Envision: Blueprint of Chinese Semiconductor Industry Analysis of Intellectual and Financial Investment

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Introduction

As part of the ambitious "Made in China 2025" blueprint, Chinese officials have set the semiconductor industry a goal of reaching US$305 billion in output by 2030 and meeting 80% of domestic demand. Aimed high, the Chinese semiconductor industry seems frustrating as for its development despite the government's support. As most commonly known, talents and capital resources are the fundamental drivers for the development of the tech-intensive industry. Guided by this concern, our research focuses on the two most important factors determining the prospect of this industry—intellectual training and financial investment. Our project aims to provide deep insights into the current bottlenecks and advise on future development to help achieve the long-term sustainable thriving of the Chinese semiconductor industry.

Methodology

We evaluated semiconductor industry's talent fostering system from the following several perspectives:

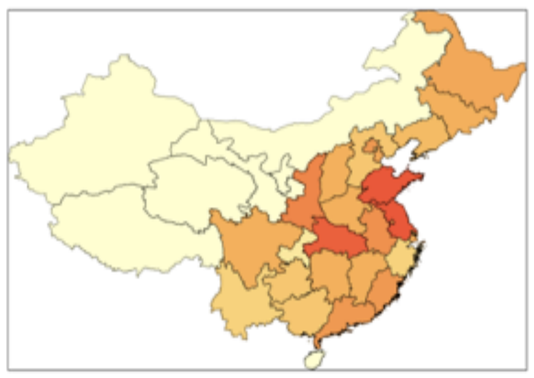
1. Distribution of majors among Universities
2. Geographic feature of the major distribution
3. Faculty resources for semiconductor-related majors in Chinese top universities
4. Employment situation among Chinese semiconductor-related majors.

We evaluated the dynamics of the capital market for semiconductor companies from the following perspectives:

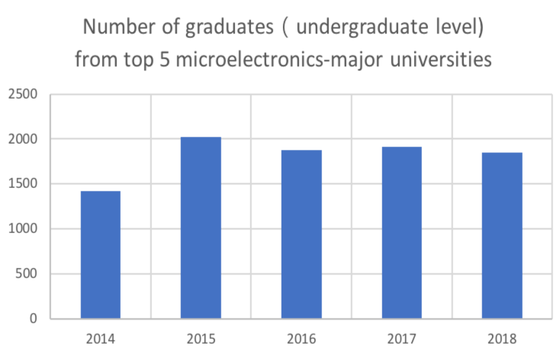
1. Identified institutional investors and financial support led by the government
2. Balance Sheet analysis of selected publicly listed semiconductor companies and evaluation of credit market funding difficulties
3. Listing trend for semiconductor companies
4. Regression analysis— key financial figures that attract fund investments

Our Findings

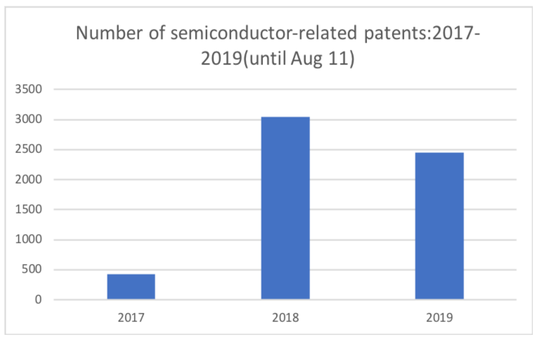
Intellectual Investment —— Supply-side Investigation:

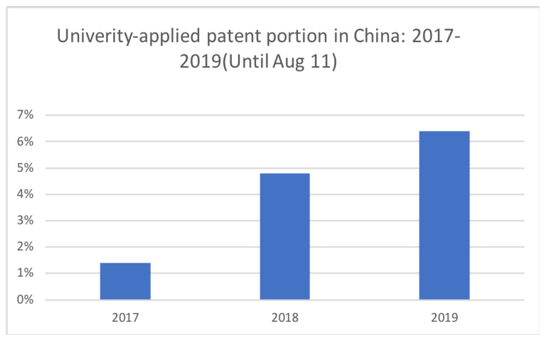


Geographical distribution and time series analysis on the semiconductor-related majors in China



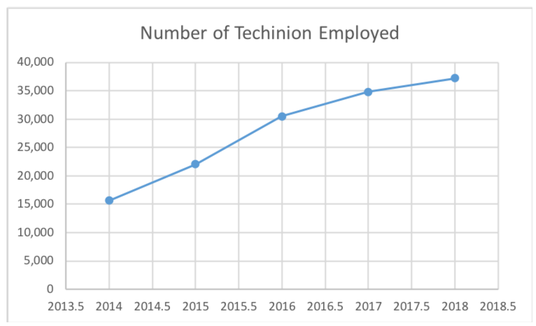
Total number of graduates from microelectronics majors from the sampled 5 universities over 2014-2018



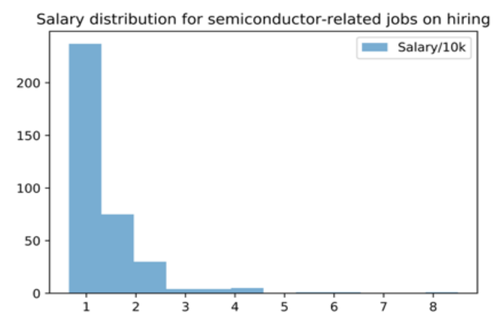


From the 5929 samples that fully attained from semiconductor patent database from 2017 to 2019, we see a surge in the published patent from 2017 to 2018. It's noticeable that we are using the data for the release of the patent, of which the application date would be one or two years earlier than this. This means that the surge for the patent application happens around 2015 to 2016, right after the publication of the government document "Made in China 2025".

