

Current Situation Analysis and Future Development Direction of Semiconductor Manufacturing International Corporation Integrated Circuit Co., Ltd

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Abstract

This article first starts with the US China trade war, and by searching for US sanctions against SMIC and analyzing SMIC's regional revenue, it is concluded that SMIC's main problem lies in the lack of international market share and the need to expand outward. Then, through SWOT analysis, it was found that SMIC has good suppliers and investments. But it lacks top-notch technology and has a high employee turnover rate. SMIC should fully leverage its advantages and leverage opportunities to expand outward. Relying on the opportunities provided by the global chip crisis and the EU's chip bill, SMIC should take the EU as the first step towards expansion. After determining the direction, this article uses the Porter's Five Forces model to analyze the feasibility of SMIC's expansion into the European Union and provides appropriate suggestions for expanding competitiveness. Finally, suggestions are proposed to make up for other shortcomings to ensure the future development of SMIC.

Keywords

SMIC; SWOT, Porter's; Five Forces model.

1. INTRODUCTION

With the continuous evolution of globalization and technological innovation, what people trade is no longer just ordinary food and drink, and high-tech has gradually become a focus of attention due to its convenience and versatility. Semiconductor Manufacturing International Corporation Integrated Circuit Co., Ltd is a Chinese company dedicated to semiconductor chips (hereinafter referred to as SMIC). It mainly provides global customers with 0.35 μ m to FinFET process design and manufacturing services. It is a famous manufacturer in China's chip industry including one-stop services in the later stage, such as packaging and testing, mask services and multi-project wafer services [1]. However, there are always internal and external troubles for every company. For example, since 2018, the China-United States trade war triggered by the constant friction between China and the United States has had a huge impact on the trade exchanges and enterprise development between the two countries. SMIC, as a well-known Chinese enterprise, will naturally be adversely affected. In addition, there is also competition pressure from peers about market share. These are all external issues. Internally, the employee turnover rate within the enterprise is also a major problem of SMIC. According to the annual report of SMIC, in 2018, the turnover rate of SMIC's employees was 22%. Although it has declined to about 17% in 2022 [2] [3], the turnover of SMIC's employees is still very serious. Based on these problems, this paper will use Porter's Five Forces Model and SWOT analysis to

analyze the current situation of this company from the internal and external aspects, including its advantages and disadvantages, and try to put forward appropriate suggestions for its future development direction.

2. METHODOLOGY

2.1. Data analysis method

Data analysis is the science of collecting, cleaning, and organizing data, and then analyzing the original data to draw wise conclusions from the data [4]. This paper will collect a series of data related to Semiconductor Manufacturing International Corporation International and its peers after the US China trade war by consulting annual reports, official statistics, literature, and other methods, and analyze and compare their business status and market share.

2.2. Comparative analysis method

The Comparative law is to connect different research objects for comparison, usually used to find similarities and differences, and explain continuity and change [5]. This article will demonstrate the differences between SMIC and its peers by comparing market share, personnel turnover rate, and other data, and identify areas for improvement.

2.3. Business model analysis method

Several models are often used in business to analyze the situation of enterprises and markets. This article will use the SWOT analysis model to analyze the internal and external status of SMIC and use the Porter Five Forces model to analyze the characteristics of competition in the industry where SMIC is located.

3. THE DECLINE OF SMIC'S INTERNATIONAL MARKET SHARE

The US China Trade War is a major global event, and the two countries, as the parties, have natural frictions. Among them, the science and technology disputes in the US China Trade War had a negative impact on SMIC. Since 2018, the United States has imposed severe sanctions on China's high-tech industry, especially the chip industry. There are two factors that have a significant impact on SMIC. One is that in 2018, the United States pressed European governments, such as the Netherlands, to give up renewing the export license of AMSL Stepper technology with Chinese companies. Nikkei Asia Review and other reports said that the target of cooperation with China was SMIC [6]. The second is that the United States will include SMIC in the Entity List in 2020 and prohibit American companies from exporting high-end chip technologies to them [7]. The negative impact of these two sanctions is mainly reflected in the proportion of SMIC's operating revenue.

