

Referee report on: „Minimum quality standards and novelty requirements and novelty standards in a One-shot development race” by J. Prokop, P. Regibeau and K. Rockett.

The authors investigate a dynamic innovation duopoly game with exogenous technological progress. Two firms face quality improving technological progress and can decide the point of time, when to introduce a new product. After one or two firms have entered the market, there is either a monopoly market or price competition a la Hotelling.

In a first step the authors characterize the equilibrium outcome of the game. In a second step they investigate the welfare properties of the equilibrium. In a first step they introduce policy instruments to correct for welfare distortions through decentralized decision making.

The paper suffers from several weaknesses:

- I. The paper has a very long technical appendix. This is not bad per se. But the main text is often not comprehensible without going into details in the appendix. For example, the game is not completely defined in section 2. The reader has to go into the proofs of the propositions to guess what the authors could have in mind.
- II. The paper is written rather sloppy: References are missing. Variables that are used in a proposition are defined later in a proof, and so on.
- III. In the very long appendix it is often not clear what the authors are doing, what exactly they are proving there.
- IV. The description of your game is incomplete. You do not explain what happens if both firms decide to enter (innovate) at the same time. If firms are symmetric, it must be the case, that they both want to be first or that they want to be second. If they are indifferent, their profits must be equal and it is a coordination game. In that case, there should be cheap talk prior to decision. Otherwise equilibria in pure strategies might not exist. Firms will then use mixed strategies. You nowhere discuss this issue!
- V. Your propositions also do not properly characterize the equilibria. It is not clear in the propositions whether the leader and the follower choose their role in equilibrium or whether this is an endogenous choice and whether the result is in pure or mixed strategies.
- VI. Some of the proofs are no proofs, but rather say that “numerical simulations confirm the claim”. This is simply not acceptable. A numerical simulation proves that certain cases exist that satisfy the claim, but it can never show that the proposition does always hold!
- VII. The Introduction is not written well.
- VIII. The policy relevance of the paper is weak.

Comments in detail:

- 1) Introduction: You start with a sentence that is hard to understand. What do you mean by “regulations on the conditions of entry”? Then you start with the usual list: A did this, B did this, C did that...”. After having read the first paragraph, why should the reader feel that this is going to be a fascinating paper ? You must start by laying out what question you are going to address, and why this question is of economic relevance!
- 2) Second paragraph: You need to refer to a paper by Shaked and Sutton.

- 3) Third paragraph: Not every reader is familiar with the Riordan-paper! Your paper is even more in the spirit by a paper by H. Hoppe and U. Lehmann-Grube: "Innovation timing games, a general framework with applications," in JET 121 (2005), 30-50. Hard to believe that you do not know or ignore that paper!
- 4) Third and fourth paragraph (page 3): The references of Regibeau and Rockett (1996, and 2005) are missing in the list of references!
- 5) Page 5, bottom: The motivation comes much too late.
- 6) Overall the introduction is too long!
- 7) Page 9: you sometimes use i sometimes j for the firm index!
- 8) Page 10: you should mention that the formula results from the Hotelling price competition model. You do not even mention that the firms engage in price competition!
- 9) Page 11, line 5 up: "firm who..." -> firm that " (A firm is not a person!)
- 10) Page 11, 2nd line up: "firms are of equal ability" -> "firms have equal ability"
- 11) Page 12, first full sentence: "While...." Too long!
- 12) Lemma 1: Strictly speaking your claim is not correct!!! The reader wonders where the number 2.55 comes from. In the appendix we find that it is the solution of the equation $x=q*\text{Exp}(-4/x)/2$. But the solution is not exactly 2.55. So instead of writing 2.55 you should introduce a new symbol, say z , and then say that z is the solution $x=q*\text{Exp}(-4/x)/2$. This also applies to your propositions 3-7 where you use similar thresholds.
- 13) Also Lemma 1: In the proof you use the fact that the θ 's of the two firms are equal. But you don't say it here!
- 14) Page 12: Don't use underline!
- 15) Page 12: Why is there a discontinuity? Usually if you let the cost (the quality) of an innovator decrease (increase) slowly, you get first incremental and then drastic innovation. But the transition is continuous. Also the profit function behaves continuously at the point of transition. Why do you get a discontinuity here?
- 16) Page 13: You nowhere say where and how t_p and t_s are defined. t_p is defined in Lemma 3. You should mention that. But where do I find the definition or calculation of t_s ?
- 17) In footnote 4 you mention a working paper. This paper is a working paper? You do not mention any working paper in the list of references!
- 18) Proposition 1: In the proof you use $\theta_A = \theta_B$ as in Lemma 1. But you do not mention it!
- 19) Proposition 1: The variable Y is not defined here. It is defined in Lemma 2! (Another sloppiness!)
- 20) Footnote 5: If there are three authors, you cite: "Dutta et al. (1995)" Moreover, the year is missing!
- 21) Page 18, last sentence of first paragraph: "Overall, ..." this I do not understand. What do you mean that the innovation of the follower comes too quickly, but a drastic innovation is introduced too? In the model you say that there is only one innovation by either firm.
- 22) Proposition 3: As mentioned above: You do not give a proper proof for the welfare claim.
- 23) Section 3: First of all, I do not understand the difference between minimum quality standards and novelty requirements? Aren't both minimal thresholds for the point in time where the product may be introduced? Further, I do not understand how such standards can be introduced in practice. Minimum quality standards may be set, if there is a variety of existing qualities, and if there is imperfect information about the quality of a product. But we are talking about innovations here. How can the government enforce a minimum quality jump for a new TV set, say? You do not mention a single example, where a minimum quality

standard for a new product can be found and where it can be measured. I am afraid that such a policy is the death of innovative activity! This is a rather academic proposal. It helps to increase the number of enemies of neoclassical analysis! I suggest to drop the whole policy section. But if you want to keep it, you should define formally what you mean by those standards.

24) Page 22, first paragraph: I do not understand what you try to say!

25) The appendix is badly organized. They should be some organizing sentences that Lemmas 2 and 3 (maybe also 4?) prepare the proof of the following propositions. Some parts should be in the main text, for example the last paragraph of page 37. On page 38 up, you mention necessary conditions and sufficient conditions. But it is not clear conditions for what.

26) Then as I said before, your arguments on page 42 is not a proof!