now let us test the correlation separately for cultures with migratory and seminomadic settlement patterns (values 1-3 of v61), on the one hand, and sedentary and semisedentary societies (v61 values 4-5). The results would look as follows (see Table X5):

Table X5. Correlations between Marital Residence (5-point scale) and Ownership or Control of use of Dwellings for migratory and sedentary cultures

<table>
<thead>
<tr>
<th></th>
<th>Nomadic and Seminomadic Cultures</th>
<th>Sedentary and Semisedentary Cultures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kendall's Tau-b</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td>-0.02</td>
<td>+0.56</td>
</tr>
<tr>
<td>Sig. (1-tailed)</td>
<td>0.46</td>
<td>0.00001</td>
</tr>
<tr>
<td>N</td>
<td>21</td>
<td>44</td>
</tr>
<tr>
<td><strong>Spearman's Rho</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td>-0.02</td>
<td>+0.61</td>
</tr>
<tr>
<td>Sig. (1-tailed)</td>
<td>0.47</td>
<td>0.00001</td>
</tr>
<tr>
<td>N</td>
<td>21</td>
<td>44</td>
</tr>
</tbody>
</table>

As we see, our theoretical expectations have turned out to be entirely correct. Indeed, among migratory cultures the correlation between postmarital residence and female control over dwellings has turned out to be close to zero, whereas among the sedentary societies it is really strong and significant.

Hence, postmarital residence turns out to be a really powerful and significant predictor of female ownership rights over dwellings when it is accompanied by the sedentism factor, whereas in nomadic cultures the postmarital residence factor does not appear to work at all.

Thus, note that in this example the third factor control has helped us to find very important nuances of a previously found regularity, has helped us to reformulate the originally found regularity in a much more sophisticated way. What originally looked like a medium-strength correlation has turned out to be a really strong correlation under one set of circumstances, and a zero correlation under another set of circumstances.

**Summary**

Third factor tests using cross-tabulation methods are at the leading edge of cross-cultural research because they get us to think about replicating results, testing validity by controlling for reliability, discovering new relationships that are the result of interactions among variables, identifying invalid relationships by controlling for third factors, and showing how certain correlations are valid within certain contexts but not others. One-
factor tests help to overcome some of the limitations of cross-cultural research by testing for reliability and developing combined measures with higher levels of reliability.

The idea of the one-factor model is that there may be many different variables that measure variants of a single concept or construct. If so, then they should correlate with one another to the extent that they share covariation along this single dimension. If they have other sources of common variation along other dimensions, a test of the one-factor model will show this as a significant deviation from the one-factor assumption. When that assumption is satisfied, the reliability of each component variable can be estimated by the one factor model, and the factor itself may be used as a new variable that has higher reliability as a measure of this dimension than any of its components. For testing hypotheses about how other variables correlate with the common dimension measured by the composite factor correlations will be highest with the factor itself, and next highest with its most reliable component variables. One of the ways of showing the validity of correlations is that they increase when more reliable measures are used. The use of the one-factor model to produce a common-factor measure (called factor scores) allows that kind of testing.

The key to successful use of third-factor controls in testing hypotheses depends on understanding what happens to correlations and significance with smaller samples. A third-factor control breaks up a sample into smaller subsamples for which the correlation between two variables is independently repeated. If the control were a purely random variable dividing the sample into f independent subsamples, the significance value \( p(N) \) observed in the sample of size N would not be reduced to \( p(N/f)^{1/f} \approx p(N/f) > p \) in each of the subsamples of size N/f. Since the \( 1/f \) root of probability p is much larger than p, significance will be lost in the subsamples. This kind of understanding of control variables draws on putting together what we learned from Chapter 5 about correlations, laws of probability, and measures of the statistical significance of correlations.

These methods, then, can be used to help establish the validity of a correlation, discovery more specific conditions under which a correlation is valid, discover complex interactions among variables, or invalidate a correlation by showing it failure to replicate for different third factor control values.

**To be added to general bibliography:**


———. 2001. *Cross-Cultural Research Methods*. Walnut Creek, CA etc.: AltaMira Press.


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New Haven, CT: HRAF Press.