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The Fleeting Possibility of Merging the World's Largest Chip Manufacturer in 2017: The Pain of Chinese Chip Industry

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ABSTRACT

This article examines a possible Chinese semiconductor industry's merger and acquisition in 2017, the year before the Sino-US trade war and US high-tech sanctions against China. The feasibility of a merger between Tsinghua Unigroup and Taiwan Semiconductor Manufacturing Company is thoroughly examined as well as their development history and the current financial standing. The financial data collected form the two companies' annual report was analyzed using multiple corporate valuating models. We discovered that the industrial policy and financial reports in 2017 favored the merger, but the combination ultimately collapsed, which was quite a pity for Chinese chip sector. The research contributes to an in-depth comprehension of China's semiconductor business and serves as a model for future financial analyses of comparable sectors.

INTRODUCTION

With the US's August 2022 ban on exporting EDA software to China, the path to technologically advancing China's high-end chip production has been obstructed once again. Since 2018, the United States has levied penalties on China in the high-tech sector, particularly in the semiconductor industry. In April 2018, when the Sino-US trade war began, the Chinese high-tech corporation ZTE was added to the sanctions list. The announcement that Huawei was set to be sanctioned was made afterwards. During this period, China grasped the significance of independent research and development in the chip industry, and progressively boosted its investment in this sector. However, it is impossible for a single nation to overcome all restrictions and technologies. The patent hurdles and long-term technological reserves constructed by the United States and its allies have made it exceedingly difficult for China to advance. Tsinghua Unigroup's potential acquisition of TSMC emerged as a hot subject in Chinese society as early as 2017, when the trade war started. At that time, China's capital market was red-hot, and Tsinghua Unigroup's aspirations rose swiftly following many large-scale mergers and acquisitions while TSMC's R&D experienced challenges, and the company's financial status has varied, the relative power disparity is at its narrowest.

In truth, Unigroup did suggest a proposal to purchase TSMC, but it was unsuccessful for a variety of complex reasons. Later experts largely held the opinion that Tsinghua Unigroup's acquisition strategy at the time was little more than a catchphrase intended to boost the stock price, but the Chinese semiconductor sector will always rue this botched purchase since the United States blocked the advancement of China's semiconductor technology only one year later. TSMC's condition also got better at the same time, overtaking Samsung and slowly growing to become the biggest chip manufacturer in the world. Tsinghua Unigroup also experienced bankruptcy as a result of bad management in the latter years, which is something that makes one groan. Although history cannot be assumed, it may be examined. This essay will go back to 2017 in an effort to assess the likelihood and viability of Tsinghua Unigroup acquiring TSMC at that time, as well as to understand the highs and lows and mistakes made in the past by China's chip sector. Readers will better grasp the particular M&A data and financial analysis by understanding the analysis of this paper's study of the two firms' financial standing.

LITERATURE REVIEW

Many East Asian nations and regions, including South Korea, Japan, Singapore, and Taiwan, have implemented aggressive industrial policies and pursued export-oriented strategies since the 1970s. These economies' ability to catch up is dependent on their quick understanding of the sophisticated Western underpinnings after initially copying them (Hobday, 1998; Mathews & Cho, 1999; Edgington & Hayter, 2000). One industrial park after another has been built in these nations, amassing manpower, money, technology, and management from labor-intensive sectors as they move toward capital- and knowledge-intensive ones. The success of this agglomeration economy is discussed by McCann and Arita (2006), who also explain the function of economic industrial parks in late-developing nations. The Taiwanese government has effectively built a chip manufacturing industry chain by combining R&D, design, and production using reverse engineering models. Knowledge transfer from a multinational corporation's parent business to its subsidiary has a significant positive impact

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on the local economy and technology (Minbaeva et al. 2003). According to Baum and Ingram (1998), companies that are adept at transferring information from one unit within a company to another are more productive than those that do not. The movement of engineers between businesses may help knowledge transfer and innovation in the US semiconductor sector, according to Almeida and Kogut (1999). This phase of knowledge-based economic transfer has benefited the East Asian model's use of this very effective organization. Although there are significant country variances, multinational firms and their local affiliates play a significant part in these strategies. In this sense, the experiences of Korea and Taiwan are particularly instructive (Biggart, 1996; Poon et al., 2006). The government of Taiwan adopted a strategy to support and stimulate the chip manufacturing sector at the right moment. The representative one is TSMC.

At the outset of its existence, TSMC ignored the highly competitive chip R&D and design fields and instead concentrated on production (Tsai & Cheng, 2006; Chang, 2011). It preserves limited money to invest in the most vital sectors, while avoiding competition with its own upstream and downstream clients. The success of latecomers hinges on their ability to modify the demand for and usage of costly capital equipment in sophisticated ways in response to market volatility and fluctuating customer requirements (Winston, 1974; Chien et al., 2009). Scholars have determined that this is TSMC's greatest edge against Samsung of South Korea. Because TSMC would not compete with them for business, Samsung's US partners are compelled to move certain orders to TSMC. TSMC's rise demonstrates the role of latecomers as creative local players (Hsu, 2012), replacing the original dominance of MNCs in Taiwan and moving the nation's operations away from low-cost production of standardized electronics, transitioning to value-added manufacturing based on R&D (Wu et al., 2006; Lee & Pecht, 2020).

Heikal et al. (2014) evaluated Indonesian stocks using return on assets (ROA), return on equity (ROE), net profit margin (NPM), debt to equity ratio (DER), and current ratio (CR) as Exchange and Profit Growth indicators. Kothari and Ball (1994) identified Growth, Profitability, Turnover, and Financial Leverage as the four most essential performance indicators for a business. Ozkan (2000) investigated the influence of debt structure on corporate operations and decision-making and his research supported us to use TSMC as a study model. Martin and Scott (1974) also examined the impact of debt-equity structure and leverage use on business decision-making. Jaggi and Gul (1999) demonstrated that cash flow and business size would influence investment decisions and preferences differently when firms confront debt. The research of Newberry and Novack (1999) demonstrated the effect of government taxes on company debt maturity and business behavior; hence, we infer the potential positive effect of China's tax relief policy on UNIS and TSMC M&A.

METHODOLOGY

The data in this article are obtained from Tsinghua Unigroup and TSMC's public information releases, including annual reports of publicly traded firms, all data are provided in excel and compared as categorical data. By logging on to the websites of these two companies, we search for the financial information of the concepts of the two companies, and aggregate and compare the information provided by "East Money Information" and "Guotai Junan Securities" (securities trading software). The information comes from several sources, thus it is trustworthy. The process of gathering information is distributed across the team members; after collecting the classified material, we summarize and sanitize all the information, removing any blatantly incorrect content. Multiple financial indicators, such as Return on Equity (ROE), Profit Margin on Sales, Debt to Asset Ratio are utilized for data analysis. Measuring the cash flow, liabilities, and future profitability of a firm is a complicated endeavor, and it is impossible to utilize a single quantitative measure. For thorough analysis, it must be coupled with several indicators. In order to provide a thorough view of UNIS's financial standing at the time of the impending purchase, we present several computations in the "VALUATION" section. These indicators are also helpful for subsequent scholars.