	2017	2018	2019	2020
North America	0.4	0.32	0.264	0.232
China and Hong Kong	0.47	0.59	0.594	0.635
Europe and other Asian regions	0.13	0.09	0.142	0.133

Figure 1. Income ratio of SMIC's main business in different regions from 2017 to 2020

Note: SMIC, 2018 & 2020

From Figure 1 [8] [9], in 2017, SMIC's revenue in Europe and other regions accounted for 13% of the total revenue. However, after the first move by the United States in 2018, the Eurasian market decreased to 9%. Then, revenue in North America has plummeted from 40% before the

start of the trade war in 2017, to only 23.2% after the sanctions in 2020. Although SMIC's revenue share in the Chinese region is increasing, combined with data and specific events, its international market share is rapidly losing due to the impact of sanctions. After understanding the main problem, the SWOT analysis model will be used to analyze the strength and opportunities of SMIC, to try to come up with a solution to the problem. And its weakness and threat parts are used to identify other issues that are not conducive to the company's development, and then to further enhance the company and help solve the main problem of international market loss by addressing these issues.

4. SWOT MODEL ANALYSIS OF SMIC STATUS

Strength	The largest chip manufacturing company in China Large investment Multiple supplier resources	Opportunities	Global chip shortage
Weakness	Lack of top-notch technology The brain drain is serious	Threat	US China Technology Dispute

Figure 2. SMIC SWOT analysis model

Note: Author's own figure

Through SWOT analysis of the current situation of SMIC, it can be concluded that its internal strength lies in its presence in China, the world's largest and fastest-growing electronic product production and consumption market, and it is the largest chip foundry enterprise in China with a huge investment amount [10]. This first ensures the leading position of the enterprise in the Chinese market, as well as its international visibility and investors' trust in the enterprise's capabilities. Secondly, the abundant resources in China also provide guarantees for the demand of the supply chain of SMIC. According to SMIC's ESG report for 2022, over 65% of SMIC's raw material supply came from China in 2022[3]. Adequate and stable supply sources will bring a sense of security to enterprises and customers. However, it is also evident that the weakness of SMIC is lacking cutting-edge chip technology. According to data available on the official website, SMIC can currently only produce chips up to 28 nanometers in mass production [11]. TSMC, a competitor in the same industry, has achieved mass production of 5-nanometer chips in 2020 and is expected to produce 3-nanometer chips in the second half of 2022 [12]. This indicates that there is still a significant gap between SMIC and its top peers in terms of high-end technology. This is also one of the reasons for its low global market share. According to Statista data, TSMC's global market share in 2022 exceeded 58.5%, while SMIC only accounted for about 5% [13]. Then, the fundamental reason for the lack of top-notch technology is the lack of talent. The severe brain drain is also a problem for SMIC. The SMIC 2022 ESG report pointed out that the company's employee turnover rate is 16.94% [3], although there is a significant decrease compared to 21.19% in 2021 [14], compared to the 6.7% reported by TSMC in the 2022 ESG report [15], SMIC's employee turnover rate remains high. As for the external, SMIC's opportunities lie in the global shortage of chips. Forbes pointed out that due to the impact of COVID-19, lockdowns, unemployment, and sluggish consumer purchasing desire, there has been a shortage in the global chip supply chain [16]. However, the lockdown caused by the current pandemic has basically disappeared, and various industries are beginning to recover. The disruption of the global supply chain is also an opportunity for suppliers to seize the market. SMIC can also take advantage of this opportunity to expand into the international market. Finally, as mentioned earlier, Threat mainly comes from the loss of international market share caused by the sanctions imposed on the US China technology dispute.

