**EXERCISE 1**

LPM models, even when estimated with robust standard-errors, suffer from some unavoidable problems. Mainly, unit increases in *Xi*always change the estimated in the same amount, regardless of the initial level. With that said, our variable is binomial and the probability of should never be bigger than 1 or smaller than 0. But because of the mentioned issues with the coefficients, we may get probabilities outside the (0,1) interval for the dependent variable. That is why LPM is rarely a suitable way to model probabilistic dependent variables.



First, it should be said that the only thing we can interpret directly from the probit and logit estimated coefficients are its signs: they give us the positive or negative influence of the independent variables on the probability of a woman to be part of the labor force outside the home (i.e. working for a wage outside the home at some point during the year).

Looking only at the signs of the coefficients, we get exactly the same results on Probit and Logit – which shouldn’t be surprising since Probit and Logit are two very similar models.

The husband’s income (*nwifeinc*), the age of the woman (*age*), and number of children aged less than six years old (*kidslt6*) affect negatively the probability of a married woman working for a wage outside the home. The other variables, *educ*, *exper* and *kidsge6* have a positive impact on the probability of a married woman to work for a wage outside the home. However, both models’ p-value for variable *kidsge6* seem to indicate that this variable is not statistically significant.

PROBIT:

Interpreting the coefficients with regard to the average marginal effects:

*nwifeinc*: An increase of 1 thousand dollars in the husband’s income leads to decrease of the probability of a married woman reporting working for a wage outside the home at some point during the year by 0.3532 p.p.

*educ*: An increase of 1 year of education increases the probability of a married woman reporting working for a wage outside the home at some point during the year by 4.08301 p.p.

*exper*: An increase of 1 year of labor market experience increases the probability of a married woman reporting working for a wage outside the home at some point during the year by 2.14447 p.p.

*age*: An increase of 1 year in the age of a married woman decreases the probability of a married woman reporting working for a wage outside the home at some point during the year by 1.69669 p.p.

*kidslt6*: Having one more kid aged less than six years old decreases the probability of a married woman reporting working for a wage outside the home at some point during the year by 26.70162 p.p.

*kidsge6*: Having one more kid aged between six and 18 years old increases the probability of a married woman reporting working for a wage outside the home at some point during the year by 1.05506 p.p. However, given the p-value shown for this variable, it is not statistically significant at a 5% significance level.

LOGIT:

Interpreting the coefficients with regard to the average marginal effects:

*nwifeinc*: An increase of 1 thousand dollars in the husband’s income leads to decrease of the probability of a married woman reporting working for a wage outside the home at some point during the year by 0.36634 p.p.

*educ*: An increase of 1 year of education increases the probability of a married woman reporting working for a wage outside the home at some point during the year by 4.11306 p.p.

*exper*: An increase of 1 year of labor market experience increases the probability of a married woman reporting working for a wage outside the home at some point during the year by 2.16992 p.p.

*age*: An increase of 1 year in the age of a married woman decreases the probability of a married woman reporting working for a wage outside the home at some point during the year by 1.65062 p.p.

*kidslt6*: Having one more kid aged less than six years old decreases the probability of a married woman reporting working for a wage outside the home at some point during the year by 26.08333 p.p.

*kidsge6*: Having one more kid aged between six and 18 years old increases the probability of a married woman reporting working for a wage outside the home at some point during the year by 1.05417 p.p. However, given the p-value shown for this variable, it is not statistically significant at a 5% significance level.

As we can see, the results for both models are very similar. This should not come as a surprise, as the models follow very similar cumulative distribution functions (CDF): Standard Normal for the Probit model, and Logistic Distribution for the Logit model.



First, it should be said that LPM and Probit/Logit coefficients are not directly comparable. That is why we need to compare LPM coefficients with Probit and Logit average marginal effect coefficients. This allows for a direct comparison.

The real problem with the LPM model is that, as mentioned above, there is no accounting for the level of the variables, which can lead to predicted probabilities outside the (0,1) interval and bias.

The sign of the coefficients is the same in the three different methods, which corroborates what we have already said about the LPM coefficients.

In what concerns to the magnitude, the LPM coefficients either underestimate or overestimate. We can’t say they overestimate all coefficient or underestimate all coefficients, as that is not what we observe. The Probit and Logit magnitudes are much closer to each other than they are to LPM.



**PROBIT:**

1. The probability of a women working outside home if she has no kids younger than 6 years old is 61,92%, with reference to the average value of the regressors.
2. The probability of a women working outside home if she has one kid younger than 6 years old is 39,48%, with reference to the average value of the regressors.
3. The probability of a women working outside home if she has two kids younger than 6 years old is 25,20%, with reference to the average value of the regressors.

**LPM:**

1. On average, the probability of a women working outside home if she has no kids younger than 6 years old is 61,68%, all else constant.
2. On average, the probability of a women working outside home if she has one kid younger than 6 years old is 40,55%, all else constant.
3. On average, the probability of a women working outside home if she has two kids younger than 6 years old is 26,74%, all else constant.

At the average value of the regressors, the probabilities are very close to one another. As the number of children with age lower than 6 increases, the probability of a woman getting into the labor force falls dramatically - but that probability drops faster for the Probit model (as should be expected because it takes into account the level). We can see the drop in probability on both LPM and Probit models. However we can see that for LPM the range (Min, Max) falls outside the (0,1) interval for all estimates – which is why we prefer probit/logit models.

**1e)**

PROBIT:

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LOGIT:

