Supplementary Material to "Hiding Information in Electoral Competition"*

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December 22, 2003

1 Introduction

This note contains proofs that were left out from Heidhues and Lagerlöf (2003) due to space constraints. It is organized as follows. The following section provides some preliminaries. Section 3 proves the claim we made about the function EW_{mix} (see footnote 18 of the paper).

2 Preliminaries

For convenience, let us first restate the following equations from the paper (the numbering of the equations is the same as in the paper):

$$\sigma^N = \frac{\varepsilon(1-\varepsilon)(2q-1)(1-\rho)}{1-\varepsilon-q+\varepsilon(1-\varepsilon)(2q-1)(1-\rho)} \equiv f(q,\varepsilon,\rho), \tag{4}$$

$$EU_{mix} = 1-\varepsilon - f(q,\varepsilon,\rho)(1-\varepsilon-q). \tag{5}$$

3 The claim made in footnote 18

Claim. *For any $q < 1-\varepsilon$, EU_{mix} is convex in q: $\partial^2 EU_{mix}/\partial q^2 > 0$.*

Proof. Differentiating EU_{mix} in (5) twice with respect to q yields

$$\frac{\partial^2 EU_{mix}}{\partial q^2} = 2\frac{\partial f(q,\varepsilon,\rho)}{\partial q} - \frac{\partial^2 f(q,\varepsilon,\rho)}{\partial q^2}(1-\varepsilon-q). \tag{A1}$$

*This paper was produced as part of a CEPR research network on The Evolution of Market Structure in Network Industries, funded by the European Commission under the TMR programme (contract no. ERBFMRXCT980203). //[Doc: experts-supp-mat-final.tex]//

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Rewriting f in (4) as $f(q,\varepsilon,\rho) = K/(1-\varepsilon-q+K)$, where $K \equiv (1-\rho)\varepsilon(1-\varepsilon)(2q-1)$, and then differentiating with respect to q, we have

$$\frac{\partial f(q,\varepsilon,\rho)}{\partial q} = \frac{\varepsilon(1-\varepsilon)(1-\rho)(1-2\varepsilon)}{(1-\varepsilon-q+K)^2} > 0. \tag{A2}$$

Differentiating again with respect to q, gives

$$\frac{\partial^2 f(q,\varepsilon,\rho)}{\partial q^2} = \frac{2[1-2\varepsilon(1-\varepsilon)(1-\rho)]}{(1-\varepsilon-q+K)} \frac{\partial f(q,\varepsilon,\rho)}{\partial q}. \tag{A3}$$

Substituting (A3) into (A1) and then simplifying yield

$$\frac{\partial^2 EU_{mix}}{\partial q^2} = 2\left\{\frac{K+2\varepsilon(1-\varepsilon)(1-\rho)(1-\varepsilon-q)}{(1-\varepsilon-q+K)}\right\} \frac{\partial f(q,\varepsilon,\rho)}{\partial q},$$

which is strictly positive, since for any $q \in \left(\frac{1}{2}, 1-\varepsilon\right)$ the term in curly brackets is positive and $\partial f(q,\varepsilon,\rho)/\partial q$ is positive by (A2). ■

4 Reference

Heidhues, Paul, and Johan Lagerlöf, (2003). Hiding Information in Electoral Competition. Games and Economic Behavior 42, pp. 48-74.