Quantitative Methods II
Assignment 8
October 16, 2011
Solutions

One of the persistent claims is that putting real political power in the hands of the people encourages them to work harder. This leads, according to Adam Smith, to a wealthier population and a wealthier State.

A second claim, although of more recent origin, is that certain regions of the world — either due to culture, religion, or environment — do not react to democracy in the same manner as described above. Some regions of the world, in terms of wealth, react negatively to democracy.

These claims can be tested using a variety of statistical techniques on the same research model, which is

<p align="center"><code>gdpcap ~ democracy * region</code></p>

Those four statistical techniques are the four combinations of classical linear modeling and generalized linear modeling with log-transforming the dependent variable or not. *A priori*, we expect that the log-transformed models are superior to the non-transformed models. This is due to the nature of the dependent variable. GDP per capita is bounded below, but unbounded above, by construction.

The results of the four models support this conclusion. The classical linear model without transformation had an adjusted R^2 value of 0.3156; the log-transformed model, 0.4821. Thus, we would select the log-transformed model over the non-transformed classical linear model. The results from the two generalized linear models lead us to the same conclusion: the Akaike Information Criterion for the non-transformed model is 3757.8; for the log-transformed model, 3729.3.

We are unable to compare the classical and generalized linear models with our current knowledge. Thus, we will use both models to test our hypotheses and to make predictions.

The results of performing classical linear modeling on the data are found in Table 1. Note that there is a statistically significant interaction effect for the islamic region. This indicates, along with the negative effect coefficient, that increasing democracy in the Islamic region is actually associated with States with a *lower* GDP per capita. This effect direction is statistically different from all regions, which have a positive effect. The prediction graph, Figure 1, emphasizes this point more clearly. All regions have a positive relationship between the level of democracy in the state and the GDP per capita *except for* the Islamic region. Theirs is a negative relationship.

Substantively, the conclusions based on the generalized linear modeling are similar. The significance of the democracy effect in the Islamic region remains. In fact, it is a much larger effect (in the negative direction). The GLM also indicates that the democracy effect in the 'other' States is significantly different from the effect in African States. This differs from the conclusions of the linear model.
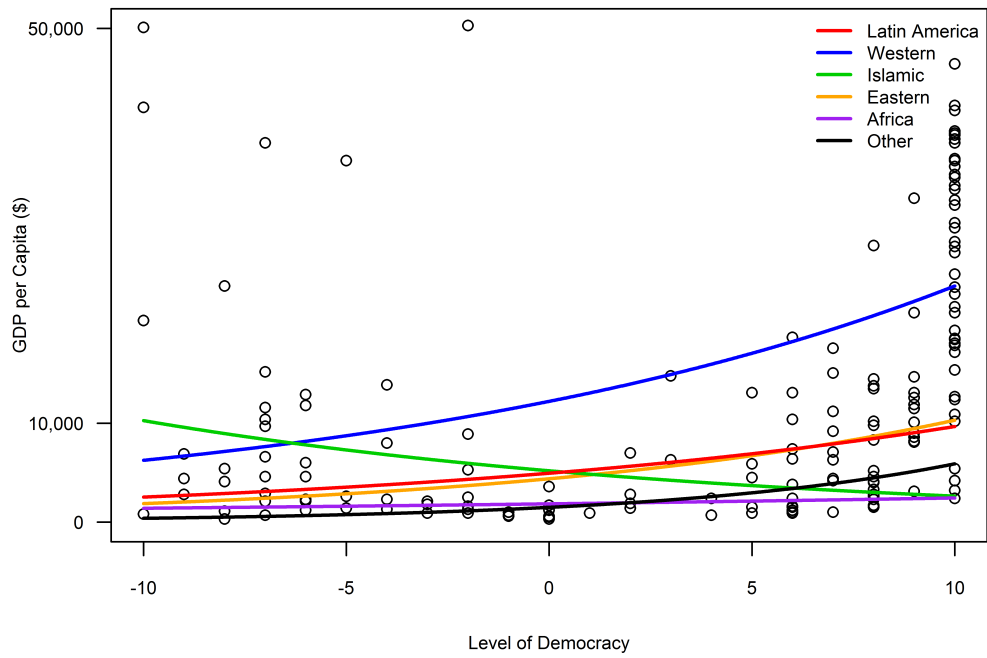
Figure 1. *Predictions of GDP per capita for various levels of democracy in the six world regions using the classical linear model. Note that there is a different wealth-democracy effect in each region.*
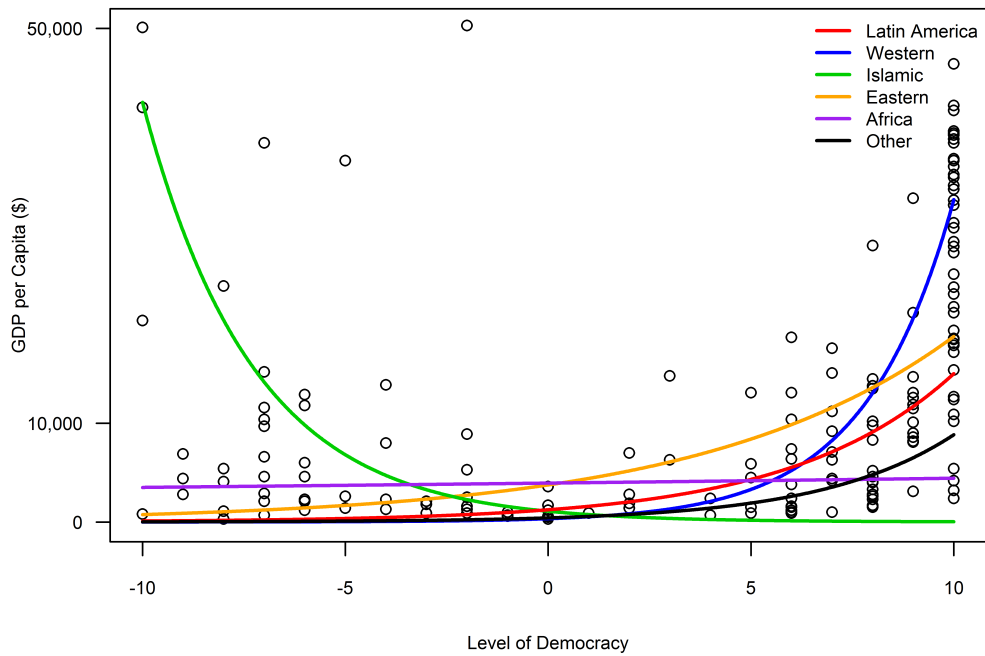
Figure 2. *Predictions of GDP per capita for various levels of democracy in the six world regions using the generalized linear model. Note that the conclusions are the same as for the classical linear model technique (Figure 1). Note, too, that the predicted effects are very different from those in the classical linear model.*

