The Open Enterprise: Academic Entrepreneurship

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What does the term "Open Society" mean from the perspective of an entrepreneur or potential entrepreneur, especially one who comes from a science or technology background? Above all, it means that any person with a new idea and who is willing to put in the work required can contemplate starting a firm, the so-called "level playing field". This implies that regulations are transparent and do not favor those with connections to government or those who are willing to pay high fees or bribes. It also means that the intellectual property system needs to strike the right balance between an individual's right to exclude others from using his or her idea and an individual's right to build something new but where others' ideas are used as some of the inputs.

I would like to discuss two aspects of this topic today, necessarily briefly. The first is drawn from my experience as an academic entrepreneur and concerns the importance of low entry costs for an entrepreneurial culture. The second is the broader issue of the role of patents in academic technology transfer.

Perspectives from a very small Silicon Valley startup firm

Although I am now a university professor, at one time I was a computer programmer-entrepreneur, and I am still a partner in such a business. In 1979, I founded a small software firm to develop, market, and sell a niche product for econometric modeling and estimation: the product's origins lay in a simple program developed by graduate students over a period of years beginning in 1965 and widely distributed in source code for mainframe computers, mostly to researchers at universities. As an aside, one of our early users was Mario Draghi, now President of the Bank of Italy. The firm is now a partnership, and is operated in Palo Alto on a day to day basis by my partner, who joined the firm about six years after its creation.

To me as a successful firm founder, an open society is a marketplace where the rules of entry are clear and simple, and where entry into a legal business is as easy or easier than entry into an illegal business (this latter point is important in many countries). Consider the steps necessary to start a firm in California (note that you could be in business before doing any of these steps, under your own name and bank account):

1. Choose a firm name and register it as "doing business as" with the local city by publishing it in the newspaper for a few weeks (cost minimal). Name must be unique to city; it is helpful if it is unique to state
2. Obtain a certificate of sales tax exemption from the state (simple online application) that allows you to collect sales tax (like VAT) from end-customers but avoid it on intermeditate goods. The government simply mails you a small piece of paper with your ID number on it and add you to their mailing list for taxes.
3. Obtain a bank account under that name. This takes only a half an hour to an hour at a local bank. A minimal deposit ($100 or so) is required and can be done over the founder's signature with a driver's license.

That's it. As long as you have an address (which could be a residential or accommodation address), you have a business – you can sell anything that people will pay for (assuming it is a legal good), and you can deposit the payments in the bank and use them to buy materials and pay bills. It is possible to do the whole thing in less than a week. There is unlimited liability (depending on your personal insurance situation) but in many IT businesses that is not a real problem. The tax returns required are due once a year: 1) sales tax collected from customers; and 2) a schedule on the personal income tax return for self-employment income.

Two further steps are necessary for most businesses: convincing the bank to let you accept credit cards (this may take time until you build up a history of payment and reputation) and acquiring employees. The latter is of course the most time-consuming, but still relatively simple, at least until the firm starts to grow:

1. A new employee has to fill out two forms: one for tax witholding and one to establish his or her immigration status (visa, citizen, etc.)
2. The employer is free to hire by the hour for as many hours as they want, and the employee can accept or reject the offer as he chooses. He or she is also free to quit at any time. Obviously these non-fulltime jobs may be of a more temporary nature and may have more turnover.
3. One must obtain workman's compensation insurance in case of on-the-job injury, but there is a state-sponsored firm that supplies this to small firms. It costs about one per cent of gross pay per year, with a minimum charge of $200 (about 150 euros).
4. The government tax return requirements now become more onerous, with quarterly filings of the taxes witheld, unemployment and disability insurance with the state and the federal government. On top of gross wages, this may add about 10 per cent.

The flexibility of the employment contract is important for small firms, which may have fluctuating income streams and can be dependent on obtaining a few key employees – by being able to try people out, one occasionally comes across someone who is ideally suited for a larger role in the firm. The same argument applies to the employee. My current partner was originally a user, then a student consultant for the program at Harvard University, and finally was hired as a programmer. Another employee was at my firm for 5 years while she was a student (doing a range of the nontechnical aspects of the business – selling, shipping, marketing, ad design, etc.) , gaining valuable experience in an IT firm, and now has a management position in eBay.

