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**Course:** Econometrics 512

**Problem Set 5**

**Solution**

**Problem 1**

**Question (a):**

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**Interpretation:**

Ignoring in fixed effect, we realized that regression for robust standard and when we grouped individuals in cluster the result of the two analyses are the same. By implication, when we account for unknown structure of variation and heteroskedasticity/differences across clusters of observation the results are the same However, the estimated parameter for *lsales* is insignificant for both methods. We present the STATA output in Appendix 1and 2. Also, the programming codes are shown in Appendix 13.

**Question (b):**

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**Interpretation:**

Estimating the fixed effect model using demean approach, we find that the estimated parameter of *x and q* are different. Although the results for both approaches are insignificant, but it suggests that when the fixed effect model is estimated and we account for difference/heteroskedasticity across group, the results are different. We present the STATA output in Appendix 2 and 3. Also, the programming codes are shown in Appendix 13

**Question (C):**

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**Interpretation:**

The most interesting part of these analyses is that when we account for individual and group effects, lsales has a significant impact on lrpdi. Comparing the two methods, we realize that the estimated parameters of the indicator variables are similar, and they are all significant at 5% level of significance. Therefore, estimating the fixed effect model with individual dummy variables and in clusters, the results are similar and significant. We present the STATA output in Appendix 3 and 4. Also, the programming codes are shown in Appendix 13

**How do all of these results compare?**

Using different approaches to estimate the fixed effect model, we realize that they generate the same results based on the estimated parameter. However, the most efficient method in this case is the fixed effect regression when we account for individual dummy variables or differences across groups. Note that these results could be as a result of the data we considered in this analysis. Both demean and robust standard errors approach give insignificant results.

**Problem 2**

**Question a(i):**

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**Interpretation:**

It is evident from the result that when considering E=0 for 1987 and 1988 the mean values are quite close. However, for E=1 the mean values are far from each other. This effect could be as a result different number of observations. Similarly, for the diff-in-diff estimation, we find that when considering 1987 the result is insignificant based on the t-test. However, for other estimations, the results are significant at 5% level of significance.

**Question a(ii):**

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**Interpretation:**

The result shows that grant has significant positive impact on hrsemp. Other variables in this model are insignificant to hrsemp. We present the STATA output in Appendix 5, 6, and 7. Also, the programming codes are shown in Appendix 14

**Question a(iii):**

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**Interpretation:**

The result shows that when estimating fixed effect model grant has significant positive impact on hrsemp. Other variables in the model are insignificant to hrsemp. We present the STATA output in Appendix 7. Also, the programming codes are shown in Appendix 14

**Do you get the answer in each of these cases? Why or why not?**

The results show that when we account for dummy variable for being a firm that receives treatment the estimated parameters of grant are close to the one in the fixed effect regression and they both significant. Generally, the results from two approaches are the same. The reason for this result is that the fixed effect model is exactly the same with the regression model since and  are considered to be dummy variables in the two model.

**Question 2b(i):**









**Question 2b(ii)**



**Interpretation:**

Generally, the result shows that when we considering firm-specific variables and trend for the three years, the most important residual is the one coming from grant. However, other residuals are not important to the firm. In conclusion, estimating fixed effect model using this approach is inefficient. We present the STATA output in Appendix 8,9,10,11, and 12. Also, the programming codes are shown in Appendix 14.