Taiwan Semiconductor Manufacturing Company

Taiwan Semiconductor Manufacturing Company, often known as TSMC, was formed in 1987 in Hsinchu Science Park, Taiwan, China (the republic of). In 1987, Morris Chang founded the world's first and largest professional integrated circuit manufacturing provider (Wafer foundry) (Perry, 2011). At the time, semiconductor firms worldwide (including Intel, Samsung, and other heavyweights) all followed the same business model: to develop their own chips, manufacture them in their own fabs, and do chip testing and packaging on their own. As a result, Morris Chang saw a tremendous economic opportunity: creating the model of manufacturing. His company does not make its own goods, but rather produces things for semiconductor design firms. After its founding, his factory continued to expand and progressively increased its portion of the global market. TSMC was the first wafer foundry firm to join the semiconductor industry's top 10 in 2002 (the others are design giants). Despite being a foundry, TSMC contributes significantly to the innovation of the whole semiconductor industry (Ip, 2008). In addition to advancing the technology level, it establishes standardized methods and diverse platforms to assist several IC design firms in Taiwan, utilizing part of its own power to assist Taiwan's whole semiconductor industry (Chao, 2012).

In 2015, TSMC's market share was 54.8%, which was much higher than GlobalFoudaries' 9.6% and UMC's 9.0%. It was worth 4.79 trillion New Taiwan dollars (160 billion dollars). In addition, it utilized 3% of Taiwan's total electricity and generated 3.8% of Taiwan's GDP and

6.8% of its total export value. In 2016, TSMC's sales was 947.938 billion New Taiwan dollars, and its net profit was 334.38 billion, although the earnings of all 39 Taiwanese banks combined did not exceed 300 billion New Taiwan dollars (1 US dollar = 30 New Taiwan dollars). On March 20, 2017, TSMC surpassed Intel in market value and ultimately becomes the largest semiconductor manufacturer in the world. TSMC stated in 2016 that it had inked an investment agreement with the Nanjing Municipal Government and will spend $3 billion to create TSMC (Nanjing) Co., Ltd. in Nanjing, China. It would have a 12/14/16-inch fabrication facility and a design center. In 2018, manufacturing began at TSMC in Nanjing. TSMC's 14/16-nanometer wafers presently account for more than fifty percent of the global 14/16-nanometer wafer market. It is anticipated that TSMC's market share in the 14/16-nanometer sector would continue to rise as a result of the Nanjing facility as that time.

Table 1: Top Semiconductor Revenue and Market Share from 2017 to 2021 (Unit: Billion U.S. Dollars). In 2020, those four companies: Powerchip, Specialty IC, H-Grace, Dongbu HiTek has been dropped out of the Top-ten list. Source: Rimol, M. (2021)

Rank	Company	2017 Revenue	2017 Share (%)	...	2020 Revenue	2020 Share (%)	2020 Revenue	2021 Share
1	TSMC	32040	55.9	...	45562	59.7	56674	56.6
2	GFoudaries	5407	9.4	...	4850	6.4	6585	6.6
3	UMC	4898	8.5	...	6009	7.9	7606	7.6
4	Samsung	4398	7.7	...	5150	6.8	8537	8.5
5	SMIC	3099	5.4	...	3907	5.1	5443	5.4
6	Tower-Semi	1388	2.4	...	1266	1.7	1508	1.5
7	Powerchip	1035	1.8	...	-	-	-	-
8	Specialty IC	817	1.4	...	-	-	-	-
9	H-Grace	807	1.4	...	-	-	-	-
10	Dongbu HiTek	676	1.2	...	-	-	-	-

SWOT Analysis of TSMC

Next, we do a SWOT analysis of TSMC and UNIS Group, respectively, in order to determine their relative strengths, weaknesses, opportunities, and threats.

Table 2: SWOT Analysis of TSMC

Strengths	**Weaknesses**
Excellent production efficacy	Low R & D expenditures
Excellent revenue scenario	Senior employee departure
Superior manufacturing technology	Reduction in profitability
Opportunities	**Threats**
Artificial intelligence development	The growth of more Chinese manufacturers
Large market demand in China	Wafer design homogenization
US embargo on China	The global economy confronts new obstacles

Strengths: 1. Excellent production efficacy. Wafer industry success is contingent upon the manufacturing cycle (Tung, 2001). The most modern 3nm mobile phone chip features an 180-layer internal structure, making it is a highly difficult procedure. The factory management system at TSMC can compute the optimal production layout in one minute. The on-time delivery percentage is 99.5%, and the duration of the manufacturing cycle is 1.2 days. 2. Excellent revenue scenario. In recent years, TSMC's operational revenue has continued to increase. And the rise is considerably greater than its two rivals. 3. Superior manufacturing technology. The "Most Powerful and Smartest" iPhone bionic processor, the A11 chip, includes 4.3 billion transistors and 6 CPU cores, including 4 tiny cores and 2 small cores. Even though it was separately designed by Apple, only TSMC can manufacture it on a global scale. Qualcomm is aggressively developing a new generation of Snapdragon 855, which can only be made by TSMC using a 7-nanometer manufacturing technology. Weaknesses: 1. Low R & D expenditures. Compared to comparable firms, TSMC has less R&D spending and a lower R&D investment-to-revenue ratio (Chen et al., 2019). This may result in TSMC's future development failing. 2. Senior employee departure. High-level TSMC executives, including Jiang Shangyi, Cai Lixing, and Liang Mengsong, left the company to work for mainland Chinese manufacturers. Xu Guojin went to another US-based organization. Not only does the recent loss of executives have a significant impact on TSMC's routine operations, but it also promotes the technical growth of its rivals and diminishes TSMC's competitiveness. 3. Reduction in profitability. In April of 2018, TSMC released their financial report for the first quarter of the year. Compared to the previous quarter, TSMC's revenue decreased 8.2%, net profit decreased 9.6%, and wafer shipments were unchanged. The slow fall in TSMC's profitability may be attributed to the sluggish global growth in smartphone sales. This demonstrates that TSMC is significantly impacted by the global economic climate.

Opportunities: 1. Artificial intelligence development. The smart medical and artificial intelligence industries are thriving, and the need for high-level processors will expand substantially. In the near future, there will be a

Table 3: Top Semiconductor R&D Spender in 2016 and 2017. Source: IC Insight's Strategic Review Database.

