INCENTIVES FOR UNIVERSITY STUDENTS: A THEORETICAL MODEL

Universitat Autònoma de Barcelona

Autor: Marcel Boixader Tomás

Tutor: Amedeo Piolatto

TFG Grau d'Economia, Febrer 2018

1. Introduction

- Designing an incentive scheme in which students get a discount on tuition, which can be larger than tuition itself, depending on their academic performance. These incentives would be paid for by the same universities, taking into account the preferences of everyone involved.
- The goal is to analyse if asymmetries of information have an impact on optimal policies and contracts in such a situation.
- Calculations shown are the ones used for a benchmark situation in which a good student exerting high effort is expected to be the preferred case.

2. Setting the base problem

Maximise the university's utility function *(B)* restricted to the student's preferences *(U)*, which need to be higher than their reservation utility.

$$B(p,y)=\alpha f_1(p)-\beta f_2(y)$$
$$U(y,e)=v_1(y)-v_2(e)$$

$$\max_{p,y}\ \alpha f_1(p)-\beta f_2(y)$$
$$s.t.$$
$$v_1(y)-v_2(e)\geq u^0$$

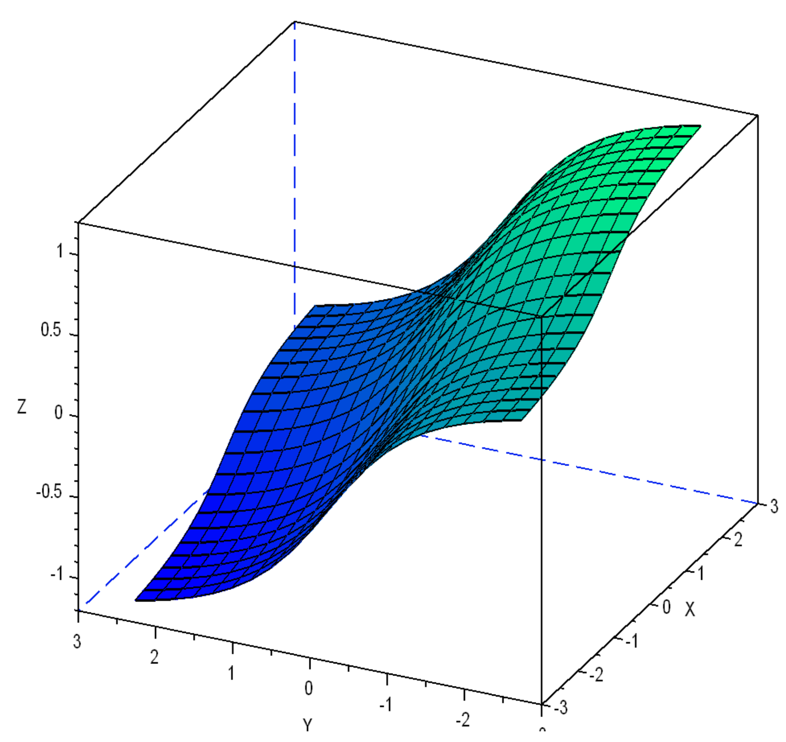


Figure 1

Arctangent functions were used to specify the university's preferences. These draw a surface such as the one shown in figure 1, once given specific values to all the variables and parameters

3. Setting the problem

- Complete information

$$\max_{y_h,y_l}\ q_h[\alpha f_1(p_h)-\beta f_2(y_h)]+(1-q_h)[\alpha f_1(p_l)-\beta f_2(y_l)]$$
$$s.t.$$
$$q_h[v_1(y_h)-v_2(e_h)]+(1-q_h)[v_1(y_l)-v_2(e_h)]\geq u^0$$

- Moral hazard

$$\max_{y_h,y_l}\ q_h[\alpha f_1(p_h)-\beta f_2(y_h)]+(1-q_h)[\alpha f_1(p_l)-\beta f_2(y_l)]$$
$$s.t.$$
$$q_h v_1(y_h)+(1-q_h)v_1(y_l)\geq u^0+v_2(e_h)$$
$$q_h v_1(y_h)+(1-q_h)v_1(y_l)-v_2(e_h)$$
$$\geq$$
$$q_h v_1(y_l)+(1-q_h)v_1(y_h)-v_2(e_l)$$