Although my firm is small, the experience is not different from the accounts of the very early history of some very large firms in Silicon Valley (e.g., Yahoo, Google, Appe Computer). It is instructive to compare this to figures for the rest of the world, which has been done in a very useful set of papers by Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2002, 2003). They find that entry costs for a simple limited liability company that does not conduct foreign trade and is not subject to environmental regulation ranges from essentially zero per cent of GDP per capita in United States to 4.6 times GDP per capita in the Dominican Republic. The costs in

terms of entrepreneurial time ranges from 2 days in Canada to 152 days in Madagascar.

Figures 1 and 2 show the steps involved for France and New Zealand. The U.S. would be similar to New Zealand (3 days, 1.7% of GDP per capita) and Italy to France (53 days, 14% of annual GDP per capita). Although one can doubtless quibble with the necessity of or time allocated to individual steps in the process, the overall range of costs is impressively wide and small variations will not affect the conclusion that entry costs vary widely, even across developing countries.

Djankov et al. (2002) use these data to demonstrate that entry costs are negatively correlated with economic growth. Ciccone and Papaioannou (2006) find that entry in industries that experience global increases in demand occurs more quickly in countries with lower entry regulation.

Some myths about US tech transfer

In 1982, the U. S. Congress passed the Bayh-Dole act, which created a uniform policy across federal agencies towards ownership of patents on the results of federally-funded research, allowing universities to own the patents that resulted and removing some of the restrictions on licensing. This act is viewed in some quarters as the key to the success of the U.S. high technology industries and has therefore been emulated in other parts of the world. Closer examination of its consequences reveals a more nuanced view of the results.

Myth 1: Bayh-Dole caused an upsurge in patenting by US universities

The reality is that patenting by universities relative to the amount spent on research was already growing before Bayh-Dole (at a rate of about 4% per annum) -- there was no increase in the rate of growth (Figure 3). There was a slight increase in the rate of growth of university patenting as a share of all patenting (Figure 4). A second consequence is that the rate of growth of the share of universities with tech transfer offices increased after Bayh-Dole.

Myth 2: Tech transfer is an important source of income for universities in the US

Licenses do not cover the costs of most tech transfer offices and most patents earn little revenue (as is the case of patents in general). Offices of technology transfer are in fact a small piece of the industry-university relationship, although possibly growing in importance. The profits from the UC system OTT were 16 million dollars per year during the 1991-2003 period, whereas the one year industry contribution to UC research in 2003 was 235 million dollars (15 times as much).

Myth 3: Tech transfer via license is an essential way to transfer knowledge from university to industry

The reality, based on survey evidence, is that other methods such as publications, informal contacts, and conferences are much more important. The most important sources of knowledge for industrial R&D performers are the public R&D sources of information such as publications and meetings and conferences. Other important

sources are personal contacts and consulting, suggesing the importance of tacit knowledge transfer.

Myth 4: University research is essential to innovation in all sectors

The primary areas where university research was an important source of knowledge at the time of the Yale Survey in the mid-1980s were food, agriculture, wood and paper, drugs, and some electronics products (15 out of 50 sectors surveyed). At the time of the Carnegie-Mellon University survey of the mid-1990s, nonferrous metals and specialized industrial machinery were added to this group (see Table). Note that over half of university patenting is in the biomedical sector, which is a relatively narrow subset of technology.

The conclusion is that patenting and licensing by universities may be important for technology transfer in a very few sectors, notably the biomedial and ag-biotechnology sectors, but it is much less important in other sectors.

