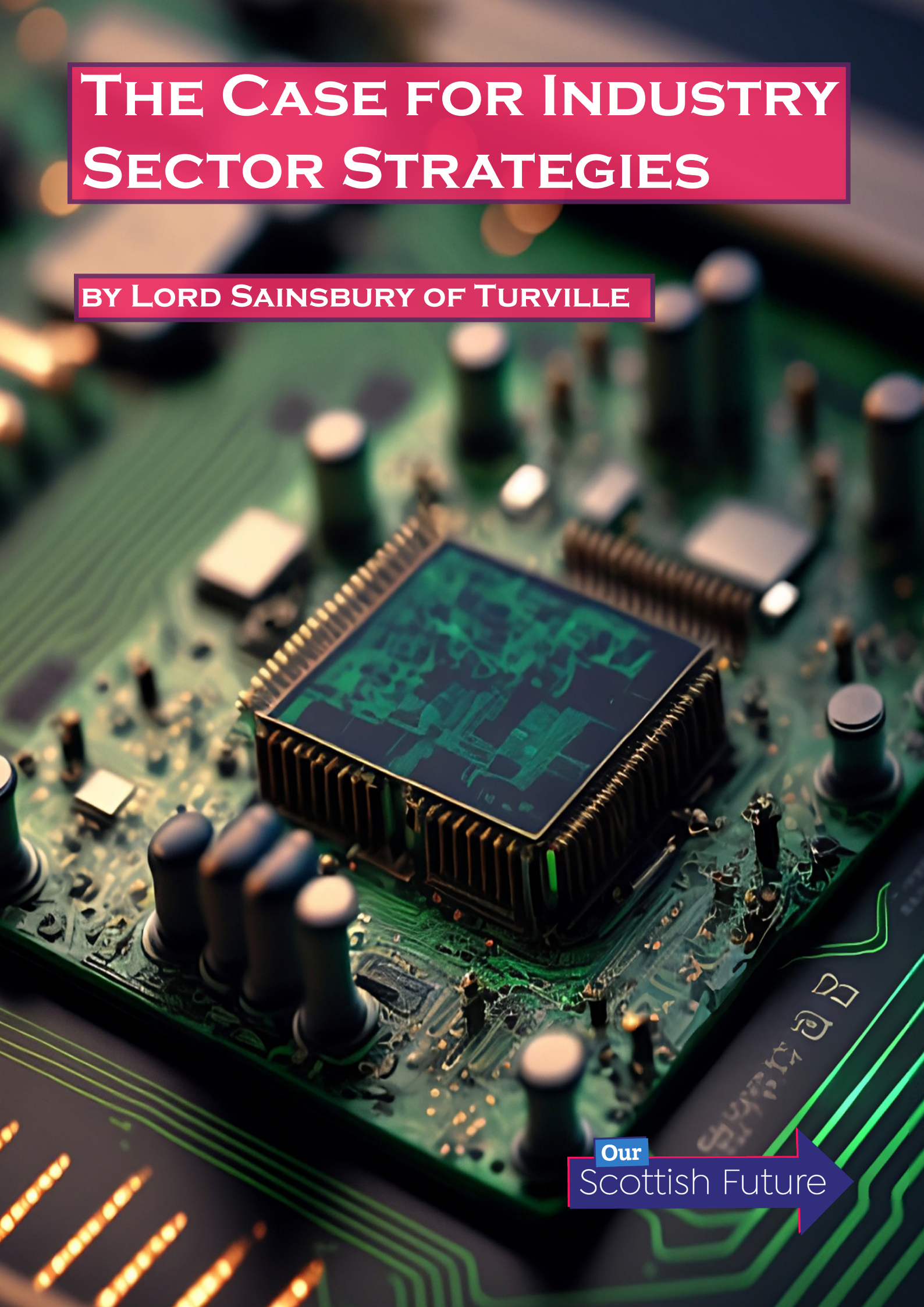
The Case for Industry Sector Strategies

by Lord Sainsbury of Turville



Our Scottish Future

About the author

Lord Sainsbury, Founder of the Centre for Cities

David Sainsbury joined Sainsbury's in 1963, and became Finance Director in 1973, overseeing a period of rapid growth for the company. In 1988 he was made Deputy Chairman, before becoming Chairman in 1992.