- Adverse selection

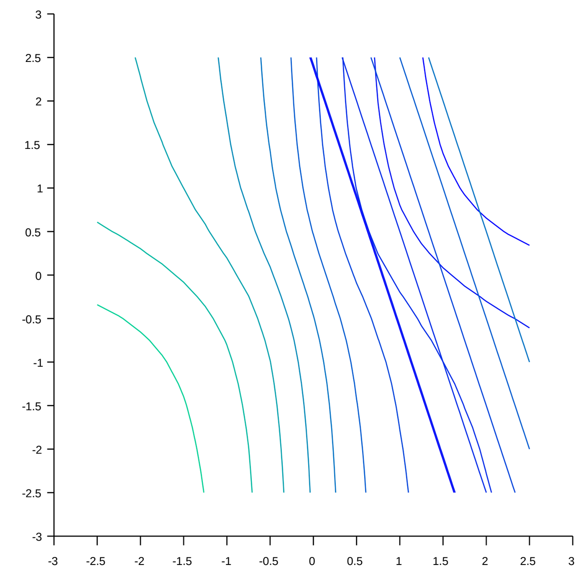
$$\max_{(y_g,e_g),(y_b,e_b)}\ q[\alpha f_1(e_g)-\beta f_2(y_g)]+(1-q)[\alpha f_1(e_b)-\beta f_2(y_b)]$$
$$s.t.$$
$$v_1(y_g)-v_2(e_g^g)\geq u^0$$
$$v_1(y_b)-v_2(e_b^b)\geq u^0$$
$$v_1(y_g)-v_2(e_g^g)\geq v_1(y_b)-v_2(e_b^g)$$
$$v_1(y_b)-v_2(e_b^b)\geq v_1(y_g)-v_2(e_g^b)$$

4. Solving the problem

- Complete information

One solution for each case, given the symmetry of information. Proof found when using the Lagrangian, which yields:

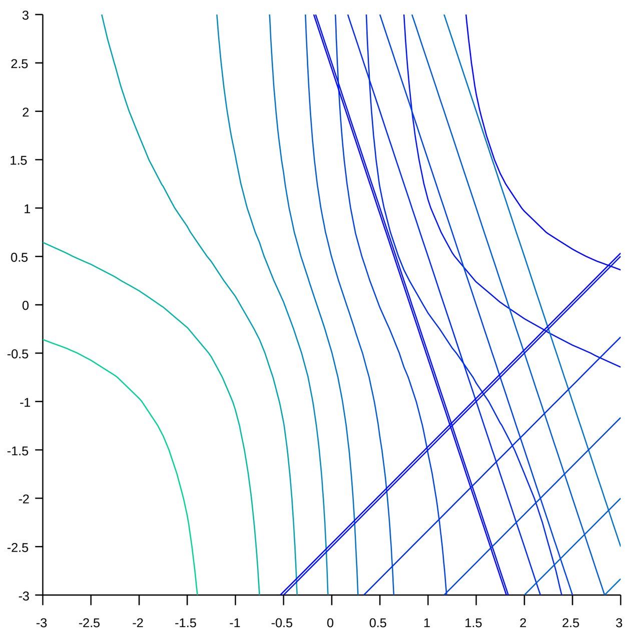
$$\left.\begin{aligned}\lambda&=\frac{\beta f'_2(y_h)}{v'_1(y_h)}\\ \lambda&=\frac{\beta f'_2(y_l)}{v'_1(y_l)}\end{aligned}\right\}v_1(y)=v_2(e_h)+u^0$$



- Moral hazard

Both restrictions are binding, which yields two salaries for each outcome given each type of student.

$$v_1(y_h)=\frac{q_l v_2(e_h)-(1-q_h)v_2(e_l)}{q_h+q_l-1}+u^0$$
$$v_1(y_l)=\frac{q_h v_2(e_l)-(1-q_l)v_2(e_h)}{q_h+q_l-1}+u^0$$



- Adverse selection

Two of the four restrictions are binding, those being the participation constraint of the bad student and the incentive compatibility constraint of the good student. The Lagrangian establishes the following relationship between variables:

$$\alpha E_g=\beta Y_g$$
$$\alpha(1-q)E_b+\alpha qE_g=k\beta(1-q)Y_b+k\beta qY_g$$
$$y_b-ke_b-u^0=0$$
$$y_g-e_g-y_b+e_b=0$$

Where *E* and *Y* are the derivatives of *f(e)* and *f(y)*

5. Conclusions

- Clear difference between the optimal payments under complete information and under asymmetrical information.
- Informational rent exists and generates inefficiency.
- Even though a clear result couldn't be computed for adverse selection, there is a specific case analysed in the written project, using the values that were used to draw the indifference curves, which shows that adverse selection introduces inefficiencies when computing the optimal scenario.
- Informational asymmetries would benefit the student but would hurt the university, since its expected utility would decrease.
- Further research could be done attempting to estimate a university's utility function, which would likely take much more into account than the one used for this model.