Active Learning: Using Excel Based Interactive Graphs to Teach Incidence of Excise Tax and Deadweight Loss in a Principles Class

Sarah Ghosh

Department of Economics and Finance

University of Scranton

Scranton, PA 18510

E-Mail: ghoshs2@scranton.edu

&

Satyajit Ghosh

Department of Economics and Finance

University of Scranton

Scranton, PA 18510

E-Mail: ghoshs2@scranton.edu

ABSTRACT

Most instructors of Economics often feel frustrated that they cannot properly demonstrate some crucial materials in the Principles or Intermediate level courses because they often require tedious calculations and/ or drawing somewhat complicated graphs. Consider for example the topics of tax incidence of an excise tax and the role of elasticity in determining the tax burden on consumers and producers or the related topic of deadweight loss of an excise tax and the importance of elasticity of demand and supply to determine the size of the deadweight loss.

We present these materials in an active learning framework using Excel spreadsheets, where students can control the graphs. The interactive graphs are created by inserting "scrollbars" from Excel Developer tab and connecting the control of the scrollbars to the graph. Students are then assigned to investigate the link between elasticity and tax burden or deadweight loss. In different trials at least 99 percent of students independently drew correct conclusions regarding the link between elasticity and tax burden or deadweight loss. In a survey of students, 100 percent of students expressed interest in having more of such interactive assignments.

The assignments can also help save valuable class lecture time by freeing faculty from having to draw numerous graphs and or work out tedious calculations.

Active Learning: Using Excel Based Interactive Graphs to Teach Incidence of Excise Tax and Deadweight Loss in a Principles Class

Frustrated with the lack of student interest in graphs or simple algebra to analyze abstract concepts such as the incidence of excise tax or deadweight loss? We developed an active learning framework. Using Excel we created <u>interactive graphs</u> and gave the control to students. Results were very encouraging.

99 percent of the students understood the link between price elasticities of demand and supply and the tax burden and 100 percent of the students drew the correct conclusion between elasticity and deadweight loss. And above all, they all enjoyed the exercises.

Elasticity and Tax Burden
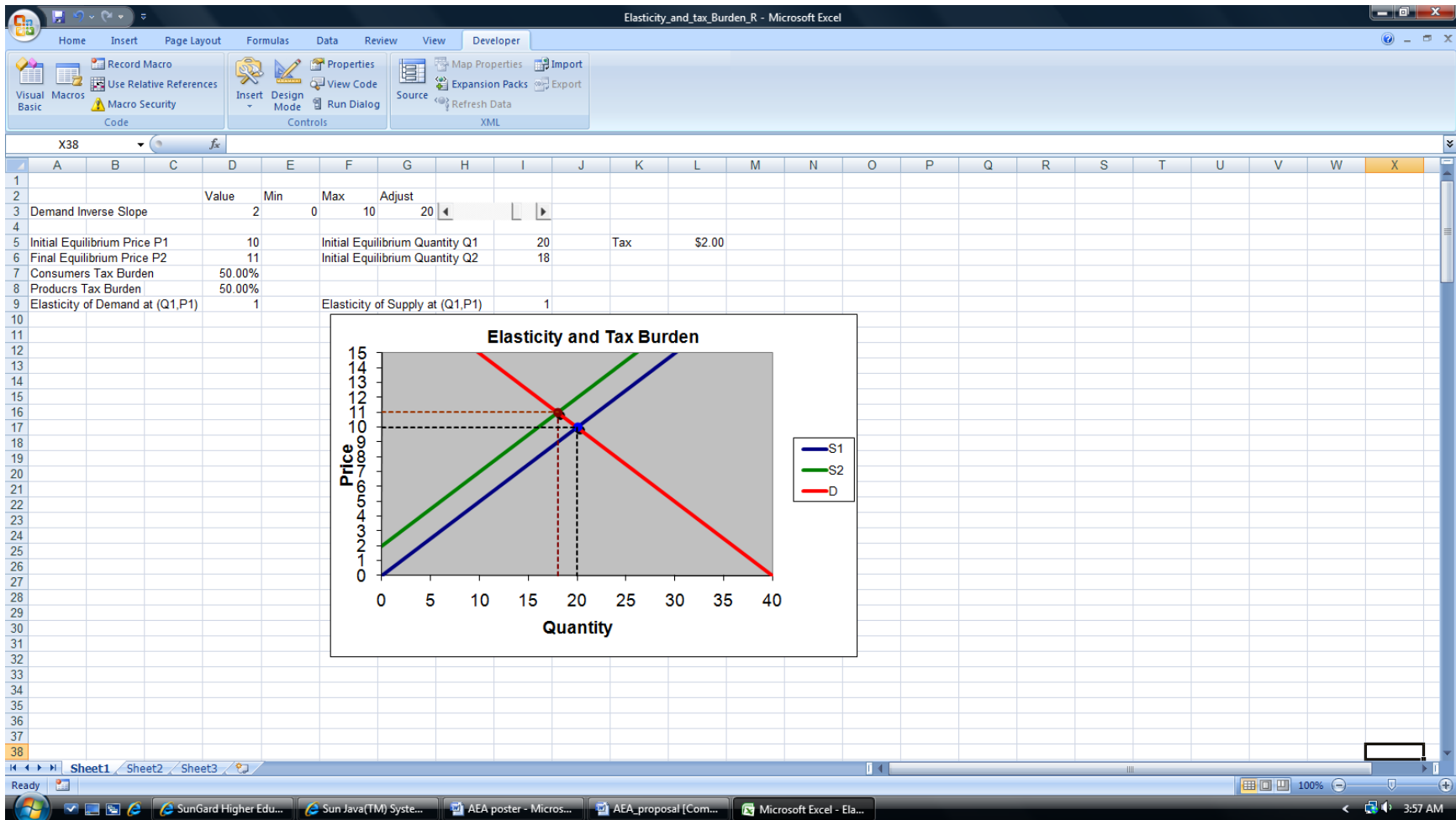
Student activity: By moving the slider students can change the slope of the demand curve and consequently observe changes in price elasticity of demand and the relative tax burden.