2016	Company	2016 R&D Spending (million $)	2016 R&D/ Sales (%)	2017 R&D Spending (million $)	2017 R&D/Sales (%)
1	Intel	12740	22.4	13098	21.2
2	Qualcomm	5109	33.1	3450	20.2
3	Broadcomm	3188	20.5	3423	19.2
4	Samsung	2881	6.5	3415	5.2
5	Toshiba	2777	27.6	2670	20.0
6	TSMC	2215	7.5	2656	8.3
7	Media Tek	1730	20.2	1881	24.0
8	Micron	1681	11.1	1802	7.5
9	Nvidia	1560	16.4	1797	19.1
10	SK Hynix	1514	10.1	1792	6.5

high demand for chips in linked industries, and as the leading chip manufacturer, TSMC stands to generate a substantial profit. 2. Large market demand in China. In 2017, the import value of ICs in China was $227.02 billion US dollars, while the import value of oil was $116.45 billion US dollars; therefore, the import value of ICs has almost twice that of oil, while the demand for ICs in China continues to increase at a pace of 20% each year. Taiwan's tight business ties with mainland China present an excellent opportunity to capitalize on the massive market. 3. US embargo on China. The United States prohibits U.S. businesses from selling information technology equipment to ZTE (a Chinese telecom company), causing a severe crisis in the Chinese high-tech sector and causing some Chinese enterprises to move their orders to TSMC.

Threats: 1. The growth of more Chinese manufacturers. Chinese enterprises like as Huawei, ZTE, and HiSilicon have achieved considerable strides in R&D and chip design as the IC and chip design sector in China grows fast. The sales volume of the Chinese integrated circuit industry increased by 23.5% in 2017 to 535.52 billion yuan, while the design, manufacturing, and packaging tests increased by 24.7%, 29.1%, and 18.8%, respectively. 2.Wafer design homogenization. With official backing, the outputs of foundries in China and other nations continue to rise, putting significant pressure on TSMC's profit margin. Emerging firms will exert considerably more effort in the research and development of new kinds of chips, thus TSMC confronts intense competition in both old and new industries. 3. The global economy confronts new obstacles. As the pandemic persists and the global supply chain continues to be stressed, global commerce and industry face growing uncertainty: the world's major economies are facing economic risk, China's deleveraging task is arduous, the US stock market is in a false prosperity, the cloud of trade war does not dissipate, and Europe and Japan have sluggish growth.

UNIS Group

Before 1980, China's IC industry was all but nonexistent (Chen, 2020). China contributed less than 1% of all IC production in the globe in 1996. But the strength of the country's burgeoning electronics industry being a major exporter promises a ready market for any acceptable IC that Chinese wafer fabrication factories can provide (Hauge, 2019). Global corporations including Motorola, NEC, Mitsubishi, STMicroelectronics, Philips, Siemens, and Toshiba are assisting this emerging semiconductor sector. These businesses are constructing wafer fabs, spending money, transferring technology, and establishing joint ventures with Chinese partners. China's IC output is unable to satisfy local demand despite fast increases in production capacity and technical advancement. In the 2000s, two-thirds to four-fifths of China's required ICs came from imports. In order to lessen its reliance on foreign integrated circuit goods, the Chinese government is actively increasing domestic manufacture of integrated circuits. Chinese chips still depend significantly on imports as of 2021, however. China imported 635.48 billion chips in total in 2021, a 16.9% rise from the previous year. The historical backdrops of Japan, South Korea, and China's transfer of semiconductor industrial chains are analogous, allowing for the promotion of the industry with strong government support. Benefiting from the two fundamental trends of localization and the third transfer of the semiconductor industry, China's chip localization sector has huge potential in the localization of low-end semiconductor goods, while high-end products must be further developed and improved.

Tsinghua Unisplendour, also known as UNIS, was founded in 1999. It is currently an A-shares listed technology company specializing in electronics and information technology. It is also the first university-owned company of Tsinghua University, and it works to promote the industrialization of scientific and technological achievements (Cai et al., 2015). Initially, it was a high-tech business that focused mostly on software development. Compared to TMSC, UNIS entered the semiconductor market much later, but it has become a rising force and is expanding rapidly. After 2009, when Zhao Weiguo became CEO of Unisplendour, the company entered the semiconductor market; however, it was later revealed that Zhao's primary business income was derived from the expansion of the real estate industry (Zhang & Lan, 2022); since then, Unisplendour has grown incredibly quickly in this industry by acquiring numerous other corporations. In June 2013, UNIS acquired Spreadtrum Communications, which was ranked first in China and third in the world in the field of mobile communication baseband chip design. The following year, UNIS acquired

RDA Microelectronics, which was ranked second in the field. These two acquisitions helped UNIS consolidate its leading position in the field of mobile communication chips design. In 2017, UNIS became the No.10 Fabless company in the world and the No.2 Fabless business in China. Unlike TSMC, UNIS employs a fabless model, meaning that it concentrates primarily on its design capabilities and does not manufacture its own products. In December 2015, UNIS spent $11.1 billion and $2.3 billion, respectively, to buy powertech and ChipMOS, both of which are well-known chip manufacturing businesses.

Table 4: The Top Fabless IC Companies in from 2017 to 2021 (million dollars). Source: IC Insight's Strategic Review Database.

Rank	Company	2017 Revenue	2017 Share (%)	2020 Revenue	2020 Share (%)	2020 Revenue	2021 Share
1	TSMC	32040	55.9	45562	59.7	56674	56.6
2	GFoudaries	5407	9.4	4850	6.4	6585	6.6
3	UMC	4898	8.5	6009	7.9	7606	7.6
4	Samsung	4398	7.7	5150	6.8	8537	8.5
5	SMIC	3099	5.4	3907	5.1	5443	5.4
6	Tower-Semi	1388	2.4	1266	1.7	1508	1.5
7	Powerchip	1035	1.8	-	-	-	-
8	Specialty IC	817	1.4	-	-	-	-
9	H-Grace	807	1.4	-	-	-	-
10	Dongbu HiTek	676	1.2	-	-	-	-

SWOT Analysis of UNIS

Table 5: SWOT Analysis of UNIS

Strengths	**Weaknesses**
Abundant financial resources Good brand reputation Talent advantage	Insufficient availability of top-tier talent Poor income performance
Opportunities	**Threats**
National policy backing US trade war against China Large market demand	Inadequate in the primary sectors Global macroeconomic environment changes

Strengths: 1. Abundant financial resources. As a state-owned enterprise, UNIS receives substantial support from the Chinese government. It maintains close relationships with numerous banks in China, such as ICBC and China merchants bank, and has more than 10 million yuan in outstanding loans at these banks, allowing it to support its operations with ample funds. 2. Good brand reputation. Since 1998, UNIS has received more than 70 national awards and has become one of the national important businesses and top 100 high-tech firms in China; therefore, these honors have given UNIS a solid reputation, and clients will have a greater degree of confidence in the company. 3. Talent advantage. Tsinghua University is the origin of UNIS and offers the talent pool and technical resources necessary for UNIS to achieve strong and sustainable growth.

