Ec142, Spring 2017

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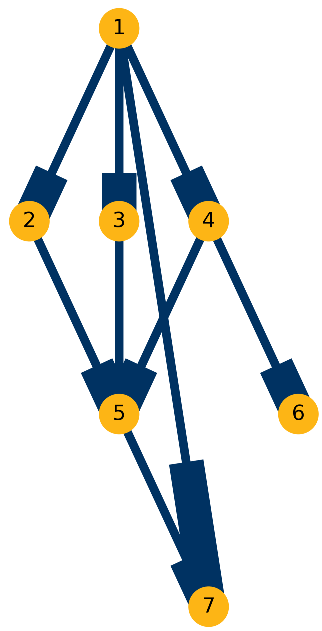
Review Sheet 4

This review sheet is designed to assist you in your exam preparations. I suggest preparing written answers to each question. You may find it useful to study with your classmates. In the exam you may bring in a single 8.5 x 11 sheet of notes. No calculators or other aides will be permitted. Please bring blue books to the exam. The midterm exam will occur in class on Thursday, April 27th.

[1] The figure below depicts a (hypothetical) supply chain. For example firm 1 sells inputs to firms 2, 3, 4 and 7; firm 6 sells inputs to firm 5 and so on.




[a] Let $\mathbf{D} = [D_{ij}]$ where

$$D_{ij} = \begin{cases} 1, & \{i,j\} \in \mathcal{E}(G) \\ 0, & \text{otherwise} \end{cases}. \tag{1}$$

That is $D_{ij} = 1$ if firm $i$ "sells" to firm $j$ (and zero otherwise). Fill in the table below to construct the adjacency matrix $\mathbf{D}$ for the depicted supplier-buyer network.

| | | *Buyers* | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| *Suppliers* | **1** | 0 | | | | | | |
| | **2** | | 0 | | | | | |
| | **3** | | | 0 | | | | |
| | **4** | | | | 0 | | | |
| | **5** | | | | | 0 | | |
| | **6** | | | | | | 0 | |
| | **7** | | | | | | | 0 |

[b] Let $A_i$ equal the productivity of firm $i$. Assume that

$$A_i = \alpha_0 + \beta_0 \left\{ \frac{\sum_{j=1}^{N} D_{ji} A_j}{\max\left(1, \sum_{j=1}^{N} D_{ji}\right)} \right\} + V_i \tag{2}$$

with $V_i$ independently and identically distributed across agents with mean zero and variance $\sigma^2$. Interpret, in words, equation (2). Why might the productivity of a firm vary with that of its suppliers?

[c] Assume firm 1 experiences a shock to $V_1$ of $\sigma$. What is the effect of this shock on the productivity of firm 1's direct customers, firms 2, 3, and 4?

[d] What is the effect of the shock on the productivity of the customers of firm 1's customers? On the customers of those firms customers?

[e] What is the social multiplier associated with this shock to firm 1's productivity?

[f] What is the social multiplier associated with a one standard deviation shock to $V_6$? How does your answer differ from the one given in [e] above? Why?