i # Candidate instructions

ECON5200/9200

This is some important information about the exam in ECON5200/9200. Please read this carefully before you start answering the exam.

Exam period: Monday, December 09, 2019 at 09.00 a.m. to Thursday December 12, 2019 at 10.00 a.m.

Guidelines: You should upload your text in pdf format - one pdf file for each problem. Do not give the files a name which can identify you. We recommend that you use the course code and your candidate number and/or the number of the problem. Please note that the maximum file size is 1GB.

You can scroll back and forth in the problem set.

You should familiarize yourself with the rules that apply to the use of sources and citations. If you violate the rules, you may be suspected of cheating/attempted cheating.

The problem set: The problem set consists of three problems, with several sub-problems. The three problems will each count one third of the total grade. The sub-problems count as indicated.

Grading: The grades given: A-F, with A as the best and E as the weakest passing grade. F is fail. Students on phd-level are awarded either a passing or failing grade. The pass/fail scale is applied as a separate scale with only two possible results.

Grades are given: Thursday 2 January 2020.

The appropriateness of general equilibrium theory for capturing the behavior of the firm has a weak support. Jacques Dreze beautifully expressed his concerns at the 1984 Harry Johnson Lecture:

> The firm fits into general equilibrium theory as a balloon fits into an envelope: flattened out! Try with a blown-up balloon: the envelope may tear, or fly away: at best, it will be hard to seal and impossible to mail. Instead, burst the balloon flat, and everything becomes easy. [1985, *Economic Journal*, " (Uncertainty and) The Firm in General Equilibrium Theory", 95:1-20]

To fill some air in the balloon, Cres and Tvede (2013, *Economic Theory*, "Production externalities: internalization by voting", 53:403-424) have recently proposed a theory where production plans are selected within the firm by majority voting. Read carefully the paper and then answer the following questions.

1. Intuitively explain the relationship between "unanimity" (in the words of Cres and Tvede), consumers behavior, and firms behavior in a standard Arrow-Debreu general equilibrium environment. What issues emerge with "direct" externalities?

2. Explain the model of direct externalities adopted here. How general is it? Comment briefly.

3. Define the concepts of ρ-majority stable equilibrium and strong ρ-majority stable equilibrium and briefly discuss the difference.

4. At a ρ-majority stable equilibrium, each firm behaves as if maximizing profits with respect to "special" prices. Explain the intuition behind this result and discuss the multiplicity issue.

5. Discuss the role of firms being small relative to the rest of the economy. What does this assumption buy? What happens to the results if there were also "standard" firms (for which the production function does not include externalities)?

6. One of the main results of the paper is to compare the equilibrium with shareholder governance and stakeholder democracy. What do we learn?

7. Is there a version of the first welfare theorem that can be formulated for these economies?

Please read carefully "Signaling games and stable equilibria" by In-Koo Cho and David M. Kreps, in *Quarterly Journal of Economics* **102**, 179–222 (1987).

Consider the signaling model in Section 13.C of Mas-Colell et al. and use sequential equilibrium as equilibrium concept. [Formally, we must turn the model into a finite game to use the concept of sequential equilibrium.]

(a) Why does the concept of sequential equilibrium imply that both firms have the same belief about the worker's type as a function of the worker's education choice.

(b) Characterize separating and pooling sequential equilibria.

Cho and Kreps (1987) present a refinement of the concept of sequential equilibrium, often referred to as the *intuitive criterion*.

(c) What sequential equilibrium outcome satisfies the intuitive criterion, and why?

(d) What happens with the sequential equilibrium outcome satisfying the intuitive criterion when λ (the probability of high productivity) approaches 1. And what if $\lambda = 1$? Discuss.

(e) Give an overview of other contributions to equilibrium selection in signaling games; for an overview, see e.g. "Silver Signals: Twenty-Five Years of Screening and Signaling" by John G. Riley in *Journal of Economic Literature*, **39**, 432–478 (2001). Discuss the relevance of such refinements.

Please read carefully "Incentives and incomplete information" by d'Aspremont, Claude, and Gerard-Varet, Louis-Andre, in *Journal of Public Economics* **11**(1): 25-45 (1979).

(a) What did we call this mechanism in class, and what was the benefits, and the drawbacks, of this mechanism?

(b) What is the difference between the mechanism offered in this paper, and the Vickrey-Clark-Groves (VCG) mechanism we considered in class?

(c) When (i.e., in which situations and under what assumptions) is it reasonable to require that the mechanism should be implementable in dominant strategies, and not only as a perfect Bayesian equilibrium? Also: When (i.e., in which situations and under what assumptions) is it reasonable to require that the mechanism satisfies ex post individual rationality constraints (i.e., "participation constraints")?

(d) Suppose there is a public project that is considered to be built: There are two individuals/groups and each can have a net value of the project that takes any real number in the interval $[-1, 1]$. Can you derive the VCG mechanism?

(e) For the same problem as in (d), can you refer to Theorem 6 in the 1979-paper above to derive the mechanism that is consistent with Theorem 6?