Econ 431 - Wohlgemuth
Fall 2018

Team Project
Report Due: Dec 3, 2018
Case Debrief during scheduled final exam

GOAL: Use the analytical tool of regression analysis to determine what factors are important in the demand for a particular product. Provide a policy recommendation for changes in tuition that maximize tuition revenue and communicate this and other findings effectively.

Higher Education is like any other durable good. It has a value today and in the future, people weigh the costs and benefits of "investing in or purchasing" the good, and if the added benefits outweigh the added costs then they will the purchase it. This project examines the demand for higher education at a single institution at an aggregate level, specifically new student enrollment (first-time freshmen and transfers) from a county (within Iowa) or a state (outside of Iowa). You are asked to determine which factors are important in explaining enrollment at a particular institution. You will also be asked to examine the findings in light of economic theory. Your primary policy recommendation is how to adjust tuition to maximize revenue.

**Dataset**: You will be given a dataset for this project. The data vary over time AND across regional areas. For example, one variable shows the number of students that enroll at Iowa State from a particular region. There are two regional groups: 1.) Counties within Iowa. 2.) States for the other states (not Iowa). Some of the variables will vary by region and time, some by region only, and others by time only. Some data may be included as nonsense variables. Your job is to decide which data are important and consistent with your economic theory to be included in your empirical models. While the data are not current, the process of analyzing and developing policy recommendations would not be different with data covering a more recent time period.

Steps for developing/conducting empirical analysis:

1. Theoretical Model: Develop a theoretical framework of the factors that influence the demand for higher education at a particular institution. DO NOT restrict your theoretical model to variables provided. This is your time to brainstorm on all reasonable factors. List each factor, the anticipated sign, and an explanation of the relationship with the demand for higher education. Be sure to keep track of and give credit to all sources used.

| Factor | Sign | Description |
|---|---|---|

2. Data Checking: As with all empirical work the data may come to you in different levels of accuracy. The first job of any empirical research is to look at the data to make sure it makes sense. Check the mean, min, max, etc. This would be a great use of Excel's pivot tables.

3. Empirical model(s): Using the theoretical model as a basis, pick those variables that are available in the dataset or created from the dataset. Develop your empirical model (please use OLS regression for this project) of the demand for higher education. Be careful to remain consistent with your economic theory, as well as common sense, in choosing the variables. (This is the "**Full** Empirical Model".)

4. Refine your empirical model(s): Based on regression results from the Full Model, statistical principles (correlation, p-values, etc) AND (last but not least) ***economic theory*** choose the variables for your final model(s) of the demand analysis. Here you *may* exclude some variables because they are statistically insignificant, cause correlation problem, or the coefficients don't make economic sense. You *may* also decide to keep a statistically "poor" variable(s) because of its economic importance. This is the "**Final** Empirical Model".[1]

5. Interpret the Results: Use the final model coefficients to draw the demand curve holding all else constant at the mean values for the most recent year. Discuss if the results of the model make economic sense. Compute/discuss the elasticities (where applicable). Are the signs of the coefficients consistent with economic theory, your initial hypothesis, and common sense?

6. Develop policy implications suggested by the regression results. Given your final model, determine how much enrollment is expected to change if tuition increases by 15%, 10%, and 5%. Will revenues increase or decrease? Your recommended price change may be different from the percentages here.

7. The data set has two observations that do not have the dependent variable (one county and one state). Most statistical packages ignore these observations when computing the coefficients – however, the software will provide predicted values if all of the independent variables are available. Use your final model regression coefficients to predict the values of enrollment for each of these observations.

8. Comment on the future outlook for what is likely to happen with enrollment at Iowa State for the next 5 years (2018-2022). You do NOT need to create mathematical forecasts using your model. Just pick a few variables that seem important from your final model, find some current forecasts (2018-2022), then discuss what this data means for enrollment over the next 5 years in light of your results. Consider sources such as: Digest of Education Statistics, State Department of Education web pages, U.S. Census Bureau, Higher Education Commissions (e.g. WICHE), etc. Most of these data sources have on-line availability.

[1] If you decide to "add" an additional variable in step 4 then you should go back to step 3 add the new variable to the full model. The "final model" will usually have fewer variables than the full model, but ALL of the variables in the final model MUST appear in the full model.

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## Written Report

Write a **1-2 page** memo to the Enrollment Leaders that presents the results of your empirical model.[2] Include the key policy recommendation to maximize revenue based on your model and elasticity, as well as brief model discussion, and other policy relevant findings based on your model. A longer **3-5 page** economic/statistical summary should include more detail on the theoretical and empirical, the results and additional detail to support the policy implications. Tables and regression output are to be attached in an appendix (and are not counted in the page limit). One appendix page will include explicit demand equations for the coefficients and variables in your final model.

**Key points in economic summary**:

- Brief introduction of research question.
- Brief theoretical model with discussion of anticipated signs.
- Brief empirical model (both full model results and final model results).
- Interpretation of findings (signs, elasticities, statistical performance, etc).
- Demand curve (all else held constant at means for most recent year).
- Policy implications.
- Predicted enrollment for observations with missing dependent variables.
- Find evidence to support a 5 year outlook for enrollment at ISU for the next 5 years (2018-2022) based on your final model results AND supporting data you can find.
- Include a "work cited" page to adequately document any and all sources you used. This would include any web pages used.

**Tables** (can be printouts from your statistical package): Don't include all possible tables that a software package will produce. Provide the tables you discuss or refer to in the document.

**Regression Results:**

Columns to include: Variable names, full model results, and final model results.
Include coefficient and some measure of the significance (t-ratio, p-value, …)
Include regression summary statistics (R-squared, Sample Size, F-value, …)

**Correlation Matrix**

**Debrief/Presentations/Discussion:**
Each team develops a brief presentation to share the highlights with the class. Be ready to discuss the strategies, results, policy implications, elasticities and other key aspects of the project that your group considers unique.

[2] The Enrollment Leaders includes, the Univ. Administrators, Deans, Faculty (from Statistics, Biology, and English), and the directors from the Offices of Business, Admission, and the Registrar.