

Examples of Lab Assignments in Economic Geography from Joan Walker, Boston University

GE103 Economic Geography Assignment 2

Due Date: Monday, October 16

You must work in groups of 2 or 3 persons. Make sure that you equally share the task of manipulating the GIS (i.e., working the mouse) as you all need to develop these skills. Produce your answers in a single word document and upload your solutions to CourseInfo (Student Tools – Student DropBox). Include your names at the top of the word document.

IMPORTANT - Use the following naming convention for your file:

A2_FirstName1_FirstName2_FirstName3.doc, e.g, *A2_Sally_Frank_Pat.doc* or *A2_Bill_Laura.doc*

Remember to provide all requested maps in your word document, and include titles, legends, scale bars, and north arrows on each. Provide units for all answers, where appropriate.

1. For each member of your group, find an example of a GIS map used in a current newspaper or periodical (dated September or October of 2006). If you have 2 members in your group, you need two examples. If you have 3 members, you need three examples. Turn in the GIS maps (*), cite the source, and for each map describe each of the layers used in terms of content (e.g., county, city) and types (point, line, area, raster) used in the map. Not sure what 'raster' means? See your reading.
 2. Using the BUUndergradsByState.shp file, generate 6 different maps displaying the information provided regarding where BU students come from in the US. Aim for variety across the 6 maps. Be creative about how the data can be displayed (e.g., Choropleth is obviously useful, but also think about others as well, e.g. Figure 10.4 from reading) and what information is available in the dataset (e.g., don't forget about the differences from '05 to '06). Make sure to briefly describe each map.
 3. Create a map using BUUndergradsLocal.shp and BlockGroup_Rent.shp. Only display the students who do NOT live in the dorms (DORMCODE is empty) and display the average rental prices visually on the map. What can you infer about how rental prices and distance from BU influence where BU students choose to live? BlockGroup_Rent.shp was generated from data provided on the MassGIS website. Provide the exact file names of the two files used to generate these data.
 4. Using the shape files provided, answer the following questions: (i) How many BU undergraduates are from South Korea? (ii) Between California and Texas, which has a higher percentage of their student-age population at BU? (use the Age 15 to 19 information.)
(iii) Name a country that has only 1 undergraduate student attending BU. (iv) What percentage of students live within 0.50 miles of an MBTA rail stop?
- (*) If the map is electronic, copy it to your word document. If it is not electronic, turn in a hardcopy (photocopy is fine) either handed to me or left for me at my office (slipped under the door is fine). Providing me with just a URL is not sufficient.

GE103 Economic Geography Assignment 3

Due Date: Friday, November 10

The objective of this assignment is for you to become more familiar with the gravity model and with statistical regression. Each of you must do your own work and turn in your own answers, although you are encouraged to discuss the problem with your classmates. For example, it's a good idea to check your answers against another student's answers to make sure that you have done the calculations correctly. Submit your answers in hardcopy. **Make sure to fill in the blanks in this handout (this is what will be graded) as well as attach supporting work.**

In this assignment, you will develop a model of the migration patterns of high school students from the continental US to Boston University. Download the Assignment 3 datafile from CourseInfo, which includes:

- ◆ BU_UndergradsByState.xls – This is the datafile you'll be working with.
- ◆ ContinentalUS.shp (and all of the files associated with a Shape file) – You'll use this datafile for some visualization.
- ◆ GravityCalibrationExample.xls – This is the file that was used in class to demonstrate how to use regression; you'll use this for tips on how to do the assignment.

Recall the gravity model:

$$ijijVWIkc\beta=$$

You are going to use the data provided in BU_UndergradsByState.xls to generate 3 different estimates of k and β . Throughout the assignment, use the units as provided in the datafiles and use log to the base 10.

1. Using the data available in the Excel file, write out the gravity equation above using California and New York as example data points. You now have two equations (one for California-BU and one for New York-BU) and two unknowns (k and β). Use these equations to solve for the two unknowns. Attach your work and enter the calculated values here: $k = \beta =$
2. In class, you learned how to manipulate the gravity equation so that it took the form of a linear regression equation: $Y=a+bX+e$. Write this form of the gravity equation here (and make sure you know how to arrive at the equation): In the following steps, you will estimate the parameters of the linear regression, first by eyeballing a line on a graph and then by using statistical regression.
3. Now in Excel, use equations to generate two new columns in your dataset, one of the "explanatory" or right hand side variable (X) and one of the "endogenous" or left hand side variable (Y). Enter the resulting values for California and New York here: X Y
California New York
4. Use Excel's chart making capability to create an XY (Scatter) plot of the data with X on the X-axis and Y on the Y-axis. Print out the chart and manually draw a straight line that you believe fits the data well. Use this line to generate an estimate of k and β . Attach your chart (on which you show your work) and enter your estimates here: $k =$ (don't forget that the *intercept* = $\log(k)$, so $k = 10^{\text{intercept}}$) $\beta =$ (don't forget that the slope is the negative of β , i.e. β should be positive)
5. Now use Excel's statistical regression tool to generate statistical estimates of k and β . To do so, follow these steps: - choose Tools – Data Analysis (If Data Analysis is not there, choose Tools-Add-Ins and add the "Analysis Toolpak".) - choose Regression

and click OK - Input the Y Range and the X Range. Output options: New Worksheet Ply (provide a name) Enter the regression results here:

Coefficient t-stat

Intercept X Variable 1

6. How can you tell from the regression results whether distance plays a significant factor in the migration of High School Seniors to BU? Does it suggest that distance is significant?

7. What are your estimates of k and β from the regression? Calculate the number of students from California and the number of students from New York that are estimated by the model. $k =$ (don't forget the pointers in question 4.) $\beta =$

from California = # from New York =

8. The error of the gravity model is the actual number of students minus the number of students predicted by gravity model using the estimated values of k and β . Using the estimates from the statistical regression, what is the error of the model (in terms of number of students) for California and New York? California error = New York error =

9. It is often useful to visually look at the errors of a model, because this can be used to better understand how the model is working, for example where it is overestimating and where it is underestimating the true values). For this, you of course need GIS. Open ArcMap and open ContinentalUS.shp provided with the dataset. In order to plot the errors, you need to enter a new column in the Attribute database and provide the equation for the errors. Do so using the following steps. - Open the Attribute table and examine it (the units here are the same as the Excel file)

- Add a new column by Options-Add Field; provide the Name 'error' and Type Float

- Right click on the new 'error' column and choose Calculate Values. Click Yes to continue.

- With the field calculator, enter the formula for the error. (hint: $14_{1.5}$ is written as $14^{1.5}$) (Hint: make sure the errors for New York and California match what you calc for question 8.)

Enter your formula here:

What state has the highest positive error? And what is the error?

What state has the highest negative error? And what is the error?

What state has the smallest error? And what is the error?

10. Create a choropleth map of the errors and attach the map. Think about how best to display such data (e.g. color choice and break points). You may prefer to display Percent Error. Do you see any trends in these errors? Think about it in terms of the various inputs: # of students, size of population, and distance from BU. For example, what are the properties of the states that have high positive errors? High negative errors? States that fit the model well?