Figure 1
Startup Costs in New Zealand

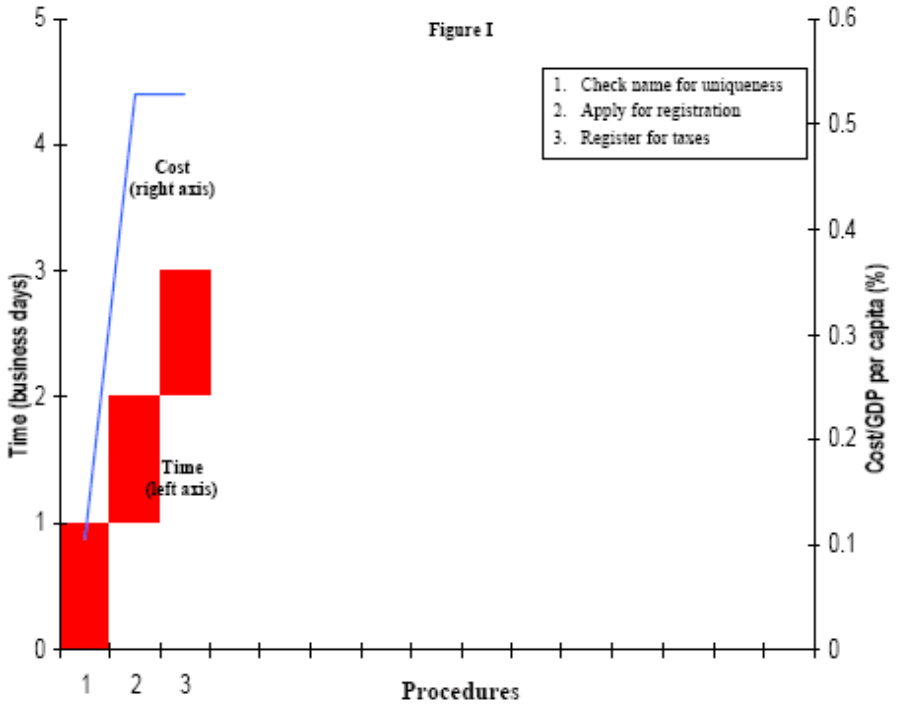
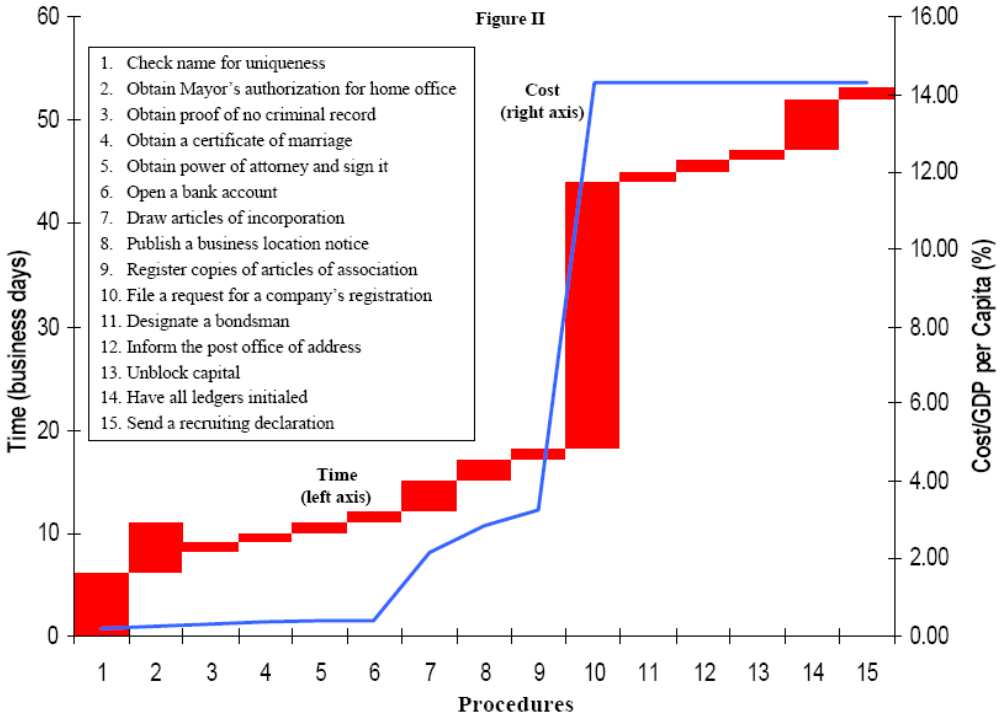


Figure 2
Startup Costs in France



Start up Procedures in France. Procedures are lined up sequentially on the horizontal axis and described in the text box. The time required to complete each procedure is described by the height of the bar and measured against the left scale.

Figure 3

US university patenting per R&D
(lagged one year, millions of constant dollars)

