

Index Correlation, Measurement Reliability and Biased Estimation

--- Measuring Democracy as a Latent Variable

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Abstract: Casper and Tufis's article (2003) identified the non-interchangeability problem of the three most commonly used democracy indicators. But, they did not identify the source of this problem and did not provide a right solution either. As demonstrated in this paper, random measurement error or low reliability is what makes the indicators non-interchangeable. The right way, as proposed in this article, to correct this problem is to build a measurement model covering the random measurement errors or to combine the existing indicators into a new and reliable measurement.

The article "Correlation Versus Interchangeability: the Limited Robustness of Empirical Finding on Democracy Using Highly Correlated Data Sets" by Casper and Tufis (2003) has clearly pointed out a serious, but often neglected problem of democracy measurements. That is, the three most commonly used democracy indicators - Polity IV, Polyarchy 1.2, and Freedom House – are not interchangeable when used as a dependent variable in regression equations. As demonstrated by their results, Casper and Tufis found that using a different democracy indicator as a dependent variable will produce different coefficient estimations for their regression modeling. However, the key issue behind this problem was not identified in their paper. Neither any right solution was provided.

In the social science, we often use indicators to measure some constructs that cannot be observed directly. Polity IV, Polyarchy 1.2, and Freedom House are three indicators used to measure democracy as a latent variable. As the same as any other indicators, these three indicators have measurement errors. But, one of the basic assumptions for OLS linear regression is that all the variables must be measured without errors (Weisberg 1985, Kline 1998). Violating this assumption, as did in many democratization researches and in Casper and Tufis's examples, could lead to biased coefficient estimation. In other words, different measurement errors of the three democracy indicators will surely cause Casper and Tufis's model estimation results inconsistent from each other.

According to the modern measurement theory, a good indicator needs to have good validity and reliability. Validity concerns whether the indicator measures what it means to. Reliability concerns the consistency, precision and repeatability of the indicator (Kline 1998). In Casper and Tufis's example, validity is about whether the Freedom House, Polity IV and Polyarchy indicators really measure democracy. Reliability is about

whether these three indicators are interchangeable. As measurement errors are generally divided into two kinds - random error and systematic error, reliability concerns random error. In contrast, validity includes systematic measurement error and some random error (Bartholomew 1996).

Polity IV, Polyarchy and Freedom House indicators are highly correlated to each other (Casper & Tufits 2003). This is a good base to assume these three indicators have very small systematic errors, but cannot be used to further assume these indicators have no random measurement errors. In other words, these indicators have acceptable validity, but their reliability may be low as high correlation does not guarantee high reliability. A low reliability can lead to biased estimation in regression modeling. As clearly demonstrated by Casper and Tufis, these three democracy indicators are not interchangeable, therefore, not reliable as indicators to measure democracy. In this perspective, the Casper and Tufis's article has made a great contribution by drawing our attention to the reliability issue of democracy measures. Recently, more and more attention has been paid to measurement error issues in political science (Adcok & Collier 2001, Munck & Verkuilen. 2002). Many have studied the systematic errors of democracy indicators (Bollen & Paxton 2000), but not much about the random errors of the democracy measurements.

Casper and Tufis's work clearly demonstrated that the random measurement errors of the three most often used democracy indicators cannot be ignored. To correct this problem of obtaining biased estimation, the best is to take these measurement errors into the consideration of our model building and estimation. One way is to construct a measurement model to estimate the random measurement errors, and then incorporate these measurement errors into our regression models (Kline 1998).

Or, another easy approach is to combine these three indicators into a new democracy measurement, which usually will increase the reliability of this new measurement over the old ones. If the combination of these three is still not enough to produce an acceptable reliability, more indicators will be needed. In other words, Polity IV, Polyarchy 1.2, and Freedom House indicators should be combined to produce a new democracy measure more reliable than before, in order to avoid the biased estimation that may exist in hundreds of the past democracy research papers.

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