typical of what is often encountered in practice. In Table 1-1, looking at the column labeled 1 versus 2, 3, 4, we see that men are three times as likely to be in one of the higher categories as they are to be in the lowest category, so the odds for men are 3, i.e. 750/250. Women, on the other hand, are nine times as likely to be in one of the higher categories, so the odds for women are 9, or 900/100. The ratio of the odds for women to men, that is, the odds ratio, is 9/3 = 3.

Similarly, for the column labeled 1, 2 versus 3, 4, men are equally likely to be in either the two lowest or the two highest categories, yielding odds of 1. Women are three times as likely to be in one of the two higher categories as they are to be in one of the two lowest categories, yielding odds of 3. The odds ratio for women compared to men is therefore once again 3.

Finally, for the 1, 2, 3 versus 4 logistic regression/cumulative logit, only 1/3 as many men are in the highest category as are in the 3 lowest categories, yielding odds of 1/3. Women are equally likely to be in the highest as opposed to the three lowest categories, yielding odds of 1. The odds ratio is therefore 1/(1/3), which is equal to three.

If the parallel lines assumption holds, then (subject to sampling variability) the coefficients should be the same in each of the cumulative logistic regressions, and (as the row labeled Betas shows) indeed they are (1.098612; this is also the same as the beta coefficient when a single ordered logit model is estimated). Similarly, if the proportional odds assumption holds, then the odds ratios should be the same for each of the ordered dichotomizations of the outcome variable. Proportional Odds works perfectly in this model, as the odds ratios are all 3. The Brant test reflects this and has a value of 0.

Table 1-2 presents a second example. In this case, women are again clearly more likely to agree than men, and yet the assumptions of the ordered logit model are not met.

Gender has its greatest effect at the lowest levels of attitudes; as the odds ratio of 3 indicates, women are much less likely to strongly disagree than men. But other differences are smaller; in the 1 & 2 versus 3 & 4 cumulative logit, the odds ratio is only 1.5, and in the last cumulative logit, 1, 2, 3 versus 4, the odds ratio is only 1.28. Nonetheless, as the Betas show, the effect of gender is consistently positive, i.e. the differences in the coefficients across the different dichotomizations of the outcome variable involve magnitude, not direction. Similarly, the odds for women are consistently greater than the odds for men (and hence the odds ratios are consistently greater than 1). But, because the odds ratios are not the same across the different regressions, the Brant test is highly significant (40.29 with

Table 2. Proportional odds and partial proportional odds models for government should reduce differences in income levels*.

	Model 1: Proportional odds		Model 2: Partial proportional odds**				
Explanatory variables	*P* Value	Coef	Overall *P* Value***	SD vs D, N, A, SA	SD, D vs N, A, SA	SD, D, N vs A, SA	SD, D, N, A vs SA
Life is getting worse	.000	.322	.000	.329			
Feelings about household income	.000	.234	.000	.227			
Member of ethnic minority	0.843	.037	.867	.032			
Age (in decades)	.065	–.042	.001	–.172	–.102	–.071	.042
Gender (1 = female, 0 = male)	.287	.096	.018	.484	.304	.217	–.182
Satisfaction with state of economy	.052	–.049	.000	.111	.047	–.043	–.109

*Data are from the European Social Survey. The European Social Survey (ESS) is a cross-national study that has been conducted every two years across Europe since 2001. For this example we use the 2012 ESS survey for Great Britain (ESS Round 6: European Social Survey Round 6 Data, 2012). The study has 2,286 respondents, of which 2,123 (92.8%) had complete data for the variables used in this analysis. Because cases have unequal probabilities of selection, sampling weights are used. The Stata user-written program gologit2 (Williams, 2006) is employed for the analysis.

**Only one set of coefficients is presented for explanatory variables that meet the proportional odds assumption. SD = Strongly Disagree, D = Disagree, N = Neither Agree Nor Disagree, A = Agree, SA = Strongly Agree

***The overall p value is based on a test of the joint significance of all coefficients for the variable that are in the model. For variables that meet the proportional odds assumption there is one coefficient; for variables that do not meet the assumption there are four coefficients.