Weaknesses: 1. Even though UNIS has access to Tsinghua University's talent pool, it lacks elite talent. On the one hand, the domestic foundation of the high-tech electronic information industry is still relatively weak; on the other hand, the talents prefer jobs in the financial sector or Internet industry due to their high rate of return. The high risk and low return of research and development jobs are insufficient to attract sufficient talent. 2. Poor income performance. The company's performance in 2016 reduced by 15.92% when a favorable tax policy is subtracted. In the first three quarters of 2017, the company's net income decreased by 21.49 percent compared to the same period in 2016 due to the fact that it cannot generate money in this business.

Opportunities: 1. National policy backing. With the vigorous push of national strategic deployments such as "Made in China 2025," "Network Power," and "Internet Plus," China's electronic information industry is accelerating the rate of transformation and upgrading, and the digital economy has become increasingly important to economic growth, thereby creating tremendous opportunities for the development of UNIS ' chip industry. 2. Sanctions imposed by the United States on China's high-tech sector led the Chinese to recognize the significance of independent research and development and to reach a consensus on investing in chip production. 3. Large market demand. This has been discussed earlier, therefore I will not expand.

Threats: 1. Inadequate in the primary sectors. China is still a latecomer to this market (Ernst et al., 2014), and its enterprises are still largely focused in areas with low added value and low technical content, such as manufacturing and packaging. In 2016, the share of the self-design industry in China was only 37.9%, and the sector as a whole is through a change, so it will take time to catch up to the advanced nations. 2. Changes in macroeconomic environment in the globe. Currently, the global economy is recovering, China's economy

is growing steadily, and the merger of the digital and conventional economies has provided UNIS with a wide market area. However, if there is a shift in the domestic and international macroeconomic climate, the decline in digital construction investment may have an effect on the company's operations.

Porter's Five Forces Analysis

Then, we use Porter's five forces model to evaluate the overall degree of competitiveness in the semiconductor business, in terms of "Threat of New Entrants, Threats of Substitutes, Bargaining Power of Customers, Bargaining Power of Suppliers, and Intensity of Competitive Rivalry."

Table 6: Porter's Five Forces Analysis

Threat of New Entrants	**Bargaining Power of Customers**
1. Less capital is required to launch the firm. 2. There are little economies of scale in place. 3. Customers may switch simply (low switching cost). 4. Critical technology is not difficult to get or is not well safeguarded. 5. Product is not differentiated.	1. Purchasing in bulk or controlling several access points to the ultimate consumer. 2. Few purchasers exist. 3. The cost to switch to a different provider is modest. 4. They threaten to backward integrate. 5. There are several alternatives. 6. Buyers are attentive to pricing.
Threats of Substitutes	**Bargaining Power of Suppliers**
1. There are other alternatives accessible. 2. Customers may locate your goods at lower prices elsewhere. 3. The product of the competition is of higher quality. 4. By producing a substitute product, a corporation with large profits may cut prices to the absolute minimum.	1. There are few significant suppliers. 2. They provide a rare resource. 3. It is expensive to move to a different provider. 4. Customers are hesitant to switch since the product is easily distinguishable. 5. The supplier may risk vertical integration. 6. There are no or few accessible alternatives.
Intensity of Competitive Rivalry	
1. When there is a clear market leader, there are fewer rivals of comparable size or size. 2. Customers have little switching expenses. 3. The sector is expanding. 4. Exit obstacles are strong, so competitors remain and compete. 5. High fixed costs result in massive output and price reductions	

The Possibility and Benefit of Unis to Merge Tsmc

If the merger between Tsinghua Unisplendour and TSMC occurs, it would significantly alter the global chip manufacturing environment. The combined company will become a global leader in chip production, wafer polishing, and R&D. This article will examine the effects of the merger between Tsinghua Unisplendour and TSMC in terms of "large sales market," "great capital investment and governmental support," and "scale synergy effect."

The Chinese government established an ambitious strategy in 2014 and would spend between $100 billion and $150 billion in public and private finances. The purpose of this action is to allow Chinese chip businesses to technically outperform the world's top firms in the design, assembly, and packaging of different kinds of chips, and to terminate their reliance on foreign suppliers (Zenglein & Holzmann, 2019). In 2015, the Chinese government also established a new objective: to improve the rate of self-regulation on the domestic chip market to 70% within ten years. Tsinghua Unisplendour is able to develop high-end chips with government support, but its overall design and production capacity are insufficient. In contrast, TSMC has a complete chip manufacturing chain, but its R & D intensity is insufficient, and the departure of a number of TSMC executives has severely weakened the company's technological superiority. Compared to other chip firms in the globe, TSMC's R&D spending is comparatively modest. However, with the fast growth of technology, TSMC should improve R&D to keep up with this wave of technology. If Tsinghua Unisplendour and TSMC can successfully integrate, the resulting business will have both robust R&D and comprehensive manufacturing capabilities.

China's integrated circuit market grew from 126 billion yuan in 2001 to around 1.2 billion yuan in 2016, accounting for over 60% of the worldwide market share, while the growth rates of the integrated circuit industry and market were 38.4% and 15.1%, respectively. In the context of a sluggish global integrated circuit market, the proportion of the Chinese market in the global market is steadily increasing. With the introduction and implementation of "Made in China 2025," the development of high-tech enterprises in China will accelerate even further. Future demand for high-end chips in artificial intelligence, big data, smart materials, and precision equipment production will be much greater. China's present chip self-sufficiency rate is less than 20%, indicating that the Chinese market has a significant demand gap. The Central Government Government Procurement Network posts the "Announcement of Public Comment on Information Products (Hardware) and Air Conditioning Products Procurement Projects of Central Government" Included on the list were announcements pertaining to desktop, laptop, server, switch, air conditioner, and other

procurement brand-related product technical requirements, domestic operating systems, and domestic chips. This is very beneficial for the growth of homegrown semiconductor firms. After UNIS and TSMC amalgamated, the resulting firm was recognized as a "medium concept" business, and it was deemed advantageous to enter the mainland China sales market.