We then gave them the following assignment:

Start from the default position of the slider ("adjust" value: 20) when the consumers' and producers' tax burdens are both 50%.Move the slider to any position. Record the new price, consumers' tax burden, producers' tax burden, numerical values of elasticities of demand and supply. Repeat it 10 times and arrange the data in a table. You must record 10 different sets of data and make sure to record values by moving the slider both to the right and left of the initial (default) location. Do you see any pattern emerging?

Deadweight Loss and Elasticity
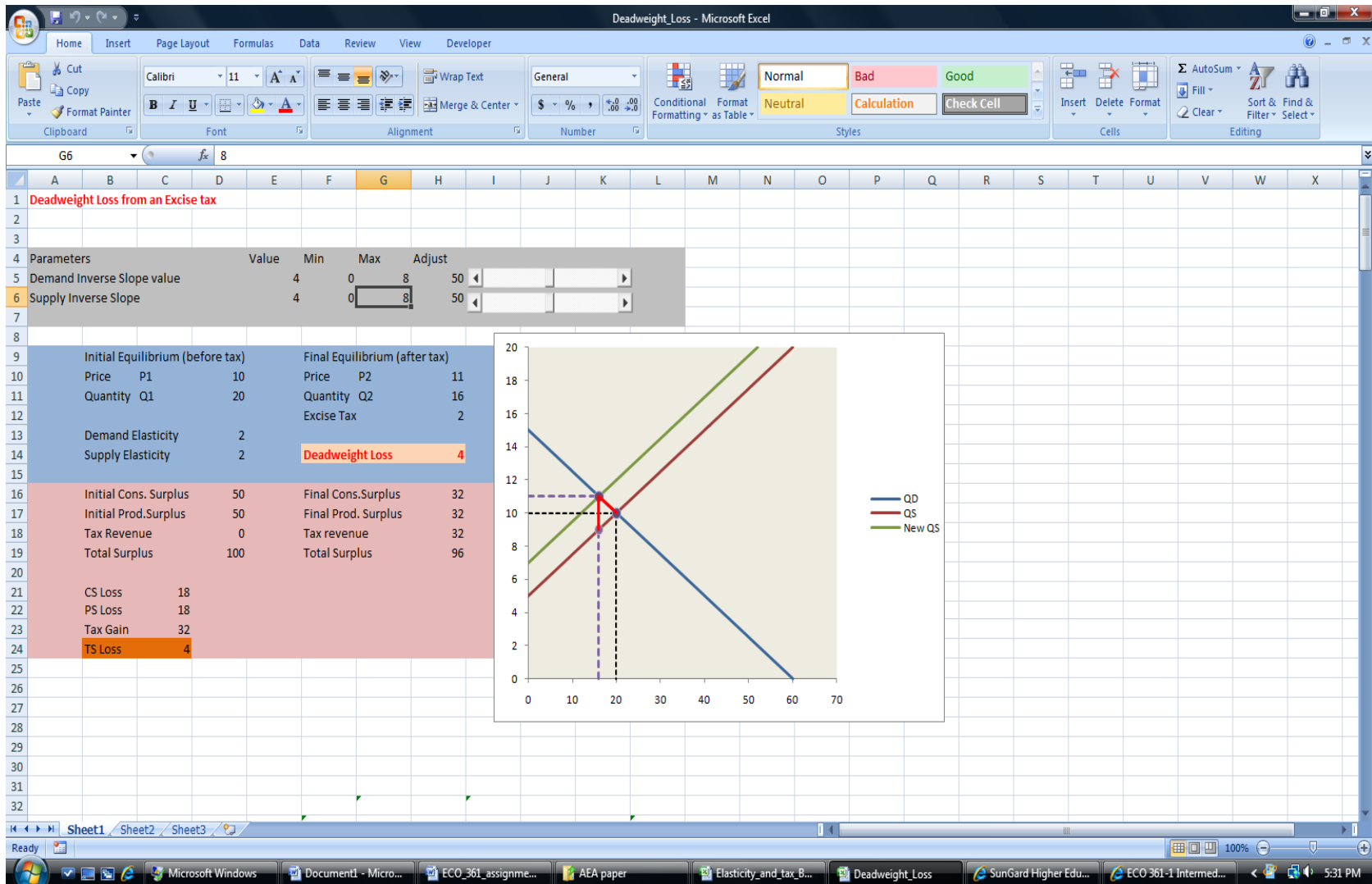
Student activity: By moving the two sliders on the graph students can change the slopes of the demand and supply curves and can observe the changes in elasticities as well as the measure of the deadweight loss.

