

# Review: MS 888 “(In)determinacy, bargaining, and R&D policies in an endogenous technological changing economy”

The paper introduces a combination of several R&D policies and bargaining over a franchising contract between intermediate and final good producers into a standard expanding variety model of R&D-driven endogenous growth. The author shows that bargaining in this setting can result in dual equilibria that exhibit local indeterminacy. He also shows that on a low balanced growth path (BGP), R&D subsidies to private firms and the government’s own R&D activities can enhance the economic growth rate by drawing more resources into R&D and thereby increasing innovation. Along this BGP, increasing the bargaining of intermediate goods firms (that use the blueprints from the R&D sector) enhances growth. If the economy is on a high BGP, R&D subsidies to private firms and government R&D activities may instead decrease the economic growth rate. On this growth path, final good firms play a more important role and increasing their bargaining power enhances growth.

The question of what can cause multiple equilibria and indeterminacy in R&D-driven growth models is an important question. Conceptually, to study interaction between vertically integrated final and intermediate goods producers in this context is appealing. However, in my opinion, the paper in its current form is not convincing the reader that the model can shed light on these issues.

The optimal bargaining contract is shown to be to set the price of the intermediate input to marginal cost and for the intermediate and final good producers to share the rents from sales of the final good through the franchise fee. (Importantly, both intermediate and final goods are differentiated.) Since bargaining over this franchise contract is explained to have an effect on the overall economic growth rate of the economy, the use of a franchise contract needs further motivation. (Some discussion is provided in Wang et al (2010) that this paper builds on, but should be clarified further.) Is it only to be interpreted in the context of vertically integrated firms, or also for vertically connected firms (including outsourcing)? Is the franchise fee to be interpreted as a fully contractable payment for a relationship-specific investment (to produce an intermediate good that is tailor-made for a certain final good)?

The framing of the paper is that it shows that bargaining between final and intermediate goods producers may cause local indeterminacy (and dual BGPs) in the Grossman and Helpman (1991, Ch. 3) model of R&D-driven endogenous growth. What is not clarified in the paper is how the dual equilibria (that can exhibit indeterminacy) seem to be a result of introducing bargaining between intermediate and final goods producers *combined with* a set of several government interventions related to R&D.<sup>1</sup> (See Proposition 1 and its proof.) The paper builds on Wang et al (2010) in which the authors introduce the same kind of bargaining over franchising contracts between intermediate and final good firms (both operating under imperfect competition) in the Grossman and Helpman (1991, Ch 3) model and find a unique equilibrium with no indeterminacy.

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<sup>1</sup>Government policy for R&D includes: (i) specific taxes on both intermediate goods and final goods, (ii) the weight of total government expenditure to be financed by taxes from the final goods sector and intermediate goods sector, respectively, (iii) R&D subsidy that lowers the cost of innovation for private firms in the R&D sector, and (iv) R&D conducted in public institutions (the amount of R&D labor hired in public R&D).

In the paper reviewed here, Appendix A shows that if there is no bargaining, but the structure of government R&D interventions remains, there is a unique equilibrium that exhibits determinacy. It therefore appears as if both bargaining and the structure of government interventions are needed to generate indeterminacy (and dual BGPs). If that is indeed the case, framing the paper as if it is the bargaining between final goods and intermediate goods producers per se that generates multiple equilibria and indeterminacy is misleading. If both are needed, it may also severely limit the relevance of the results from the model.

On a related note, in Wang et al (2010), as in standard R&D-driven growth models with expanding variety, R&D is done by intermediate goods firms that upon successful innovation obtain the blueprint and use it to produce a product variety (under monopolistic competition). In the paper reviewed here, a private R&D firm is a separate agent from an intermediate good producer. In addition to private R&D firms, blueprints are also developed by R&D labor hired by the government. The paper would benefit from clarification on how intermediate goods producers obtain the ownership/right to use the blueprints.

## Minor comments

In general, there are linguistic problems throughout the paper. For example, the discussion in lines 9-21 on p. 2 that seems to highlight the main contribution of the paper is mostly grammatically incorrect and hard for the reader to follow. Footnote 8 on p. 16 is another example. The paper needs much work in this regard, and I will not list the errors here. A few other smaller issues:

(p. 1-4) In the related literature, there is no mentioning of the literature on contractual frictions and relationship-specific investments among vertically connected firms, for example Antras and Helpman (2007), Antras and Chor (2013). Also, regarding the role of R&D and technological change for vertical integration, Acemoglu et al (2010) could be a useful reference.

p. 2 Villas-Boas reference: Should be “her results”, not “his results”.

p. 16-17 Proposition 2: The use of “dual economy” could be misleading as it often refers to an economy where two sectors exhibits different growth rates (for example agriculture and manufacturing in developing countries). Here it refers to multiple equilibria for the economy as a whole.

p.17, Eqs (55)-(56): “sign”, not “sing”

p. 18 Using “low equilibrium” whe discussing the BGP with a high growth rate and vice versa is confusing. (“Low” (“high”) refers to the share of labor hired in intermediate goods production.)

## References

- Acemoglu, Daron, Philippe Aghion, Rachel Griffith and Fabrizio Zilibotti (2010), “Vertical Integration and Technology: Theory and Evidence”, *Journal of the European Economic Association* 8(5): 989-1033.
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- Wang, Vey, Chung-hui Lai, Lung-Sheng Lee and Shih-Wen Hu (2010), “Franchise fee, contract bargaining and economic growth”, *Economis of Innovation and New Technology*, 19: 539-552.