5. EXPANDING INTO THE EUROPEAN UNION

Until 2023, SMIC established four chip foundries in China. But in the plan to go global, SMIC has been stagnant. It only has promotion offices in other countries and regions [17]. This indicates that it has not participated in the production process of globalization itself. This will lead to a lack of international influence and competitiveness compared to its multinational peers. Therefore, the loss of the international market is also understandable. A good way to seize international market share is to expand. The supply chain disruption caused by the global core shortage crisis has led to various countries and organizations actively seeking solutions. The European Union is a good example. The European Union has proposed the European Chip Act to achieve the goal of producing chips independently. And it has provided a series of assistance to the chip industry, such as tax reduction, government subsidies, and so on [16]. At the same time, the EU is also seeking international cooperation and encouraging foreign investment. For example, Intel, also a chip manufacturer, seized this opportunity to further expand into the European Union and has planned to invest 80 billion euros in the next decade to build the chip industry. This can enjoy subsidies and support from the government through the European Chip Act while expanding the market. Moreover, Intel's strategic goal is not only to build production chains in the EU region, but also to focus on the EU's knowledge and technological resources, talent resources, and research laboratories [19]. SMIC can also seize this opportunity to expand into the European Union and strive for European technology and talent to make up for its shortcomings in cutting-edge technology research and development. Opening channels for cooperation with the world at the same time, rather than passively accepting orders from international sources, limited to production in China. SMIC's expansion to the European Union can be analyzed using the Porter Five Forces model for feasibility.

6. PORTER'S FIVE FORCES MODEL ANALYSIS OF EXPANSION FEASIBILITY

Low threat of potential new entrants: The investment amount in the chip industry is huge, and the technology level is extremely high, which creates a high entry barrier that can effectively prevent the influx of new entrants. And as the largest chip foundry enterprise in China and a company that poses a threat and is explicitly prohibited by the United States, investment volume, technology, and visibility are also chips for SMIC to develop and surpass new entrants internationally.

Industry competition is fierce: There are many powerful semiconductor companies in the EU, such as STMicroelectronics, AMS AG, Infineon Technologies AG, and ASML Holding N.V. [20]. There are also external investments attracted by the excellent conditions of the European Union, such as Intel, which is preparing to invest 80 billion euros. Although the competition in the local market of the European Union is fierce, SMIC can also seek cooperation with local enterprises. For example, ASML Holding N.V. in the Netherlands has already had experience collaborating with China. Although the Netherlands has imposed restrictions on exports to China, this does not prevent both sides from conducting technical cooperation within the EU.

Low bargaining power of suppliers: As mentioned above, 65% of SMIC's raw material suppliers will come from China and Hong Kong in 2022. If the prices offered by European suppliers are too high, exceeding the cost of transportation from China, SMIC can choose to continue purchasing from Chinese suppliers.

The buyer's bargaining power is high: according to SMIC's 2022 annual report, it is mainly oriented to the Chinese market, and its revenue in the Chinese market accounts for 74.2% of the total revenue [21]. This also indicates that SMIC has a relatively small international market share and customers, and the purpose of expanding into the European Union is to open the international market. So, when negotiating with international buyers, it needs to compete for customers at a low price.

The threat of substitutes is moderate: firstly, in 2020, European chip manufacturers accounted for 6.8% of the global supply of chips between 20nm and 40 nm in size, less than China's 15.4% [22]. Although, as China's largest chip manufacturer, SMIC has certain advantages, European chip manufacturers can still be used as substitutes for SMIC, as SMIC mainly produce traditional chips with sizes of 28nm and above. Secondly, the products of investors such as Intel are also very competitive. Intel's technology enables mass production of 14nm chips [23]. This means that it can suppress SMIC's products from a high-end technical perspective. To cope with these situations, SMIC can mass produce traditional chips and increase production capacity to capture the lower tier market. CNBC stated in 2023 that China can seek to pursue a dominant position in the field of existing traditional chips. And according to data from International Business Strategies Inc., by 2030, the global demand for 28nm chips will exceed three times the current level [24]. This indicates that there will still be a large market in the field where SMIC excels in the future. According to the three elements of the Marketing strategy, Segmentation, Targeting and Positioning, SMIC can divide the market into chips of different technology levels, and then target its best 28nm chip manufacturing. The target customers are industries that need a lot of traditional chips worldwide. Finally, it can position itself as a traditional chip manufacturer with strong capabilities and compete for market share in the European Union.

