Chapter 9
Consumer Welfare and Market Structure in a Model of Competition between Open Source and a Model of Proprietary Software

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ABSTRACT
I consider a Vickrey-Salop model of spatial product differentiation with quasi-linear utility functions and contrast two modes of production, the proprietary model where entrepreneurs sell software to the users, and the open source model where users participate in software development. I show that the OS model of production may be more efficient from the point of view of welfare than the proprietary model, but that an OS industry is vulnerable to entry by entrepreneurs while a proprietary industry can resist entry by OS projects. A mixed industry where OS and proprietary development methods coexist may exhibit large OS projects cohabiting with more specialized proprietary projects, and is more efficient than the proprietary model of production from the point of view of welfare.

INTRODUCTION
There is a variety of mixed industries; industries where for-profit and non-profit coexist. In the present model, I will focus on the decision by consumers between contributing to collective projects, or buying goods that are produced by independent entrepreneurs and sold for profit. The model will be particularly adapted to the study of competition in the software industry between software developed under proprietary license terms and software developed under open source (‘OS’) license terms. However, it is also adapted to the wide range of areas in which open development methods are used concurrently with proprietary methods. This includes genetic and biological research, which among other research areas has benefited from the use of open source
methods. For example, the publicly financed and open Human Genome Project competed with the privately financed Celera Genomics. Other projects have been set up to further the use of OS methods in this area (www.bioforge.net, www.bioinformatics.org, www.genome.wustl.edu). This also includes blogs (Raynes-Goldie (2004), Gaudeul, Mathieu, and Peroni (2008)), which link spontaneously generated independent contributions together in a complex system of relations and have emerged as an alternative and/or complement to established news media. Online databases that can be openly edited by anybody (Wikis) generate alternative repositories of knowledge also compete with established dictionaries and encyclopedias. Online communities and other group communication mechanisms, such as Facebook or LinkedIn compete with established search and coordination infrastructures provided by firms and in markets. Knowledge production in the academia, which can be described as an open source process (Bezroukov (1999), Raymond (2001)), competes with the research output produced from within firms. Finally, non profits in the health sector, the provision of services to the poor, museums, job training, etc... compete with their private counterparts. The domains of application of this article are therefore extensive.

The current literature on the patterns of competition and cooperation between open source and proprietary software is already rather well developed. However, there is little work on how the cohabitation of open source and proprietary models of production affects consumer welfare and market structure at the industry level. I find that an industry where only the OS development model is used is more efficient from the point of view of welfare than an industry where proprietary development is used to the exclusion of other development methods. However, an OS industry will be vulnerable to entry by entrepreneurs that use proprietary development methods, while an industry that uses the proprietary mode of development will be able to resist entry by OS projects. A mixed industry where OS and proprietary development methods coexist may exhibit large OS projects cohabiting with more specialized proprietary projects, and this pattern of coexistence will improve on a proprietary industry from the point of view of welfare.

CONTEXT

I have conducted two main empirical studies to analyze the patterns of cohabitation between open source and proprietary software. In the first project (Gaudeul (2003), Gaudeul (2007)), I consider the evolution of the patterns of competition between LATEX, an open source typesetting software, and its proprietary alternatives and complements. In a second project (Gaudeul (2008)), I consider empirical data to explain when and why open source software does not attract users. There are very few other empirical studies of the patterns of competition between OS and proprietary software (‘PS’) and of the influence of open source software (‘OSS’) on PS production and vice-versa. Bitzer and Schröder (2006) assert from case studies that OSS encourages innovation from proprietary software – even though Klincewicz (2005) report that OSS itself may not be very innovative, and Harison and Koski (2008) report that firms that develop OSS as part of their business model are less productive than those that provide only proprietary applications. Franke and von Hippel (2003) consider the development of security functionalities in Apache, the web server, and show its success comes from being able to address the heterogeneous needs of those users who are dissatisfied with the proprietary offering. Mockus, Fielding, and Herbsleb (2005) compares the development of Apache and Mozilla and underlines how Mozilla may have benefited from maintaining much of the machinery of its past commercial development.
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