The Beijing Municipal Government and the Central Government will provide them with generous policies and financial support: not only in terms of policies, but also actively promoting excellent companies at home and abroad to cooperate, and giving more financial and tax concessions in the planning and construction of factories. On February 14, 2015, the National Integrated Circuit Industry Investment Fund stated it will invest 10 billion yuan in Beijing Zhanrui (a subsidiary of UNIS Group), and the China Development Bank (CDB) announced it would give 20 billion yuan in complete credit grants. After the approval of the National Industry Fund and China Development Bank, several marketplaces flooded the market with capital. China Development Bank and the National IC Industry Investment Fund provided UNIS Group with 150 billion yuan in investment and financial assistance in 2017. Under the direction of the Taiwan Democratic Progressive Party, industrial power prices in Taiwan have continued to increase. The DPP administration opposed the Chinese and impeded the regular interaction between island and mainland businesses (Lo, 2022). Taiwan Semiconductor Manufacturing Co., Ltd. actively seeks a route out of the island's unfavorable economic climate. In Nanjing, Chongqing, and other Chinese cities, they construct factories in partnership with local businesses. If TSMC and Tsinghua Unisplendour can work together, TSMC will be able to charge for the foreseeable future.

Valuation of Unis

Financial Ratio Analysis

We will begin our appraisal by studying UNIS's profitability ratio, liquidity ratio, activity ratio, and leverage ratio in order to have a basic knowledge of the company's financial situation. All information is obtained from the UNIS financial report (2017 edition). In this part, we will assess the profitability of UNIS using two ratios: Return on Equity (ROE) and Profit Margin on Sales.

Return on Equity (ROE)
$$= \textit{Net Income} / \textit{Owner's equity} = 2,630,000,000 / 28,900,000,000 = 9.1\% \quad (1)$$

The return on equity (ROE) is a measure of a company's profitability; a ROE between 15% and 20% is often regarded as satisfactory. A return on equity of 9.1% is reasonable, given that UNIS operates in a rapidly expanding sector in China and invests heavily in R&D.

Profit Margin on Sales
$$= \textit{Operating Income} / \textit{Sales} = 2,630,000,000 / 39,071,000,000 = 6.7\% \quad (2)$$

Profit Margin is the proportion of the selling price that is converted to profit, and the higher it is, the better. This company's 6.7% profit margin on sales is not outstanding, but its high R&D expenditure may help it attain a better profit margin on sales in the future.

Debt to Asset Ratio
$$= \textit{Total Debt} / \textit{Total Asset} = 13,700,000,000 / 42,600,000,000 = 32.1\% \quad (3)$$

The debt-to-asset ratio measures the financial risks and leverage ratio of a corporation. Nearly one-third of the firm is backed by debt, indicating that it is leveraged and that investors can anticipate typical levels of risk.

Average Collection Period
$$= \textit{Accounts Receivables} / \textit{Average Daily Sales} = 5,500,000,000 / 107,000,000 = 51.4 \textit{ days} \quad (4)$$

The average collection period is the estimated length of time it takes a firm to obtain payments owing. Also known as the activity ratio. The collection time of 51.4 days suggests that this firm collects money quickly, but also has severe credit restrictions. This provides UNIS with a rather stable financial flow.

Inventory Turnover
$$= \textit{Costs of Good Sold} / \textit{Inventory} = 30,486,000,000 / 5,050,000,000 = 6.03 \quad (5)$$

Inventory turnover is the number of times in a certain time period that inventory is sold. In 2017, UNIS sold their goods six times. Considering that high-tech businesses such as UNIS often have lengthy manufacturing periods, this rate is reasonable. Moreover, investors should be wary of UNIS's comparatively big inventory, which might result in a sluggish cash flow. Next, we utilize the current ratio and the quick ratio to get UNIS's liquidity ratio.

Current Ratio
$$= \textit{Current assets} / \textit{Current Liabilities} = 20,700,000,000 / 5,050,000,000 = 1.67 \quad (6)$$

Current ratio is a liquidity ratio that assesses a company's capacity to meet both short- and long-term commitments. The ratio of 1.67 is well within the acceptable range of 1-2, showing that UNIS has the capacity to pay off its obligations and uses its current assets and working capital well.

Quick Ratio
$$= (\textit{Current Assets} - \textit{Inventory}) / \textit{Current Liabilities} = (20,700,000,000 - 5,050,000,000) / 12,360,000,000 = 1.26 \quad (7)$$

The quick ratio gauges a company's capacity to satisfy its short-term commitments using its most liquid assets. The rate of 1.26 is moderate, suggesting that UNIS has sufficient liquidity, does not depend excessively on inventories and other assets to pay off its short-term debt, and does not have excessive cash reserves.

Book Value of Equity Per Share
$$= \textit{Total Shareholder's Equity} / \textit{Number of Shares Outstanding} = 28,890,000,000 / 206,000,000 = 140.2 \quad (8)$$

Price to Book Ratio
$$= \textit{Stock Price} / \textit{Book Value Per Share} = 75.3 / 140.2 = 0.537 \quad (9)$$

The book value of equity per share is one measure investors use to decide if a stock price is cheap, and the price-to-book ratio (P/B Ratio) compares a firm's market value to its book value (Salim & Pardiman, 2022). This rate of 140.2 is approximately double the market rate; this is not a normal or acceptable rate and is quite upsetting. Likewise, the Price to Book ratio of 0.537 is not optimistic. The first explanation is the accounting method; given the nature of UNIS's industry, the machinery quickly becomes obsolete and cannot be used to produce product if the company is to remain competitive; consequently, the machinery can only be sold for scrap while the accounting value remains the purchase price. The second factor is that investors on the market are losing confidence in the company's future and are withdrawing funds. Before purchasing this firm, we must do extensive due diligence to determine the true cause of this situation. Then, we determine the current market value of UNIS.

$$\begin{aligned} &\textbf{\textit{Enterprise Value}} \\ &= \textit{Value of equity} + \textit{Value of debt} \\ &= 75.3 * 206,000,000 + 13,400,000,000 \\ &= 28,912,000,000 \end{aligned} \tag{10}$$

UNIS has 206,000,000 outstanding with a value of $72.03 and 13,700,000,000 in debt at the end of 2017.

$$\begin{aligned} &\textbf{\textit{UNIS Enterprise Value}} \\ &= \textit{Shares} * \textit{Market Value Per Share} + \textit{Value of Debt} \\ &= 206,000,000 * 72.03 + 13,700,000,000 \\ &= 28,538,180,000 \end{aligned} \tag{11}$$

Table 7: Trading Multiples of Similar High-tech companies.

