

THE STRATEGIC ROLE OF SEMICONDUCTOR INDUSTRY

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ABSTRACT

The semiconductor industry that produces microchips plays an increasingly important role in today's world economy. This industry is characterized by cutting-edge technological complexity and prohibitively high costs; both factors lead to the concentration of microchip production in a few major companies in a few countries. The combination of these factors and recent disruptions caused by the pandemic and trade wars underlined the strategic role of semiconductor production. The paper reviews the basics of microchip fabrication, the types of companies in the semiconductor business, the market share of main companies, and the main countries in chip production. The authors emphasize the role of microchips in defense industries and the necessity for national sovereignty in this area. Special attention is paid to the current technological race for supremacy in the semiconductor industry and to numerous national programs to help national companies in bringing inshore chip design and manufacturing expertise.

Keywords: semiconductor industry, microchips, chip fabrication, chip shortage, strategic technology

1. INTRODUCTION

In the last couple of years, microchip industry came to the focus of not only ICT professionals but almost everybody from business analysts to lay people, and it became as popular subject in business discussions as the prices of oil and food. The reason was the global shortage of these tiny electronic components which today are an integral part of almost all tools used in everyday life. Microchips are used to track pets, monitor patients' health, control home appliances, navigate airplanes, to create virtual reality and artificial intelligence systems, and so on. With new technological advances, the potential areas of chip applications are quickly expanding and include now such "traditional" areas like agriculture, healthcare, education, transportation, and construction just to mention a few. That's why when in the middle of the Covid pandemic different businesses ran into a widespread shortage of microchips the issue immediately became a global problem. Thus, due to its universal need, adequate production and supply of microchips turned out to be critically important for economic development and their shortages can seriously affect all areas of business activities.

Today semiconductor chips are extremely complex devices by both design and production processes, by many parameters they can be considered the most sophisticated objects ever made by humans. There are only a few companies in a few countries that rule this industry. The current shortage of microchips helps to underline their strategic importance in current technologies and the pivotal role they play between countries for dominance in modern high-tech industries. Recognition of the key role of the semiconductor industry and increasing competition between countries for sufficient access to microchips led to national programs in the U.S., Europe, and Asia to support and expand national production.

This paper provides a general overview of the semiconductor industry, analyzes its current development, and emphasizes its strategic role. In the next section, we briefly describe the basics of microchip manufacturing. We then review the structure of the global semiconductor industry, the leading companies in this field, and their geographic origins. We also discuss the reasons why the Covid pandemic caused a serious disruption in chip supply. Based on these inputs, the paper discusses the fundamental role of microchips in the current global economy and the competition between the main world economies for leadership in this area. Based on this conclusion, the paper reviews the current national programs and the role of supporting factors with the purpose to boost local chip design and especially production.