Economics 220, January 2022 **Your Name:** Dhyey Dharmendrakumar Mavani
Homework, day 10

1. Each period, a government receives \$100 in tax revenue, and then a politician and their constituents play the following game: first, the politician decides what fraction (g) of government revenue to spend on providing public goods, and what fraction (1-g) to "embezzle", for example, by awarding government contracts in exchange for campaign contributions, diverting public funds for private benefit, etc. Second, the constituents (who act as a single player) decide whether to re-elect the politician, or vote them out, in which case the politician is replaced in the subsequent period by another politician in the following period (and the removed politician receives 0 payoffs thereafter). The politician's payoff each period they are in office is equal to the amount they embezzle [100(1-g)], and the constituents' payoff is equal to the amount spent on public goods [g]. Both 'players' discount the future at a rate δ.

(a) Suppose the politician promises to spend all tax revenue on public goods. Assuming the constituents will eject the politican from office if they fail to keep this promise, for what values of δ is this promise credible?

$$100(1-g) + 100(1-g)\delta + 100(1-g)\delta^2 + \dots\dots \geq 100$$

$$\frac{\cancel{100}(1-g)}{(1-\delta)} \geq \cancel{100} \Rightarrow (1-g) \geq (1-\delta)$$

$$\Rightarrow \boxed{\delta \geq g} \Rightarrow \text{values of } \delta \text{ for the promise to be credible}$$

(b) Suppose the politician promises to spend 90% of tax revenue (ie., \$90 each period) on public goods. For what values of δ is this promise credible?

$\Rightarrow$ According to (b) the g is 90%.

$\Rightarrow g = 0.9 \Rightarrow \boxed{\delta \geq 0.9}$ because $\underline{\delta \geq g}$ from (a)

(c) Suppose $\delta = ¾$. What is the maximum value of g that the politican can credibly promise to allocate to public goods?

when $\delta = 0.75$, g has maximum value of 0.75 because

$\delta \geq g$ from (a)

when politician can credibly promise to allocate to public goods

(d) Suppose that in addition to embezzled funds, the politician also obtains an 'incumbency rent' equivalent to $10 per period in any period they hold office [that is, the politican's payoff each period they are in office is 100(1-g)+ 10]. Suppose $\delta = 0.8$. What is the maximum value of g that the politican can credibly promise to allocate to public goods?

$$(100(1-g)+10) + (100(1-g)+10)\delta + (100(1-g)+10)\delta^2 + \dots \geq (100(1-0)+10)$$

$$\frac{100(1-g)+10}{(1-\delta)} \geq (100(1-0)+10)$$

$$\boxed{\delta = 0.8} \Rightarrow 100(1-g)+10 \geq 0.2(110)$$

$$\Rightarrow 110 - 100g \geq 22$$

$$\Rightarrow 100g \leq 88$$

$$\Rightarrow \boxed{g \leq 0.88}$$ Ans

2 Consider a large population of producers who produce a variety of food and manufactures. Each week, they each individually decide whether to barter their wares locally, or to travel to a market, where they can sell their goods for money which they can use to purchase a variety of goods from a wider selection of trading partners.

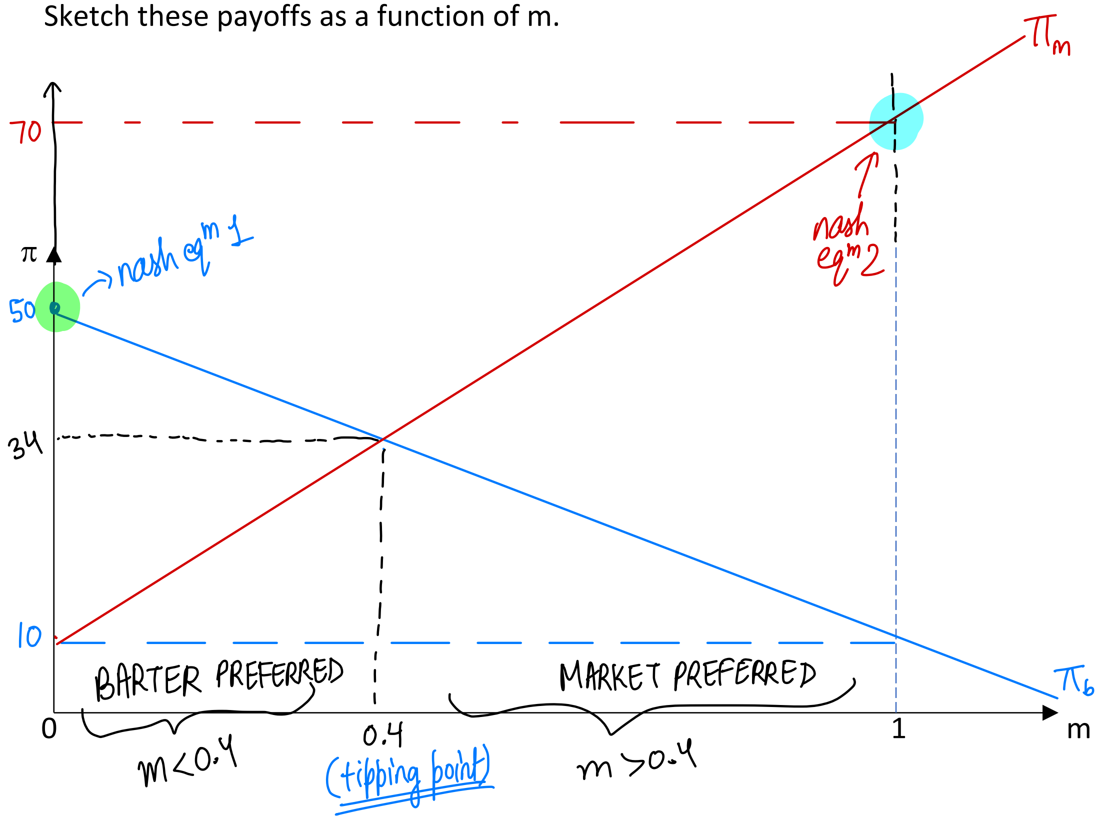
Traveling to market is costly, however, and the benefit depends on how many other people go to market: the more, the better. Conversely, the more of one's neighbors go to market, the lower is the benefit from local barter exchange.

Let $m \in [0,1]$ denote the fraction of people who travel to market (m can take any value between 0 and 1).

Suppose the benefit of barter exchange is $\pi_b = 50 - 40m$

and the benefit from market exchange is $\pi_m = 10 + 60m$

Sketch these payoffs as a function of m.



What are the equilibria of this game (what values could m take in a Nash equilibrium)?
What is the "tipping" point at which market trade becomes worthwhile?

$\Pi = 50 - 40m = 10 + 60m$

$100m = 40$

$\boxed{m = 0.4}$

Tipping point

$\boxed{\Pi = 34}$

The two Nash equilibria in this scenario are the m values of 0 and 1 at Π-values of 50 and 70 respectively.

Nash equilibria 1: BARTER PREFERRED (0,50)

Nash equilibria 2: MARKET PREFERRED (1,70)