

Chapter One Preview

Chip by Chip

From TSMC to Terafab

People, Process & Technology — The TSMC Story

Tesla Yoda

*To understand AI, you have to know Nvidia.
To understand Nvidia, you have to know TSMC.
To understand TSMC, you have to know ASML.
To understand ASML, you have to know Zeiss.
To understand Zeiss, you have to know Optics.
To understand Optics, you have to know Physics.*

To understand all of it, you have to read this book.

PART I: WHY YOU NEED TO READ THIS BOOK

Chapter 1

The Most Important Company You've Never Studied

You own AI stocks. Maybe not directly — maybe through an index fund, maybe through a retirement account someone else manages — but you own them. You own Nvidia, or you own something that depends on Nvidia. You follow Tesla. You have opinions about the future of autonomous vehicles, about large language models, about the data centers going up in Texas and Iowa and the deserts of the Middle East.

You have done your homework. Or you believe you have.

Let me ask you a question: can you explain the single company that every one of those investments depends on?

Not Nvidia. Nvidia designs chips. It does not manufacture them. Not Apple. Apple designs its own silicon now, and that silicon is extraordinary, but Apple does not manufacture it either. Not Google, not Amazon, not Microsoft — all of them design custom chips for their data centers, and none of them can make those chips themselves.

Every one of these companies — every single one — depends on Taiwan Semiconductor Manufacturing Company. TSMC. Ticker 2330 on the Taiwan Stock Exchange. A company

headquartered in Hsinchu, Taiwan, that most investors have never truly examined.

I do not mean they have never heard of it. They have heard of it. It shows up in articles about chip shortages. It shows up in articles about geopolitical risk. The name registers. But registration is not understanding. You can register the existence of gravity without understanding general relativity. You can register the existence of TSMC without understanding why it is, by several measures, the most important company in the world.

Here is what I mean by important. If TSMC's fabs went dark tomorrow — all of them, simultaneously — the consequences would make the 2020 chip shortage look like a minor inconvenience. Every new iPhone would stop. Every new Nvidia GPU would stop. Every leading-edge chip for every major technology company on Earth would stop. The AI revolution would not slow down. It would halt. Not because the software disappeared, not because the ideas disappeared, but because the physical substrate — the silicon on which all of it runs — comes overwhelmingly from one company's fabrication plants on one island in the western Pacific.

This is not a supply chain fact. This is a *civilizational* fact.

The Gap Between Owning and Understanding

Most investors operate in layers of abstraction. They buy Nvidia because AI is growing. They buy Apple because the iPhone is dominant. They buy index funds because the market goes up

over time. Each of these statements is defensible. None of them constitutes understanding.

Understanding means knowing what you depend on.

Understanding means tracing the thread from the product you can see to the foundation you cannot. Understanding means asking the question that almost no one in the AI conversation seems to ask: where does the chip come from?

Not who designed it. Where it was physically manufactured. In what building. On what equipment. By what people. Through what process.

When you ask that question and follow it honestly, you arrive at TSMC. And when you arrive at TSMC, you discover something that should keep every serious investor awake at night, or fill them with confidence, depending on how they process the information: the entire digital economy rests on a manufacturing capability that exists nowhere else on Earth.

Samsung tries. Samsung has spent enormous sums on leading-edge fabrication, and Samsung is not incompetent. But Samsung's yields at advanced nodes have consistently lagged TSMC's, sometimes by margins that are commercially decisive. Intel is trying. Intel has announced tens of billions of dollars in fab investment, rebranded its foundry business, and hired some of the best talent in the industry. It is too early to say they will fail, but it is not too early to say they are years behind and operating from a standing start in a race where the leader has a thirty-seven-year head start.

That head start is the subject of this book.

I am not going to tell you to buy TSMC. I have no interest in your portfolio allocation. What I am going to do is make sure that if you invest in the future of intelligence — artificial or manufactured — you understand the foundation you are building on. If you own Nvidia, you are making a bet on TSMC. If you own Apple, you are making a bet on TSMC. If you own any company that depends on leading-edge silicon, you are making a bet on TSMC. You should understand the bet.

This book is that understanding.

What You Think You Know

Most of what the popular press tells you about TSMC falls into three categories: geopolitics, financial performance, and chip shortages. All three are real. None of them is the story.

The geopolitics conversation is about Taiwan and what happens if there is a conflict in the Taiwan Strait. This is an important conversation. It is also a conversation about risk, not about the company itself. Knowing that TSMC is located on a geopolitically sensitive island tells you something about the risk of owning the stock. It tells you nothing about why the company is great, why no one can replicate it, or why the entire technology industry chose to depend on it in the first place.

The financial performance conversation is about revenue growth, margins, and capital expenditure. TSMC's numbers are extraordinary — operating margins that routinely exceed 40 percent, revenue growth driven by an insatiable demand for

advanced compute, capital expenditure that dwarfs most industrial companies. These numbers are worth knowing. But they are outputs. They tell you what happened. They do not tell you why.

The chip shortage conversation is about what happens when demand exceeds supply. In 2020 and 2021, the world discovered — with some panic — that semiconductors are in everything and that you cannot simply conjure more of them. This was a useful revelation. But the conversation focused on the symptom, not the cause. The cause is that manufacturing leading-edge chips is so extraordinarily difficult that only one company does it well.

This book is about the cause. It is about the people who make the chips, the process they follow, and the technology they use. It is about why the gap between TSMC and everyone else exists, why it is growing, and why closing it would require not just money — not just tens of billions or even hundreds of billions of dollars — but a reconstruction of culture, talent, institutional memory, and compounding trust that cannot be purchased at any price.

Why I Wrote This

TSMC should have written this book. They did not, because telling stories about yourself is not part of the culture. Morris Chang, the founder, built a company that lets the work speak. TSMC does not hold splashy product launches. It does not cultivate a mythology of genius founders in black turtlenecks. Its

annual reports read like they were written by engineers, because they were. The company's idea of public communication is a quarterly earnings call where the CEO answers questions with the precision and emotional restraint of a well-calibrated instrument.

This humility is admirable. It is also a problem, because it means the most important company in the world is also one of the least understood. The gap between TSMC's importance and TSMC's visibility is enormous, and that gap is filled with ignorance — ignorance that leads to bad investment decisions, bad policy decisions, and a casual complacency about a manufacturing capability that took decades to build and could not be replaced in any reasonable timeframe.

I am not that humble. So I wrote it for them.

By the time you finish this book, you will understand TSMC — not at the level of a ticker symbol, not at the level of a headline, but at the level of the system. You will understand the business model Morris Chang invented and why it is so difficult to replicate. You will understand the people — the Taiwanese engineering culture that makes nanometer-scale manufacturing possible. You will understand the process — the thousands of steps, the institutional memory, the relentless pursuit of yield. And you will understand the technology — the physics, the lithography, the materials science — at a level that lets you see the foundation beneath the revolution.

You will also understand why studying TSMC changed how I think about building anything at scale. TSMC is my boot disk —

the operating system I loaded before thinking about everything else. But that is the next chapter.

The story continues.

In ***Chip by Chip***, you will follow the chain all the way
down —

from physics to optics, from Zeiss to ASML,
from the heresy of Morris Chang to the compound
machine,
and all the way forward to Terafab.

Physics → Optics → Zeiss → ASML → **TSMC** → Nvidia
→ AI

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