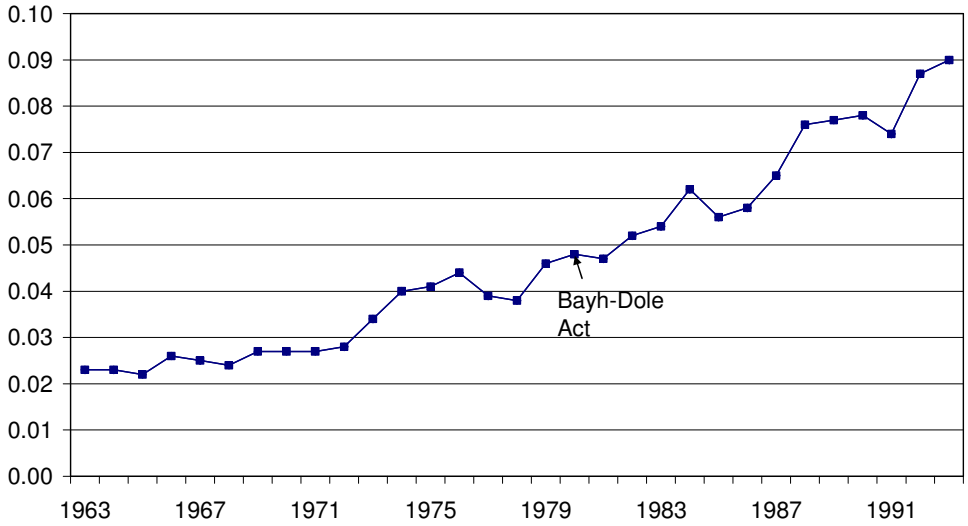
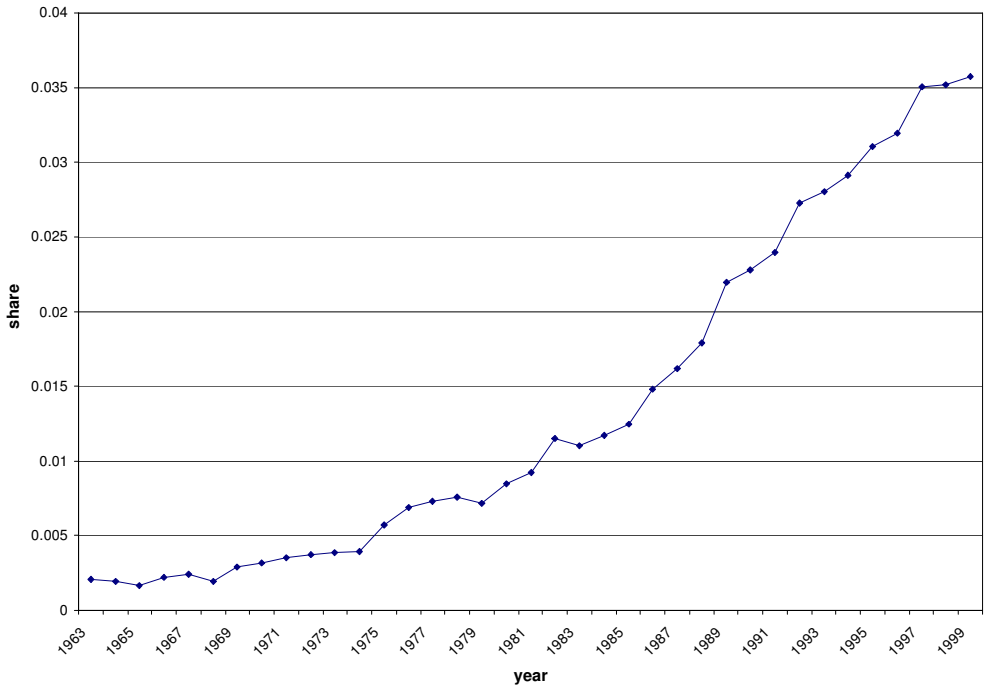


Figure 4

US research univ. patents % of all domestic-assignee US patents, 1963 - 99



Source: Mowery et al?

Table 1
Importance to industrial R&D of public R&D sources of information

Information source	**% of respondents rating source as important**
Publications	41.2
Informal contact	35.6
Meetings/conferences	35.1
Consulting	31.8
Contract research	20.9
Recent hires	19.6
Cooperative research	17.9
Patents	***17.5***
Licenses	***9.5***
Personnel exchange	5.8

Source?

Table 2
Industries rating university research as important to technical advance

Fluid milk & dairy products	Logging and sawmills
Canned specialties	Pulp, paper, and paperboard mills
Grain mill products	Millwork, veneer, & plywood
Animal feed	***Semiconductors & related devices***
Processed fruits and vegetables	***Engineering & scientific instruments, incl. optical***
Pesticides and agric chemicals	***Synthetic rubber***
Farm mach & equipment	***Drugs***

Sources: Yale (1987) and Carnegie-Mellon (2002) surveys of R&D in industry

References

Ciccone, A., and E. Papaioannou (2006). "Red Tape and Delayed Entry," CEPR Working Paper No. 5996.

Djankov, S., R. La Porta, F. Lopez-de-Silanes and A. Shleifer (2002). "The Regulation of Entry," *Quarterly Journal of Economics* CXVII (1).