Company	Stock Index (in China)	P/E Ratio
Beijing Thunisoft	300271	34.91
Tian Di Science	600582	18.67
Advanced Tech & Material	000969	132.65
Rapoo	002577	265.75
Chunqiu Electronic	603890	26.38
Kingsun Science	300235	257.19
GRG Banking	002152	20.60
Jieshun Science	002609	44.45
Wiscom System	002090	29.33
Shenzhen Longood	300543	47.01
SinoSun Technology	300333	186.23
Tecsun Science	002908	90.22
Zhejiang Leo	002131	33.17
Shenzhen MinDe	300656	74.04

Now that we have a rate of the average price-to-earnings ratio of comparable sectors in China, we can estimate the stock price of UNIS. A ratio of 85.5 indicates that high-tech is still a promising business in China, but investors should be wary of bubbles

$$\begin{aligned} &= \textit{Net Income} / \textit{Number of Shares Outstanding} \\ &= 430,000,000 / 206,000,000 \\ &= 2.08 \end{aligned} \tag{12}$$

$$\begin{aligned} &\textbf{\textit{Stock Price}} \\ &= \textit{EPS} * \textit{Average P/E Ratio} \\ &= 2.08 * 85.5 \\ &= 177 \end{aligned} \tag{13}$$

We can see that our estimate of the stock price is significantly higher than the market price, but nearly in line with the book value of equity per share; therefore, we can assume that our first explanation of the low price to book ratio is accurate and that the current market price for UNIS stock is undervalued.

$$\begin{aligned} &\textbf{\textit{Equity Value}} \\ &= \textit{Stock Value} * \textit{Number of Shares Outstanding} \\ &= 206,000,000 * 177 \\ &= 36,462,000,000 \end{aligned} \tag{14}$$

China's stock market is not yet completely established, thus its equity value should only be used as a point of comparison. There is no record of UNIS acquiring another firm, but we may examine a merger of two companies of comparable size and industry: Marvell and Cavium. On 2017-11-14, Marvell acquired Cavium for six billion dollars and paid a 20% premium on target's total asset value. We assessed the purchase price for UNIS based on prior transactions to be: Total Asset Price*120% = 51,120,000,000

Discounted Cash Flow

Revenue: Considering that UNIS operates in a mature high-tech sector, we predicted UNIS's future operational performance based on the previous revenue growth rate of the targeted firm.

Cost of Goods Sold: We calculate the ratio of COGS to sales using UNIS's financial statements from the previous five years in order to get an estimate of UNIS's COGS in the next five years after the purchase has been completed.

R&D Expense: The information presented by UNIS's financial statements and other sources reveals that research and development expenses have remained at a high level of 10% of sales over the previous five years.

Table 8: Revenue and Growth Rate of UNIS from 2013 to 2017 (Unit: Chinese Yuan).

UNIS		
Year	Revenue	Growth Rate (%)
2017	39,071,040,894	41.00
2016	27,709,709,064	107.56
2015	13,349,904,816	19.78
2014	11,144,913,830	30.81
2013	8,520,037,292	-
Average		49.79

Table 9: Sales and Cost of UNIS from 2013 to 2017 (Unit: Chinese Yuan).

UNIS			
Year	Sales	COGS	COGS/Sales
2017	39,071,040,894	30,486,639,519	0.78
2016	27,709,709,064	22,525,182,549	0.81
2015	13,349,904,816	12,745,578,064	0.95
2014	11,144,913,830	10,628,793,427	0.95
2013	8,520,037,292	8,114,271,969	0.95
Average			0.83

This is why we have fixed R&D expenditures at 10% of revenue collected. The ratio of operating, finance, and administrative expenditures to revenue will remain unchanged at 8.3% during the next five years, based on historical financial data.

Tax Rate: According to its 2017 annual report, as a high-tech business UNIS has a favorable 15% tax rate. The average depreciation rate is deemed to be consistent with the depreciation policy of the parent firm: 14%, according to data from TSMC's annual report (total fixed assets of 1,563,707,177 divided by total depreciation expense of 3,525,229). We consider this to be the future UNIS depreciation rate. Regarding the Change in Net Working Capital, we determine the average change in TSMC's net working capital to its revenue and apply it to UNIS.

Table 10: Expense and Revenue of UNIS from 2013 to 2017 (Unit: Chinese Yuan).

UNIS			
Year	OFA Expenses	Revenue	Proportion (%)
2017	6,531,763,538	39,071,040,894	16.6
2016	4,455,757,561	27,709,709,064	16.4
2015	386,694,158	13,349,904,816	2.9
2014	318,775,230	11,144,913,830	2.9
2013	235,064,380	8,520,037,292	2.8
Average			8.3

Table 11: Net Working Capital of TSMC from 2013 to 2017 (Unit: Chinese Yuan)

UNIS			
Year	Net Working Capital	Change of NWC	Percentage to Revenue (%)
2017	498,496,430	-993,423	-0.1
2016	499,489,853	120,556,739	25.5
2015	378,933,114	70,064,585	20.0
2014	308,868,529	217,945,660	72.1
2013	90,922,869	-	-
Average	-	-	-

Discount Rate:

$$\begin{cases} K = WACC = (D/V) * K_d * (1-t) + (E/V) * K_e \\ K_e = Rf + \beta * (R_m - R_f) \\ K_d = InterestRate \end{cases} \quad (15)$$

The β of computer accessories industry is about 1.39; R_{fis} about 3.4% and R_m-R_{fis} about 5.81%; D/E=0.3 (According to the annual report of TSMC). We use the interest rate on 10-year bonds, which is 3.67 percent, as our risk-free rate. The majority of research institutions predict that China's GDP will expand by 6% during the next several years (removed the impact of the Covid-19). This is the growth rate used to calculate the terminal value. The determination of the discount rate:

K=WACC=0.23*2.2%*85%+0.77*(3.4%+1.39*5.81%) =9.267% 16

Table 12: Expected TSMC NPV from 2017 (Unit: Chinese Yuan).

Future Year	1	2	3	4	5
Revenue	5,860,656,134	8,790,984,201	13,186,476,301	19,779,714,452	29,669,571,678
Less: Costs	4,864,344,591	7,296,516,886	10,944,775,329	16,417,162,995	24,625,744,493
Less: R&D expense	586,065,613	879,098,420	1,318,647,630	1,977,971,445	2,966,957,168
Less: Other expenses	486,434,459	729,651,688	1,094,477,533	1,641,716,300	2,462,574,449
EBIT Less: Tax	-76,188,529	-114,282,793	-170,542,419	-257,136,287	-385,704,431
Depreciation	11,774,539,154	11,774,539,154	11,774,539,154	11,774,539,154	11,774,539,154
Less: Ch.NWC	1,758,196,840	2,637,295,260	3,955,942,890	5,933,914,336	8,900,871,503
Free cash flow	9,940,153,785	9,022,961,101	7,648,053,845	5,583,488,531	2,487,963,220

The calculation of NPV:

$$\begin{cases} TerminalValue = CF * (1+g)/(K-g) = 107,703,927,793 \\ PV(CFs) = 26,432,306,150 \\ NPV = 134,136,233,943 \end{cases}$$

CONCLUSIONS

The transaction will be structured according to what is known as the Reverse Triangular Merger Model, which we believe to be the most effective approach. There are about four categories of factors that contribute to our decision to go with this model rather than others: keeping away the minority shareholders for ultimate control; a tax shield effect (so that we accept stocks as the primary form of payment); restrictions on certain sorts of acts, such as selling target firms' assets or stripping shares; possible for the obligations of UNIS to be contained inside the subsidiary.