In 1997 he entered the House of Lords as a Labour peer. David went on to serve as Minister for Science and Innovation from 1998 to 2006.

David Sainsbury founded the Gatsby Charitable Foundation in 1967, which funds projects in scientific research, engineering education, public policy, African economic development and the Arts. He is the author of the book 'Windows of Opportunity – How Nations Create Wealth' and Chancellor of the University of Cambridge.

Foreword by **Gordon Brown**

Scotland- like the rest of the United Kingdom - is currently a low-growth economy, averaging at little more than 1 percent a year.

Unless we can raise that rate of growth closer to 2.5 percent a year or more in the decades to come, living standards will not rise fast enough and public services will not be properly funded to meet the aspirations of the people of the country.

The best chance for the growth that Britain and Scotland needs is in a productivity surge from innovation and technological progress. Medical, environmental, and information technologies including AI have the potential to deliver the kind of boost in value added output per capita that we have not seen for years. The question is how and to what extent our country will be a beneficiary of this new wave of innovation that is sweeping the world.

Industrial sector strategies for the nations and regions is at the heart of David Sainsbury's proposals for economic and industrial modernisation. It is outlined in this new paper, published by Our Scottish Future, to coincide with our conference on Scotland's economic potential.

David Sainsbury has led the way in new thinking about how we can benefit from what has been called the fourth industrial revolution.

As a pioneering minister of science and innovation from 1997 to 2007, he was responsible for the biggest growth in public investment in science and R&D this country has seen, an investment that modernised our science labs at universities and promoted innovation and technology transfer nationwide.

As the author of 'The Race to the Top,' published in 2008, David proposed a series of changes designed to prepare Britain for the second decade of the twenty-first century, to meet and master an international competition that was no longer just with the advanced economies but the rising economies, in particular China which has been moving quickly into the high-value added goods and services.

So, as David argued, Britain had to be ahead in competition with countries that had once been considered low-cost, low-skilled manufacturing economies but were now becoming high-cost, high-tech centres of production.

As the author of a recent and widely praised book 'Windows of Opportunity', he has used his knowledge of successful industrial polices in America, Europe, and Asia to outline a strategy for national and regional industrial success founded on support for R&D, skills, infrastructure, and better transport networks.

Now in this pamphlet, David shows how industry sector strategies can make the difference between a low growth and high growth economy.

He demonstrates in detail how America, Singapore, South Korea and other economies have moved further and faster than the UK in adopting new technologies and have built their economies around innovation.

He has a challenging conclusion for us: that we will not succeed without 'aiming at, or without at least maintaining, and preferably increasing, the proportion of high value-added manufacturing companies in the economy.' The emphasis on new manufacturing output is important because as he explains: The contribution of North Sea Oil is bound to fall, and it is difficult to see any way we can increase the contribution from Financial Services.....all this suggests that we should focus the government's efforts and industry sector strategies on high value-added manufacturing; the professional and scientific, and information and communication industries; and the new green industries.'

Which is precisely where Scotland's best economic opportunities lie. As our own report published for this conference shows, there are innovative clusters across the country: with precision medicine ready to expand in Glasgow, fintech in Edinburgh, IT including video games around Dundee, and the development of wind, wave hydrogen and carbon capture and storage in Aberdeen and the North East.

