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The value of a new idea: knowledge transmission, workers' mobility and market structure ☆

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Abstract

We model the process of knowledge transmission among firms via workers' mobility as a multi-stage game. In our setup an idea to be realized needs that the agent informed about the idea recruits another agent from a pool of uninformed people. This constraint generates a recursive effect of knowledge transmission via players' mobility across firms which affects simultaneously the players' payoffs and the number of active players engaged in market competition. We provide sufficient conditions for the game to possess a unique symmetric subgame perfect equilibrium in which all incumbent players deter the exit of their collaborators. The equilibrium outcome is shown to depend upon the success of the idea over time, expressed by the behaviour of the market demand and on players' time preferences. A few other intuitions are provided on the interplay between technology, market structure and the market value of an innovative idea.

1. Introduction

The idea of considering a firm as an opportunity through which a group of different individuals can actively learn how to organize the production of a given commodity is certainly not new. Sometimes working together is just a technical necessity but more often it is also a crucial prerequisite to effectively develop the knowledge and the coordination necessary to obtain a more than ordinary result in production. The learning process usually requires a certain amount of time, e.g., if the firm starts producing at time 1, after a certain period, at time 2, each worker has learned how to organize the production. As a consequence, at time 2 the firm can generate a surplus, equal to the difference between the money value of the firm's production and the market prices of the factors. However, under complete information, the market for labour should reflect the value of such a surplus. Indeed, if a worker was to depart from the firm, he could use his knowledge to setup a rival firm in the market.

This is particularly the case in modern high-tech industries, where innovative ideas can hardly be protected at the development stage, and where therefore companies' scientists, engineers and CEOs can at times find convenient to move

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to a rival firm or set independent ventures.[1] In fact, although formally companies are not completely vulnerable to the disclosure of their trade-secrets or their intellectual property rights, in reality Trade Secret Acts (like the Uniform TSA in US), corporate policies on trade secrets as well as postemployment restrictive covenants, such as non disclosure and non solicitation agreements, are often violated.[2] Moreover, when a key-employee sets up a new venture based on her organizational and market experience, companies do not really have grounds for a good lawsuit. It can be difficult to achieve evidence from which a court can infer that either customer lists, pricing and marketing plans or simply the company organizational style have been stolen.[3]

The idea that a worker can abandon the firm to setup a new venture dates back at least a few centuries. In a well known passage of the Wealth of Nations (1776), Adam Smith describes the causes of prosperity of new American colonies as a continuous process of transformation of initially subordinate workers into a group of independent producers (cf. [21]): "*The colonists carry out a knowledge of agriculture and of other useful arts . . .*"; "*Every colonist gets more land than he can possibly cultivate. . . He is eager, therefore, to collect labourers from all quarters, and to reward them with the most liberal wages. But those liberal wages, joined to the plenty and cheapness of the land, soon make those labourers leave him, in order to become landlords themselves, and to reward, with equal liberality, other labourers, who soon leave them for the same reason . . .*" (book IV, part II, chapter. VII).

The repeated and recursive process of formation of new production units appears as an important feature of a setup dealing with the issue of workers' effective outside option. Recently, there have mainly been two related issues which have attracted the attention of the economic literature. The first concerns the effects of the potential exit of the workers both on the level and distribution of earnings within the firm and on its internal organisation.[4] These contributions recognize in different ways the possibility that wages, hierarchies and contractual relations between the firm and the workers can be shaped by the potential competitive threat of employees' departure from the firm with relevant information. However, none of these works model explicitly the potential recursive effect of information transmission and new firms formation via the repeated workers' departure from their company. Moreover, the role of market demand for a given product is not the main focus of these works.

A second important recent stream of literature mainly look instead at the issue of internal competition within innovative firms and the threat of information leakage at the developing stage of an innovation, when there are no effective intellectual property rights protecting inventors.[5]

Again, the dynamic effect of increasing competition is usually not the main focus of these papers, with the exception of Anton and Yao [1] and Baccara and Razin [3]. Both these papers consider the threat of competition as a deterrence of information leakage and idea stealing. The first paper considers the problem of information leakage for an independent inventor sharing his project with a manufacturer. The inventor can protect his innovation and gain some rents by credibly threatening to reveal the idea to another competitor. However, the fact that the idea can also be stolen from the new competitor is not considered in the paper. In Baccara and Razin [3] the sequence of information spillover among agents is directly modelled through a sequential bargaining process between informed and uninformed agents. Even so, this paper does not deal explicitly with the interaction between market demand for the product, matching technology and the length of the time horizon.

Our paper proposes a very simple multi-stage game of knowledge transmission among agents across firms, via workers' mobility. Our setup assumes that initially only one agent possesses a new idea. However, to realize it commercially she needs to recruit at least another agent in the pool of existing agents, currently uninformed about the idea. This simple constraint is meant to capture the fact that usually for an inventor or a person with an innovative project it is extremely difficult to accomplish her project without the collaboration of people with different skills.[6] Even if there are no substantial setup costs to start the business, for the inventor the need to share the idea with another person does not come for free: once involved in the project and before the actual production takes place, previously uninformed workers becomes informed and potentially ready to start a new venture to develop commercially the idea, again in collaboration with another (uninformed) agent. This spillover effect—in absence of well established intellectual property rights on new

[1] The most well known cases of this occurrence are reported for the high-tech district of Silicon Valley, with its extremely high rate of turnover and spontaneous spin-offs of highly skilled personnel (see Carnoy et al. [6], Saxenian [19], Hyde [13], Gilson [12]).

[2] See, for instance, for a discussion about the problematic enforceability of trade secrets law, Cheung [7] and Fisk [11].

[3] See Levin et al. [14] for a legal analysis of trade secrets and Beser and Raskind [4] for the legal protection of property rights.

[4] See, among the others, Pakes and Nitzan [17], MacLeod and Malcomson [15], Mailath and Postlewaite [16], Stole and Zwiebel [22,23], Wolinsky [24], Rajan and Zingales [20] and Zabojnik [25].

[5] See, Arrow [2], Pakes and Nitzan [17], Feinstein and Stein [8], Anton and Yao [1], Cooper [9], Perotti [18] and Baccara and Razin [3].

[6] It is widely recognized that the commercial development of a new idea is usually a process which relies crucially on the interaction between many different individuals (see Callon [5], Dodgson [10] and Perotti [18]).