The global shortage of chips is a good opportunity for SMIC to enter the European Union. As the largest chip manufacturing enterprise in China, SMIC relies on resource rich China, which ensures sufficient capital investment and raw material supply. It can start with relatively traditional products, gain some market share in the EU, and then expand globally. In addition, the EU has government subsidies, advanced knowledge, excellent talents, and research institutes. SMIC can also pursue these benefits like Intel. And it has a large amount of investment to create jobs and recruit talents to make up for its technological shortcomings. These are the reasons to choose the EU as its expansion point.

7. MAKE UP FOR OTHER WEAKNESSES

In addition to outward expansion and development, internal management should also go hand in hand. As explained in the SWOT analysis model, another issue with SMIC is internal personnel turnover. The ability of employees is the foundation of enterprise capabilities, and the research and development of cutting-edge technology also relies on excellent talents. SMIC has created a separate topic for talent issues in its annual reports, which has revealed more than once a sense of crisis regarding talent shortages and attrition [21]. It is not difficult to see from SMIC's ESG report that the rate of employee turnover is high. Although there has been a decrease compared to the past, there are still shortcomings compared to peers. So, how to retain talent and solve the problem of personnel turnover has become a necessary path for SMIC's progress. There are two ways to improve. Firstly, increase employee online training time and add tests. According to SMIC's 2022 ESG report, the company has over 2000 online training courses, but the average learning time per person is only 39 hours. This is not proportional to the number of courses in SMIC, which only has four types of work that require training. This inevitably leads to the problem of insufficient employee quality and low labor ability. For a long time, employees will perceive the difficulty of their work as causing low motivation or desire to resign. Increasing employee training time can effectively alleviate these issues. In addition, adding tests can help ensure the quality of employee training and identify and fill in gaps. Secondly, increase employee salaries. According to SMIC's 2022 annual report, the per capita salary of R&D personnel in 2022 is approximately 448000 RMB, equivalent to approximately 62000 US dollars [21]. According to Statista's statistics, the per capita salary in the United States in 2022 was approximately \$65000 [25], even slightly higher than that of SMIC's R&D personnel. The loss of SMIC talents is highly likely due to low salaries. SMIC should appropriately increase salaries to motivate employees and make them more motivated. All in all, SMIC is facing

challenges with internal personnel turnover and talent shortages. To address these issues, SMIC should focus on increasing employee training time and adding tests to improve the quality and skills of its workforce. Additionally, SMIC should consider increasing employee salaries to motivate and retain talented individuals. By addressing these areas, SMIC can enhance its internal management and ensure the retention of valuable employees.

8. CONCLUSION

In general, the sanctions imposed by the United States on SMIC in the US China trade war directly led to the further shrinkage of the international market of SMIC. However, the global chip crisis brought about by COVID-19 provides SMIC with an opportunity to expand into the global market. And the European Union has just proposed the chip bill, hoping to vigorously develop the chip industry, and providing a series of support. In addition, the EU is rich in both talent and technical knowledge. So, the first goal of SMIC should be the European Union. SMIC can compete and expand in the European Union based on its stable suppliers, sufficient investment, and advantages in traditional chip manufacturing. It can build foundries and branches in the EU to recruit talents from the EU and cooperate with strong peers. This can make the company globalize and bypass export restrictions. In addition to external expansion, SMIC also needs to address its internal defects of personnel turnover. What is most needed in the high-tech field is cutting-edge technology and talent. However, the talent shortage caused by high turnover rates will further affect the research and development of technology. Increasing training time and testing are methods to enhance employees' abilities, allowing them to better adapt to their positions and obtain promotion opportunities. In addition, increasing salaries can also increase employees' labor motivation and reduce turnover rate. Repairing its own shortcomings can not only bring SMIC closer to the Chinese market, retain more talents, but also help it recruit more international talents and obtain more opportunities to improve its technical level during expansion.

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