As David shows, Scotland's productivity is lagging. Although the overall economy generates £35.33 of value added per hour, this varies significantly across industries ranging from £64.79 per hour in finance and insurance down to only £18.17 for accommodation and food services, and just £26.25 per hour for retail with post 2010 productivity rising only 0.3 per cent yearly. Manufacturing value added was $45.72 per hour and so modern manufacturing strength would deliver a high growth high wage Scotland -but the sector has been declining to just 10 per cent of value added.

What is needed, as David says, is consistent support from government backing those who are the innovators in key industrial sectors. In Scotland's case that means we need to build on our universities' research strengths, expanding the available research support like the Strength In Places Fund that can help Britain's regions and nations become centres of new economic dynamism.

It means we need our two governments working together in cooperation by forming a new unified Scottish Development Fund capable of incentivising key areas of exporting strength.

It will also require a renewed focus on skills including the creation of Scottish "S-Levels", a new national technical qualification, learning from T levels down south, designed to provide a pipeline of talent to growth sectors.

It also means a new Scottish Work Programme, made possible by the devolution of Job Centres, to support not just the unemployed getting back into the labour market, but the low paid and low skilled, by giving them training for higher skilled and thus better paid jobs.

In the 1960s, there was much talk of economic modernisation through scientific change. We talked them about 'the white heat of the scientific revolution'. Now a new scientific revolution is upon us. The transformation may be more likely to revolve around the quiet hum of the computers, the AI revolution, medical breakthroughs and much needed investment in renewables as part of new environmental polices, including a British Energy company, but the time is right for the same kind of ambition we had for our country fifty years ago: towards a radical shift in the structure of our economy.

The prize, as David Sainsbury's work shows, is better jobs based on better skills leading to better living standards and better public services. But the starting point is to harness the benefits of science and technology as we build the industrial economy of tomorrow.

In our country's case we will be building a stronger Scotland in a better Britain.

The Case for Industry Sector Strategies

1. In recent years governments around the world faced with increasing global competitions have been developing successful Industry Sector Strategies. Fearing that their strategic technologies or sectors are weakening, and that this poses a threat to their economic growth, governments have been supporting key sectors of their economies. Notable examples include the European Green Deal, in the USA the Inflation Reduction Act, and the Chips and Science Act. While Canada has its six priority sectors, China has its China 2025 initiative, and Singapore has for a long time had Transformation Maps for its key industries which are agreed by industry and the government.

The Prime Minister and the Chancellor, however, have seen no need to systematically support British industry in the face of fierce global competition. They appear still to cling to the Treasury's view that the good economy is one where the government always takes a hands-off approach, that the only thing that matters is market efficiency, and that if that leads to deindustrialisation and a slow rate of growth so be it.

To see how misguided the Treasury's hostility to any industrial policy is, one only has to look at one of the UK's best success stories of recent years: the vaccine task force.

The task force was essentially a government procurement scheme to encourage pharmaceutical companies to invest in the untested vaccines by taking away the financial risk. The government promised to buy a certain amount of the product in advance and to fast-track its approval. The companies agreed to accelerate research and production. Under the brilliant leadership of Kate Bingham, the task force built a diversified portfolio of vaccines according to an early assessment of their chances of success, and it worked. This should have left behind a huge legacy of home-grown vaccine factories and supply chain investment. But the government immediately reverted to type and the task force was wound up. The pharmaceutical companies' proposals for further factories, subject to a degree of state support, were ignored. They went elsewhere and that was the end of the story.

The Prime Minister and the Chancellor, however, have seen no need to systematically support British industry in the face of fierce global competition

2. The current Industry Sector Strategies initiated by foreign countries differ from national plans and sectoral interventions in the past in four ways:

(i) They are not about bailing out individual loss-making companies.

(ii) They are best drawn up initially by sectors themselves to show how they can increase their size and value-added per capita by innovation, and support by the government in the fields of R&D, technology development, skills and investment.

(iii) They are focused on industries which have the potential to gain competitive advantage internationally and grow. They are not focused on industries in decline or on industries which do not have the scale or capabilities to compete internationally.