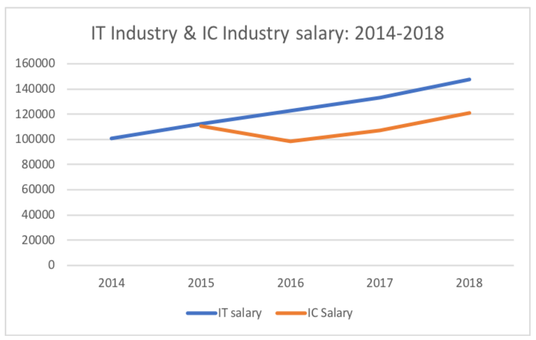
Intellectual Investment —— Demand-side Investigation:

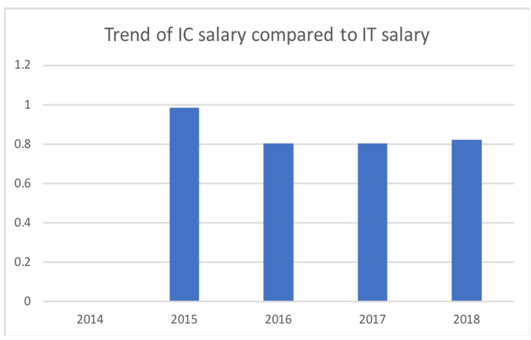


Time-series trend on major semiconductor companies' technician employment



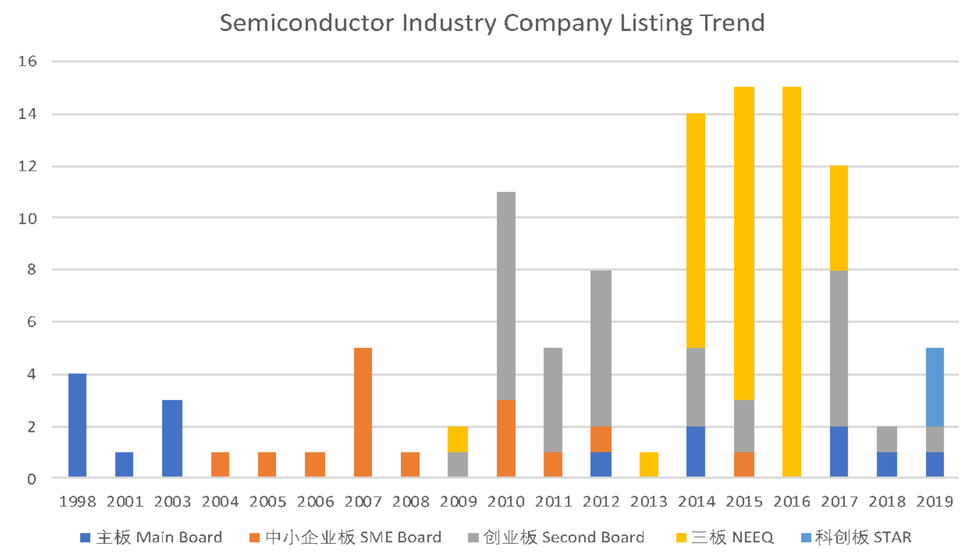
Salary distribution of semiconductor-related jobs on hiring posts from 51job website





Relative attractiveness of the semiconductor industry against the IT industry over 2015-2018

Financial Investment:



In general, there is a clear trend for companies to be listed in accordance with favorable market conditions and policy support. The SME Board was launched in 2004, ChiNext was launched in 2009, NEEQ was reformed at the end of 2013, and the STAR market was launched in 2019. Each of these events was followed with significant new semiconductor IPOs, positively responding to favorable policies and market conditions.

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. ovtest

Ramsey RESET test using powers of the fitted values of ïfundportion
       Ho:  model has no omitted variables
                  F(3, 55) =      2.30
                  Prob > F =      0.0874

Robust regression                                 Number of obs     =         59
                                                  F(  1,        57) =      22.88
                                                  Prob > F          =     0.0000

------------------------------------------------------------------------------
ïfundportion |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
remarketvalue|  -15613.05   3264.025    -4.78   0.000    -22149.15   -9076.955
       _cons |   6.011794   .8108736     7.41   0.000     4.388047    7.63554
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Regression analysis: percentage of stock shares held by investment funds as a function of company's market capitalization

Large companies are preferred by investment funds over small and medium companies in the semiconductor industry. This finding is also consistent with our previous discussions on state-owned investment vehicles dedicatedly supporting big national champions. A larger company may have a more versatile research team. Considering the high fixed costs for R&D in this industry, a large company is able to extend the research further than what the budget of a small company allows. Small and medium companies may still face difficulties in attracting fund investments for financing.

Conclusion

- Majors are generally set up broadly but with trend of being more focused.
- Majors display geographic density discrepancies and present industrial oriented features.
- The exercise of combination of industry and teaching is still weak in Chinese universities but has trend of improvising in recent years.
- An increase in the industrial conversion rate is detected for university graduates, and it is due to the increased education quality in universities, as revealed by our research.
- The industry's financing depends highly on government support and company listing accords closely with the introduction of stock market policies.
- A company's market capitalization proves to be the only statistically significant factor for the percentage of its stock shares held by investment funds.