To take advantage of the tax shield effect, the kind of payment that we recommend is to pay a 20% premium on the target firm, with 80% of the payment coming in the form of stocks (common or preferred), and the remaining 20% coming in the form of cash. In this way, UNIS and TSMC have completed substantial mergers and acquisitions and bundling of interests by establishing a joint new company. Let's call it a contingent approach for the sake of argument.

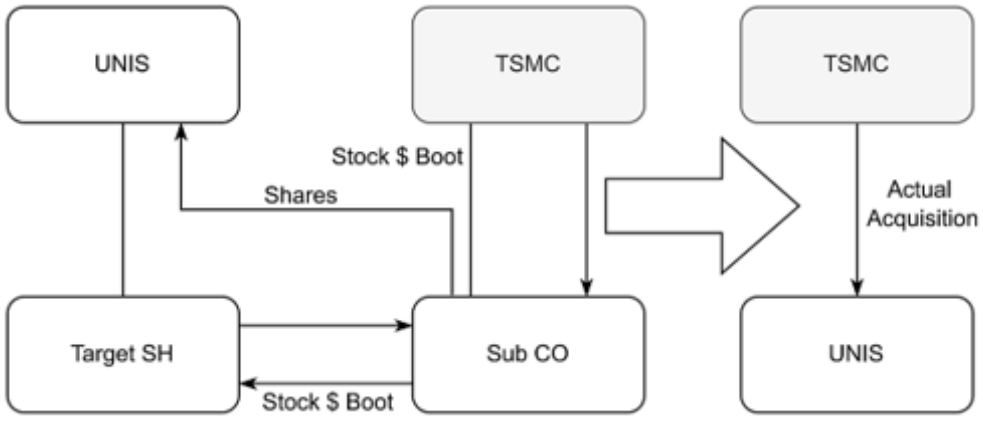

Figure 1: Proposed Acquisition Plan to Merge TSMC into UNIS

In addition to the benefit of providing a tax shield, there are a number of other considerations as following that strongly encourage us to use the stock as the payment. Such mergers and acquisitions will not be considered as unfriendly takeovers since both China mainland TSMC's interest meet in the process. China maintains a long-term policy favorable to the semiconductor sector and there is a reasonably strong demand for semiconductors both now and in the near future. TSMC also actively seeks long-term profit opportunities in the mainland Chinese market. Additionally, the majority of UNIS's senior managers are the most significant engineers in this business and are responsible for the most crucial tasks in production. According to the findings of Zhang (2001), the buyer is more likely to pay with stocks when the scales of the target enterprises are relatively huge.

When the scales of the merger are great, using the stock as a form of payment may help ease the burden of cash and finance. The heavy demands for cash that TSMC has are still another important factor contributing to the restriction of the payment. Because of the high cost of research, TSMC has a relatively low free cash flow, considering its magnitude, as was seen in the preceding section of the company's financial statement. Equipped with the favorable measures from Chinese government, for UNIS, the form of payment is actually the investment problem. As the executive board of UNIS, in theory prefers receiving cash, but as in a technological sector, the majority of them are aware of the long-term profit. The challenge of funding for TSMC is the form of payment. With a good return expectation from society, TSMC is under less pressure to get finance. But even if its potential competitors' market share is not as large as TSMC's, they may also benefit from the same policy privileges, reduced material costs, and lower land costs.

In fact, TSMC has lost its past capital and technological advantages as a result of the general industrial subsidies, and its future profitability would be devalued. At this time, it appears to be a win-win situation if UNIS acquires TSMC and develops a joint venture, as depicted in Figure 1. Lastly, the attractiveness of stock payment stems from its variable pricing feature.

The new company will benefit from the value of the coordinating effect. The contingent price indicates that shareholders of the target firm who get the new company's shares will receive the total payment value that is equivalent to or more than their proportionate part of the merger and acquisition profits. Acquisition profit is unpredictable; therefore, selecting stocks as payment will eliminate the profit uncertainty. According to the notion of the corporate pecking order, the corporation chooses internal cash financing over treasury shares, the issuing of new bonds, and the issuance of new shares. The debt-to-asset ratio of TSMC is 21.2%, while the liquid assets ratio is 20%, showing a robust capacity for debt payback. Despite the favorable financial and regulatory circumstances outlined above, the merger did not materialize, which is regrettable for the growth of China's semiconductor sector.

The collapse of the merger seems to be an indication of the problems and obstacles that China's future high-tech route would provide. This article provides a thorough overview of the history and evolution of TSMC and Tsinghua Unigroup. In addition, we investigate the viability and profitability of a merger between the two firms.

Future investors are supplied with guidelines and financial analysis indicators for analyzing comparable enterprises on the financial market.

The study has extensive ramifications. In the future, we will be able to examine the likelihood of TSMC's continued expansion and the acquisition of other small and medium-sized chip makers by combining its recent growth and the current financial condition.

REFERENCES

Almeida, P., & Kogut, B. (1999). Localization of knowledge and the mobility of engineers in regional networks. *Management Science, 45*(7), 905–917. https://doi.org/10.1287/mnsc.45.7.905

Baum, J. A. C., & Ingram, P. (1998). Survival-enhancing learning in the Manhattan hotel industry, 1898–1980. *Management Science, 44*(7), 996–1016. https://doi.org/10.1287/mnsc.44.7.996

Biggart, N. W. (1996). Enterprise and the State in Korea and Taiwan. *American Journal of Sociology, 101*(6), 1726–1727. https://doi.org/10.1086/230876

Cai, Y., Zhang, H., & Pinheiro, R. (2015). Institutionalization of technology transfer organizations in Chinese universities. *European Journal of Higher Education, 5*(3), 297–315. https://doi.org/10.1080/21568235.2015.1044548

Chang, M. (2011). Pure Play. *IEEE Solid-State Circuits Magazine, 3*(4), 21–24. https://doi.org/10.1109/mssc.2011.942450

Chao, C.-H. (2012). The influence of capital structure on organizational performance at Taiwan-listed info-electronics companies: Using corporate governance as the Moderator. *American Journal of Business and Management, 1*(1), 60. https://doi.org/10.11634/21679606170694

Chen, J. Y. (2020). The mirage and politics of participation in China's platform economy. *Javnost - The Public, 27*(2), 154–170. https://doi.org/10.1080/13183222.2020.1727271

Chen, T.-C., Guo, D.-Q., Chen, H.-M., & Wei, T.-T. (2019). Effects of R&D intensity on firm performance in Taiwan's semiconductor industry. *Economic Research-Ekonomska Istraživanja, 32*(1), 2377–2392. https://doi.org/10.1080/1331677x.2019.1642776

Chien, C. F., Shih, C., & Chang, J. (2009). The TSMC Way: Meeting Customer Needs at Taiwan Semiconductor Manufacturing Co. Harvard Business School Technology & Operations Mgt. Unit Case, (610-003).