(iv) They are very different from the old planned economy approach to industrial policy. The aim of the Industry Sector Strategies is to deploy targeted public investment in those areas that unlock the power and ingenuity of private markets, innovative firms and competition to lay a foundation for long-term growth. It is about crowding in private investment not replacing it.

3. The support of government for Industry Sector Strategies can take the form of supply-side or demand-side policies. Supply-side policies, such as grants, subsidies, tax preferences and tax credits are used by government to reduce the cost of R&D or production.

Economists argue that they may be justified when firms don't have sufficient incentives to invest in risky projects or they underinvest because they will get only a partial share of the total return of their investment.

For example, the European Battery Alliance is channelling billions of euros into research and innovation, while in the United States the IRA provides credit subsidies and loan guarantees for a range of clean energy projects.

Demand-side tools on the other hand typically affect domestic consumption of targeted products or services. They work to increase the size of the market overall. Examples include tax credits for the purchase of an electric vehicle and guaranteed pricing for renewable power sold to an operator of an electrical grid. Government procurement is another demand-side tool, as are tax credits for the installation of renewable-energy generation.

4. If Industry Sector Strategies are to be successful the government must develop the capability to evaluate such strategies. This capability does not currently exist in the Department of Business and Trade, nor in the Treasury, and needs to be developed. Civil servants who ideally have both some industrial and some technological knowledge are required rather than generalist civil servants.

5. There are now plenty of examples of countries developing such Industry Sector Strategies (Appendix A).

6. There are also plenty of examples of individual sector strategies being successful, and two of these: semiconductors in Taiwan and the biomedical cluster in Singapore are described in Appendix B.

7. There is now considerable support from industry for some form of government plan or strategy for supporting industry. The industrial and manufacturing employers body Make UK has called for an industrial strategy and the CBI has called for a plan for growth.

8. There are obviously members of the government who realise that there is a need for such industrial sector strategies. In a recent speech Chancellor Jeremy Hunt highlighted a number of key sectors that he thought might drive the UK economy forward including: digital, the creative sector, green energy, financial services, life sciences and advanced manufacturing.

The Conservative party, however, is split by ideological differences on this subject and is not, therefore, able to put forward a coherent policy. The Prime Minister, for example, when Chancellor of the Exchequer, together with Kwasi Kwarteng, abolished the last industrial strategy. As a result, no effective policy was put in place to develop the Chancellor's key sectors and, equally, there is no clear commitment from the industries involved to innovate and grow their sectors. The strategies seem simply to have been written by friends of the Chancellor.

9. If one looks at the current performance of the different sectors of the UK economy (Appendix C) it is difficult to see how the UK could achieve a growth rate of, for example, 2.5%, which is the sort of figure we should be aiming at, without developing Industrial Sector Strategies to improve the competitiveness of key high value-added British companies.

10. The Labour Party should now adopt a policy of supporting Industry Sector Strategies in addition to policies on macroeconomic stability; horizontal policies to help all industry in areas such as skills, R&D and investment; and regional policy. If the UK is to prosper in today's highly competitive global economy British companies have to become more competitive, and Industry Sector Strategies are one of the key ways that the government can help them be successful.

APPENDIX A: EXAMPLES OF INDUSTRY SECTOR STRATEGIES

This appendix provides examples of industry sectors strategies recently published in the United States, Canada, Singapore, China and Korea.

1. United States

1.1 Executive Order 14017 on America's Supply Chains

On February 24, 2021, President Biden issued the Executive Order 14017 on "*America's Supply Chains*,"[1] which directs the Departments of Commerce, Energy, Defence, and Health and Human Services to identify risks in the supply chain for critical sectors and asks the Secretaries of each Department to offer policy recommendations to address gaps within these sectors' supply chains.