Student assignment:

Start from the default positions of the two sliders ("adjust" value: 50) when the elasticity of demand and supply are both equal to 2 and the size of the deadweight loss is 4. First move the slider for the demand curve slope five times to any position. Record the new price, changes in consumer and producer surplus, the size of the new deadweight loss and the numerical values of elasticities of demand and supply. Now move the slider for the supply curve slope five times to any position. Record the new price, changes in consumer and producer surplus, the size of the new deadweight loss and the numerical values of elasticities of demand and supply. Arrange the data in a single table. All in all you must record 10 different sets of data and make sure to record the values by moving the slider both to the right and left of the initial (default) location. Do you see any pattern emerging relating elasticity values and the size of the deadweight loss?

Learning Outcomes :

The tax burden assignment was used in three sections of Principles and two sections of Intermediate Microeconomics classes.

99 percent of 105 students reached the correct conclusion regarding the link between elasticity and tax burden.

The deadweight loss assignment was used in two sections of principles classes.

100 percent of 55 students who completed the assignment drew the correct conclusion linking elasticity   of demand and supply and the measure of deadweight loss.

68 students from three principles class took part in a survey.

94 percent of the survey respondents thought that the assignment(s) helped them better understand the concepts.

100 percent of the survey respondents wanted to have more of these interactive assignments.

How to create interactive graphs?

Elasticity and Tax Burden

    1. Baseline Model:

      $Q_D = 40 - 2P$

      $Q_S = 2P$

     Initial Equilibrium:

      $P_1 = \$10$; $Q_1 = 20$

     Excise tax: $2

     Default post tax equilibrium:

      $P_2 = \$11$; $Q_2 = 18$

     Default consumer tax burden: 50%

     Default producer tax burden: 50%

     Elasticity of Supply, $E_S = 1$

     Default value of Elasticity of Demand, $E_D = 1$

    2.   On the worksheet insert a "scrollbar" from Excel's Developer tab (2007 Excel) or the View tab in 2003 Excel).

3. In cell D3 enter a formula for the inverse slope of the demand curve to vary its value from min (0) to max (20).

4. In cell G3 use the linked cell property of the control (the slider) of the scrollbar to link the slider to the inverse slope of demand curve.

Students can now move the slider to the right or to the left to change the slope of the demand curve on the graph.

Deadweight Loss and Elasticity

1. Baseline Model:

$Q_D = 60 - 4P$
$Q_S = -20 + 4P$
Initial Equilibrium:
  $P_1 = \$10$; $Q_1 = 20$
Excise tax: $2
Default post tax equilibrium:
  $P_2 = \$11$; $Q_2 = 16$
Default Elasticity of Supply, $E_S = 2$
Default value of Elasticity of Demand, $E_D = 2$

Default consumer tax burden: 50%
Default producer tax burden: 50%

2. On the worksheet insert two scrollbars from Excel's Developer tab.

3. In cell E5 enter a formula for the inverse slope of the demand curve to vary its value from min (0) to max (8).

4.   In cell H5 use the linked cell property of the control (the slider) of the scrollbar to link the slider to the inverse slope of demand curve.

5.   Repeat steps 3 and 4 for cells E6 and H6 for inverse slope of the supply curve and the associated scrollbar.

Students can now move the sliders to the right or to the left to change the slopes of the demand and supply curves on the graph.

The complete paper and the active spreadsheets are available from the authors on request.