# COMPETITIVE DYNAMICS IN SEMICONDUCTOR FOUNDRY INDUSTRY

Woonghee Lee, Hanyang University, Seoul, Korea

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## ABSTRACT

*Semiconductor foundry industry is perhaps one of the industries that is characterized by the most intense competition among technology giants. TSMC and Samsung Foundry is competing head-to-head in 3nm nodes. The two companies have different approaches to their 3 nm nodes, with Samsung using GAAFET (Gate All Around), whereas TSMC is continuing with its FinFET technology. Past and present competition in this industry is analyzed to understand the sources of competitive advantage in this industry. Three managerial implications were drawn. First, economy of scale not only lowered cost but also increased quality in this industry. Second, scope is as important as scale in determining success. For example, extending vertical scope in this industry resulted in conflict of interest with customers. In the third, first mover advantage in technological advances do not seem to play much role in this industry because clients were more interested in the stable and reliable supply of chips rather than unproven technological breakthroughs.*

***Keywords:*** *Semiconductor, Foundry, TSMC, Samsung*

## 1. INTRODUCTION

Semiconductor industry is perhaps one of the industries that is characterized by the most intense competition among technology giants. As the semiconductor business requires higher transistor density and power efficiency, the gap between competitors continues to grow, with only few companies competing at the top. This paper will focus on the competitive dynamics among Samsung Electronics, TSMC and Intel in the production of the world's most advanced semiconductor technology and compare their relative competitive advantages.

Gaining competitive advantage in semiconductor business is not just an economic issue anymore. Much of major U.S. industries such as transportation, defense and security rely on semiconductors for their performance. Consequently, the erosion of a nation’s capabilities in semiconductor industry is a direct threat to the nation’s ability to defend itself and protect their industry. For many countries, national economic system relies heavily on semiconductor-supported products. Ensuring proper supply in semiconductor technology and securing the well-functioning of the value chains that design, manufacture and distribute semiconductor products are perhaps the most important economic and national security concerns for most nations today.

Such urgency led U.S. Congress to pass the CHIPS Act in July 2022. The purpose of CHIPS act is to strengthen semiconductor manufacturing, design, and research in the United States to fortify the economy and national security and protect U.S. semiconductor supply chains. Moreover, U.S. implemented export controls on critical components, as well as the recently finalized guardrails prohibiting chipmakers receiving U.S. subsidies from expanding in China for 10 years. In reaction to U.S. policy changes, Chinese government has taken countermeasures that can mitigate the threat from United States. For example, China’s Ministry of Finance recently upgraded the country’s tax credit for investments in semiconductor R&D by 20% (Ebrahimi, 2023).

Critical to the global supply of semiconductor is the existence of well-functioning foundry business. Currently TSMC, Samsung, UMC, Global Foundries, and SMIC are major competitors in this industry. However, the duopoly between TSMC and Samsung is the most noteworthy because both firms control 70% of the market and are competing head-to-head in developing the cutting-edge semiconductor technology (see <Figure 1>). In addition, traditional semiconductor powerhouse Intel has recently announced that it will revitalize foundry business and has been investing aggressively to foundry business to catch up TSMC and Samsung.