In response to this Executive Order, the report titled "*Building Resilient Supply Chains, Revitalizing American Manufacturing, and Foster Broad-Based Growth*"[2] was published in June 2021. The report was produced by a task force that convened more than a dozen departments and agencies and drew from consultations with hundreds of stakeholders, public comments submitted by industry and experts, and analytic research by experts from across the United States government.

The report outlines a series of policy recommendations aimed at rebuilding production and innovation capabilities in four selected sectors:

· Semiconductor manufacturing and advanced packaging

· Large capacity batteries (mainly for electric vehicles)

· Critical minerals and materials

· Pharmaceuticals and active pharmaceutical ingredients (APIs)

These recommendations include: increasing public investments in R&D and commercialisation of key products, identifying potential U.S. production and processing locations for critical minerals, leveraging the government's role as a purchaser of critical goods, strengthening domestic production requirements in federal R&D grants, working with allies to decrease vulnerabilities in the global supply chains, and creating data hub to monitor near term supply chain vulnerabilities.

1.2 CHIPS Act

The Creating Helpful Incentives to Produce Semiconductors and Science Act of 2022 (CHIPS Act) was signed into law in August 2022 in response to the decline of the U.S. share of global semiconductor fabrication capacity from about 36% in 1990 to about 10% in 2020. This legislation was designed to increase production of semiconductors, strengthen research and design leadership, and grow a diverse semiconductor workforce in the United States. It also seeks to stimulate the commercialisation of cutting-edge technologies, including quantum computing, artificial intelligence (AI), clean energy, and nanotechnology.

In total, the CHIPS Act appropriates US$52.7 billion for the period 2022-2027, providing:[3]

· Direct manufacturing support of $39 billion in the form of grants to construct or modernise domestic facilities and equipment for semiconductor fabrication, assembly, testing, advanced packaging, or research and development;

· An investment tax credit of $24 billion and loan guarantee program of $75 billion for advanced production facilities;

· A $12 billion investment in research and development, including the establishment of government-industry-university technology development centers to strengthen U.S. capabilities in next generation technologies;

· Creation of up to three new manufacturing institutes with a production innovation focus.

1.3 Inflation Reduction Act (IRA)

The Inflation Reduction Act (IRA) was signed into law by President Biden in August 2022, allocating nearly US$370 billion in subsidies through grants, loans and tax credits to public and private entities.[4] The Act aims to catalyse investments in domestic manufacturing capacity, encourage procurement of critical supplies domestically or from free-trade partners, and spur R&D and commercialisation of leading-edge technologies such as carbon capture and storage and clean hydrogen.[5]

The main sectors benefited by the Inflation Reduction Act include:

· clean energy manufacturing (including solar power, wind power, and grid energy storage)

· electric vehicles (including battery manufacturing)

· utilities (including electricity storage)

The Inflation Reduction Act encompasses the following provisions:[6]

· Production tax credits to accelerate U.S. manufacturing of solar panels, wind turbines, batteries, and critical minerals processing, estimated to invest $30 billion.

· $10 billion investment tax credit to build clean technology manufacturing facilities, including facilities that make electric vehicles, wind turbines and solar panels.

· $500 million in the Defense Production Act for heat pumps and critical minerals.

· $2 billion in grants to retool existing facilities to manufacture clean vehicles.

· Up to $20 billion in loans to build new clean vehicle manufacturing facilities.

· $2 billion for National Labs to accelerate breakthrough energy research.

· Roughly $30 billion in grant and loan programs for states and electric utilities.