Edgington, D. W., & Hayter, R. (2000). Foreign Direct Investment and the Flying Geese Model: Japanese Electronics Firms in Asia-Pacific. *Environment and Planning A: Economy and Space, 32*(2), 281–304. https://doi.org/10.1068/a31171

Ernst, D., Lee, H., & Kwak, J. (2014). Standards, innovation, and latecomer economic development: Conceptual issues and policy challenges. *Telecommunications Policy, 38*(10), 853–862. https://doi.org/10.1016/j.telpol.2014.09.009

Hauge, J. (2019). The role of manufacturing versus services in economic development. In Transforming Industrial Policy for the Digital Age (pp. 12–36). *Edward Elgar Publishing.*

Heikal, M., Khaddafi, M., & Ummah, A. (2014). Influence analysis of return on assets (ROA), return on equity (ROE), net profit margin (NPM), debt to equity ratio (DER), and current ratio (CR), against corporate profit growth in automotive in Indonesia stock exchange.

International Journal of Academic Research in Business and Social Sciences, 4(12). https://doi.org/10.6007/ijarbss/v4-i12/1331

Hobday, M. (1998). Latecomer catch-up strategies in electronics: Samsung of Korea and ACER of Taiwan. *Asia Pacific Business Review, 4*(2-3), 48–83. https://doi.org/10.1080/13602389812331288364

Hsu, J. Y. (2012). New Firm Formation and Technical Upgrading in the Taiwanese Semiconductor Industry: Is Petty Commodity Production Still Relevant to High-Technology Development?. *Petty Capitalists and Globalization, 145*.

Ip, P.-K. (2008). Corporate social responsibility and crony capitalism in Taiwan. *Journal of Business Ethics, 79*(1–2), 167–177. https://doi.org/10.1007/s10551-007-9385-5

Jaggi, B., & Gul, F. A. (1999). An analysis of joint effects of investment opportunity set, free cash flows and size on corporate debt policy. *Review of quantitative finance and accounting, 12*(4), 371-381. https://doi.org/10.1023/A:1008354509316

Kim, L. (1980). Stages of development of industrial technology in a developing country: A model. *Research Policy, 9*(3), 254–277. https://doi.org/10.1016/0048-7333(80)90003-7

Kothari, S. P., & Ball, R. (1994). Financial statement analysis. *Mcgrew-Hill Companies.*

Lee, C.-S., & Pecht, M. (2020). *The Taiwan Electronics Industry*. https://doi.org/10.1201/9780429332845

Lo, L.-C. (2022). Facilitating the market with a gift: The politics of the ECFA between China and Taiwan (2008–2016). *Asian Studies Review*, 1–18. https://doi.org/10.1080/10357823.2022.2095981

Martin, J. D., & Scott, D. F. (1974). A Discriminant Analysis of the Corporate Debt-Equity Decision. *Financial Management, 3*(4), 71–79. https://doi.org/10.2307/3664932

Mathews, J. A., & Cho, D. (1999). Combinative capabilities and organizational learning in latecomer firms: the case of the Korean semiconductor industry. *Journal of World Business, 34*(2), 139–156. https://doi.org/10.1016/s1090-9516(99)00013-9

McCann, P., & Arita, T. (2006). Clusters and regional development: Some cautionary observations from the semiconductor industry. *Information Economics and Policy, 18*(2), 157–180. https://doi.org/10.1016/j.infoecopol.2005.12.001

Minbaeva, D., Pedersen, T., Björkman, I., Fey, C. F., & Park, H. J. (2003). MNC knowledge transfer, subsidiary absorptive capacity, and HRM. *Journal of International Business Studies, 34*(6), 586–599. https://doi.org/10.1057/palgrave.jibs.8400056

Newberry, K. J., & Novack, G. F. (1999). The effect of taxes on corporate debt maturity decisions: An analysis of public and private bond offerings. *Journal of the American Taxation Association, 21*(2), 1-16. https://doi.org/10.2308/jata.1999.21.2.1

Ozkan, A. (2000). An empirical analysis of corporate debt maturity structure. *European Financial Management, 6*(2), 197-212. https://doi.org/10.1111/1468-036x.00120

Perry, T. (2011). Foundry father. *IEEE Spectrum, 48*(5), 46–50. https://doi.org/10.1109/mspec.2011.5753245

Poon, J. P. H., Hsu, J.-Y., & Jeongwook, S. (2006). The geography of learning and knowledge acquisition among Asian latecomers. *Journal of Economic Geography, 6*(4), 541–559. https://doi.org/10.1093/jeg/lbi021

Rimol, M. (2021). Gartner Says Worldwide Semiconductor Revenue Grew 26% in 2021. Gartner. https://www.gartner.com/en/newsroom/press-releases/2022-04-14-gartner-says-worldwide-semiconductor-revenue-grew-26-percent-in-2021

Salim, M. A., & Pardiman, P. (2022). The role of dividend policy as intervening variables on the effect of earning per share, debt equity ratio and price book value on stock price. *Jurnal Bisnis Dan Manajemen, 9*(1), 77–86. https://doi.org/10.26905/jbm.v9i1.7602

Tsai, T., & Cheng, B.-S. (2006). The Silicon Dragon. *Edward Elgar Publishing.*

Tung, A.-C. (2001). Taiwan's semiconductor industry: What the state did and did not. *Review of Development Economics, 5*(2), 266–288. https://doi.org/10.1111/1467-9361.00123

Winston, G. C. (1974). The Theory of Capital Utilization and Idleness. *Journal of Economic Literature, 12*(4), 1301–1320. http://www.jstor.org/stable/2722381

Wu, S.-Y., Hung, S.-C., & Lin, B.-W. (2006). Agile strategy adaptation in semiconductor wafer foundries: An example from Taiwan. *Technological Forecasting and Social Change, 73*(4), 436–451. https://doi.org/10.1016/j.techfore.2005.01.004

Zenglein, M. J., & Holzmann, A. (2019). Evolving made in China 2025. *MERICS papers on China, 8,* 78.

Zhang, L., & Lan, T. (2022). The new whole state system: Reinventing the Chinese state to promote innovation. *Environment & Planning A*. https://doi.org/10.1177/0308518x221088294