ECON 321, Class 21: Shy, Network Effects

1. Read Section 1.

2. Read Section 2. These are often called *direct network externalities.*

3. Read Section 3.0 and 3.1 carefully. Look at the review problem below called "ShyNetworks2.5.2" for guidance. Then do problem #1 "Gizmo" below.

4. Read Section 3.3. These are often called *indirect network externalities.*

5. Read Section 3.4, Skim Section 4, and read Section 5. Skim the rest.

1. *Gizmo.* Suppose there are two computer-based voice-over-IP networks, Skype and Gizmo. 95% of users are s-types who prefer Skype, and their utility is $U_s(S) = 2n_S$, where n_S is the number of users of Skype. If they switched to Gizmo, they would receive utility $U_s(G) = 2n_G$. So note that they don't really care which network they use.

   The other users are g-type who prefer Gizmo, and they really love it because it's open source. They receive utility $U_g(G) = 2n_G + \delta$ from using Gizmo, and they would receive utility $U_g(S) = 2n_S$ from using Skype.

   (a) Right now, Skype has 95% market share, so $n_S = 0.95$ and $n_G = 0.05$. If this is really an equilibrium, then what is the smallest value that δ could have?

   (b) If δ is the value you found in (a), are there other equilibria besides the one in (a)? If so, what are they?

2. *ShyNetworks2.5.2.* Suppose there are two networks, A and B, with user-bases n_A and n_B. There are a users who prefer network A and

b users who prefer network B, with $a + b = 1$. Let type a users have utility $U_a = 2n_a$ if they buy platform A and $U_a = 2n_b - 0.5$ if they buy platform B. Let type b users have utility $U_b = 3n_a - 0.5$ if they buy platform A and $U_b = 3n_b$ if they buy platform B. (So the network externality is stronger for the b-types.)

(a) Prove whether there is an equilibrium where all users choose network B.

(b) If social welfare is just $W = aU_a + bU_b$, what is the social welfare associated with all users choosing platform B.

(c) If $a = b = 0.5$, is there an equilibrium where $n_A = n_B = 0.5$? What is the social welfare associated with that equilibrium?

(d) What is the largest value for b such that the non-standardized equilibrium still exists?

2. *ShyNetworks2.5.2_a.* Suppose there are two networks, A and B, with user-bases n_A and n_B. There are a users who prefer network A and b users who prefer network B, with $a + b = 1$. Let type a users have utility $U_a = 2n_a$ if they buy platform A and $U_a = 2n_b - 0.5$ if they buy platform B. Let type b users have utility $U_b = 3n_a - 0.5$ if they buy platform A and $U_b = 3n_b$ if they buy platform B. (So the network externality is stronger for the b-types.)

(a) Suppose $n_A = 0$ and $n_B = 1$. If an a-type switched, they would go from utility $2 - 0.5 = 1.5$ to utility 0. If a b-type switched, they would go from utility 3 to utility $0 - 0.5 = -0.5$. Both types would lose from switching, so this is a Nash equilibrium.

(b) Social welfare is $W = a \times 1.5 + b \times 3$.

(c) If $n_A = n_B = 0.5$, utility for a-types is $U_a(A) = 1$ and $U_a(B) = 1 - 0.5 = 0.5$, so an a-type would not switch. The utility for b-types is $U_b(B) = 1.5$ and $U_b(A) = 1.5 - 0.5 = 1$, so they would not switch either. So yes, this is a Nash equilibrium.

Social welfare is $W = 0.5\times1 + 0.5\times1.5 = 1.25$, but it using the expression in part (b), it would have been $0.5\times1.5 + 0.5\times3 = 2.25$ if everyone standardized on B.

(d) Obviously the b-types are going to be happy with their network as it becomes larger. So the question is whether the a-types would stick with A. For their utility on A to be greater than switching, we need

$$U_a(A) > U_a(B) \Rightarrow 2a > 2b - 0.5 \Rightarrow 2(1 - b) > 2b - 0.5 \Rightarrow b < 0.625$$

So $b = 0.625$ is the largest b population such that a non-standardized equilibrium still exists?