2. Canada

2.1 Economic Strategy Tables

In March 2016, Canada's Minister of Finance established the Advisory Council on Economic Growth to develop advice "on concrete policy actions to help create the conditions for strong and sustained long-term economic growth".[7] In its report of February 2017, the Advisory Council recommended identifying "a few sectors (e.g., 6-8) where Canada has a strong endowment, untapped potential, and significant global growth prospects."[8]

The need for a focused, sector approach is justified by the Advisory Council as follows: "To be sure, the government should first and foremost adopt policies that enable the economy as a whole to succeed... In practice, however, these policies will meet and take effect within sectors—some of which will benefit from additional policy focus and tailoring aimed at removing specific obstacles."[9]

In 2018, strategies for six priority sectors were published in the so-called Economic Strategy Tables, described as "a new model for industry-government collaboration":[10]

· **Advanced manufacturing,**

· **Agri-food,**

· **Clean technology,**

· **Digital industries,**

· **Health/bio-science, and**

· **Resources of the future**

In 2019, an additional Table was announced to boost Tourism sector revenue by 25% by 2025.[11] Table A1 provides an overview of the *Economic Strategy Tables*.

Table A1: Canada's Economic Strategy Tables overview

Sector	Targets	Policy Actions Proposed
Advanced Manufacturing	• Increase manufacturing **sales** by 50% by 2030 • Increase manufacturing **exports** by 50% by 2030	• Attract local and global investments • Launch a manufacturing skills programme • Support technology adoption for firms • Support manufacturing SMEs
Agri-food	• CA$140 billion in domestic **sales** by 2025 • CA$85 billion in **exports** by 2025	• Improve a regulatory system • Invest in transportation and IT infrastructure • Develop and diversify agri-food markets • Invest in automation and digitisation • Support skills development
Clean technologies	• Clean technology is one of Canada's **top five exporting industries** by 2025	• Regulation • Accelerate growth of technology firms • Use government procurement • Partnership with Indigenous communities • Global markets access
		• Jobs and skills development
Digital industries	• Double the **number of Canadian firms** earning CA$1 billion or more in annual revenue by 2025	• Scale up Canadian businesses • Attract, retain, and support skilled talent • Transform Canada into a digital society • Leverage IP and promote the value of data
Health and Biosciences	• Double **exports** by 2025 • Double the number of health and bioscience **firms and high-growth firms** by 2025	• Accelerate innovation adoption • Design agile regulations • Harness digital technology • Develop and attract talent • Create anchor firms
Resource for the future	• Increase natural resource **exports** by 40% by 2025	• Agile regulation • Strategic infrastructure • Innovation for competitiveness • Indigenous people and communities • Attracting and re-skilling talent

Source: Government of Canada (2018). Report from Canada's Economic Strategy Tables: The Innovation and Competitiveness Imperative

2.2 Global Innovation Clusters

The Global Innovation Clusters programme, formerly known as the Innovation Superclusters Initiative, was launched following Canada's 2017 budget. The initiative was designed to "help strengthen Canada's most promising economic clusters and accelerate growth in highly innovative industries while positioning Canadian firms for global leadership."[12]

The goals of the programme are to create 50 thousand jobs and CA$50 billion in gross domestic product (GDP).[13]To date, the Global Innovation Clusters have received around CA$2 billion of funding and supported more than 500 projects. Canada's government believes that the programme has helped create a strong national brand and sustain or create 23,900 full-time jobs.[14]

Five industry clusters were selected through a competitive process and announced in February 2018 (Table A2)

Table A2. Goals of the Global Innovation Clusters programme

Industry cluster	Goals over a 10-year period
Digital Technology	• CA$5 billion growth in value added • Creation of 13,500 jobs
Protein Industries	• CA$4.5 billion growth in value added • Creation of 4,500 jobs
Advanced Manufacturing	• CA$13.5 billion growth in value added • Creation of 13,500 jobs
Scale Artificial Intelligence	• CA$1.65 billion growth in value added • Creation of 16,000 jobs
Ocean	• CA$14 billion growth in value added • Creation of 3,000 jobs

Source: Government of Canada (2023). Global Innovation Clusters

3. Singapore

3.1 Industry Transformation Maps (ITMs)

Singapore's Industry Transformation Maps are described by the Ministry of Trade and Industry as "broader sector-focused strategies to sustain growth and competitiveness of [Singapore's] economy and industries".[15]

Industry Transformation Maps were originally developed between 2016 and 2018 for 23 industries covering 80% of the country's GDP. These 23 industries are grouped into six clusters: Manufacturing, Built Environment, Trade & Connectivity, Essential Domestic Services, Modern Services, and Lifestyle. Each ITM is led by a government agency or statutory body that takes responsibility for its implementation (Table A1).

