Tech and the War for Talent

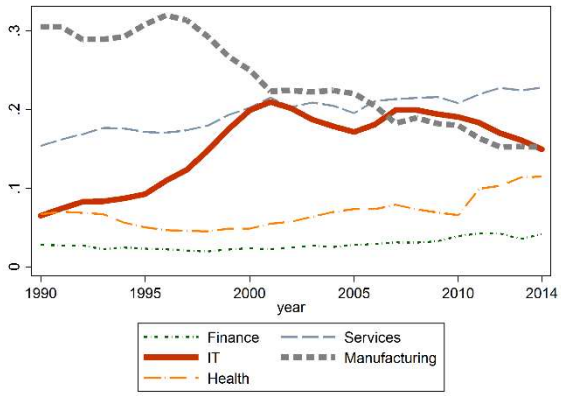
NBER Call for Research Proposals: Innovation Policy

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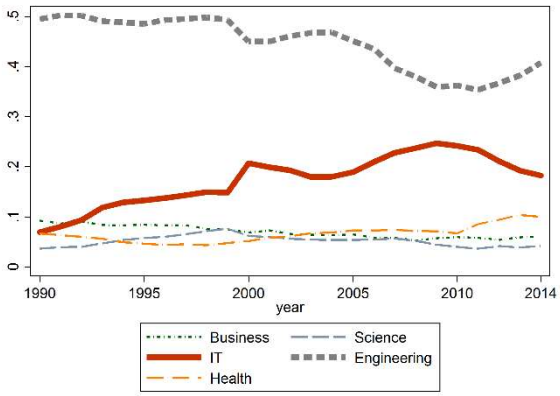
Motivation

Employment, earnings, and the GDP share of the information and communication technology (IT) industry has grown tremendously over the last decades. This has led to a debate about surging compensation and demand for talent in that sector, not only in Silicon Valley but also in other technology hubs in the US and Europe (The Economist, 2016a,b).

1a: Employment of Top-Talented Males



1b: Fields at University of Top-Talented Males



For Sweden, for instance, we see in Figure 1a that employment in IT of top talented (cognitive skill above the 95th percentile), 30 year old men has increased tremendously during the late 1990s and the dotcom boom (from about 8% in the early 1990s to about 20% from 2000 onwards). At the same time, manufacturing, which used to be the main sector for these smart males, lost half of its overall share of top talent. The trends in these two groups are mirror images of each other, not only in terms of sectors of employment but also in terms of the fields studied at university (Figure 1b). This suggests that to a substantial degree the same type of individuals are choosing either engineering/manufacturing or computer science and IT. Further analysis shows that, both, engineers and IT graduates, are strikingly skilled in the cognitive skill dimension but, conditionally, much less so on the non-cognitive / social skills dimension.

Analyses

The proposed project has two main parts. In the first part, we intend to characterize the types of workers who enter the IT sector, including their demographics, skills, education, and occupations as well as their earnings, career progression (including technological entrepreneurship), and innovative activity once they are in the sector. Thereby we document the exceptionality of the IT sector, in particular in terms of its rise in size over time and the degree of cognitive talent it absorbs.

While these will be mostly novel and interesting facts by themselves, the second part of the project goes an important step further and aims to study the "effect" of the rise in IT on individual as well as economy-wide outcomes. Specifically, we are interested how the rise of the IT sector has affected the manufacturing sector and its innovativeness.

Computer science/engineering and IT/manufacturing appear to be close substitutes for high cognitive ability individuals (see Figures 1a and 1b). Moreover, we know from Aghion et al. (2017) and Bell et

al. (2017) that education and high-cognitive abilities are key inputs in the innovation production process. We will make use of university application data to quantify the amounts (and importance) of patents that are lost in sectors such as manufacturing due to the rise and the resulting allocation of talent into IT. The heterogeneity of the effects in this estimation are also interesting, because, for example, high cognitive versus non-cognitive skills may on the margin be differentially productive in different fields/sectors.

Moreover, we plan to examine the consequences of the boom and bust cycles of the IT sector as apparent in Figures 1a and 1b. In particular, during the build-up of the dotcom bubble many (high-talented) workers joined the IT sector and founded technology firms. After 2001, these individuals' career dynamics and the success of their firms may look very different from individuals who went to "more solid" sectors (e.g., manufacturing) and compared to individuals who made their career choices after the bust.

The findings from these settings should also be relevant for individuals and for policy makers going forward. First, there exists a renewed boom of IT and technology entrepreneurship today, with many ambitious students trying to work in these areas. However, it is not clear how large the individual as well as the societal payoff to these activities are at this moment and what would happen if another IT crisis came along. Second, the payoffs from studying IT versus other subjects are potentially very different by individual characteristics. For example, it is known that high cognitive ability matters for patenting, but it may be very important to also have good non-cognitive skills to really succeed in IT or when founding and growing a technology firm. In the end, there may, for example, be a lot of scope for university admissions to improve outcomes by adjusting the marginal acceptance into the different study fields.

Data and Methodology

The first part is mostly descriptive and will make use of the rich Swedish administrative data, including firm founding and performance information. Moreover, we exploit detailed information on cognitive and non-cognitive skills as well as school grade information (see Böhm et al. 2018) which is not available in most other countries. The second part will combine new (to be collected) data of inventors with application data to Swedish university programs and grades from high-school. Given that the number of seats are limited within a program and the selection is mostly based on high-school grades, we can compare students who just made it into the program (e.g., IT) with students who just ended up below the threshold and went to a different program (engineering). In other words, we plan to apply a regression discontinuity design (RDD) along the lines of Kirkeboen et al (2016), which will help us to estimate the causal effect of certain university programs on innovation, entrepreneurial activities, and labor outcomes.

Budget

The budget consists of items related to collecting and processing of new and unique data (about 15,000 USD) as well as traveling (bimonthly research visits of the project team, about 5,000 USD). In order to measure innovation we will use patent data from the European Patent Office. We have already matched the patent data to firm identifiers. However, in a second step, we will need to match information on the identity of inventors with Swedish registry data on employees and entrepreneurs. The matching will require some confidential data that is not directly accessible to us (it is managed by Statistic Sweden). We would like to hire a research assistant who will develop and test a matching algorithm based on inventor name, her work place and home address (if available) which is then implemented by Statistics Sweden. Statistic Sweden is charging for this implementation and the hosting of the data.

References

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