	Effect	Std. Error	t-value	p-value
Constant term	7.5172	0.1532	49.06	≪ 0.0001
Level of Democracy	0.0281	0.0265	1.06	0.2906
World Region:				
Eastern	0.8683	0.3002	2.89	0.0044
Islamic	1.0374	0.2607	3.98	0.0001
Latin America	0.9884	0.4409	2.24	0.0263
Western	1.8942	0.4258	4.45	≪ 0.0001
Other	-0.2138	1.4793	-0.14	0.8853
Interaction:				
Democracy effect in the Eastern region	0.0575	0.0422	1.36	0.1744
Democracy effect in the Islamic region	-0.0963	0.0414	-2.33	0.0211
Democracy effect in the Latin American region	0.0391	0.0582	0.67	0.5023
Democracy effect in the Western region	0.0390	0.0509	0.77	0.4444
Democracy effect in the other region	0.1099	0.1767	0.62	0.5351

Table 1. *The results table for the classical linear modeling of the logged dependent variable. Note that there is a statistically significant interaction between democracy level and world region.*

	Effect	Std. Error	t-value	p-value
Constant term	8.2792	0.5290	15.65	≪ 0.0001
Level of Democracy	0.0118	0.0888	0.13	0.8947
World Region:				
Eastern	-0.0470	1.6253	-0.03	0.9770
Islamic	-1.2825	0.9927	-1.29	0.1983
Latin America	-1.1544	2.1164	-0.55	0.5862
Western	-2.4634	1.5571	-1.58	0.1156
Other	-2.2462	5.9672	-0.38	0.7071
Interaction:				
Democracy effect in the Eastern region	0.1492	0.1874	0.80	0.4272
Democracy effect in the Islamic region	-0.3779	0.1259	-3.00	0.0031
Democracy effect in the Latin American region	0.2376	0.2463	0.96	0.3363
Democracy effect in the Western region	0.2937	0.6256	0.47	0.6393
Democracy effect in the other region	0.4460	0.1727	2.58	0.0107

Table 2. *The results table for the generalized linear modeling of the logged dependent variable. Note that there is a statistically significant interaction between democracy level and world region.*