The maps aim "to drive industry transformation, support the growth of enterprises and help Singaporeans take up quality jobs and seize opportunities".[16]They are supported by a S$4.5b Industry Transformation Programme announced in the 2016 budget, which is continuously reviewed.[17]

Each ITM aimed to address four central industry needs:

a) productivity growth,

b) stimulating industry innovation,

c) promoting trade and internationalisation, and

d) upgrading industry jobs & skills.

The development and implementation of the ITMs is the responsibility of the Future Economy Council (FEC), which is headed by the finance minister. The council has 31 members from the Government (including eight ministers) as well as senior representatives from industry, unions, and educational and training institutions.

Table A3. List of Industry Transformation Map (ITM) Clusters and Industries

	Cluster	Sector	Lead Agency
1	**Manufacturing**	Energy & Chemicals	Economic Development Board (EDB)
2		Precision Engineering	EDB
3		Marine & Offshore	EDB
4		Aerospace	EDB
5		Electronics	EDB
6	**Built Environment**	Construction (incl. Archi & Engineering services)	Building and Construction Authority (BCA)
7		Real Estate	Council for Estate Agencies (CEA)
8		Cleaning	National Environment Agency (NEA)
9		Security	Ministry of Home Affairs (MHA)
10	**Trade & Connectivity**	Logistics	EDB
11		Air Transport	Civil Aviation Authority of Singapore (CAAS)
12		Sea Transport	Maritime and Port Authority (MPA)
13		Land Transport (incl. Public Transport)	Land Transport Authority (LTA)
14		Wholesale Trade	Institution of Engineers (IES)
15	**Essential Domestic Services**	Healthcare	Ministry of Health (MOH)
16		Education (Early Childhood and Private Education)	Ministry of Education (MOE)
17	**Professional Services**	Professional Services	EDB
18		ICT and Media	Ministry of Communications and Information (MCI)
19		Financial Services	Monetary Authority of Singapore (MAS)
20	**Lifestyle**	Food Services	Standards, Productivity and Innovation Board (SPRING)
21		Retail	SPRING
22		Hotels	Singapore Tourism Board (STB)
23		Food Manufacturing	SPRING

Sources: An overview of the Industry Transformation Maps is available on the Ministry of Trade and Industry (MTI) of Singapore's website: https://www.mti.gov.sg/ITMs/Overview. The MTI website also provides information on the six Maps clusters, namely Manufacturing; Build environment; Trade & Connectivity; Essential Domestic Services; Modern Services; and Lifestyle.

4. China

4.1 The 14th Five-year Plan 2021-2025[18]

Approved in March 2021, the *14th Five-year Plan 2021-2025* defines the set of social and economic development policies as established by China's central government every five years. The five-years plans have had a pivotal role in driving China's development and industrialisation in the past seventy years.

Chapter 8 of the *2021-2025 Plan* identifies key industrial sectors for upgrading China's economy, including:

· integrated circuits

· aerospace equipment

· high-tech ships and ocean engineering equipment

· robots

· advanced railway equipment

· advanced power equipment

· engineering machinery

· high-end CNC (Computer Numerical Control) machine tools

· medicine and medical equipment

4.2 Made in China 2025[19]

Issued by the State Council of China in 2015, '*Made in China 2025*' is the first ten-year action plan for the implementation of the China's strategy for becoming amanufacturing superpower. China's manufacturing development strategy includes three phases: 1) joining the ranks of major manufacturing countries by 2025, 2) rising to the middle of this group by 2035, and 3) becoming the leading manufacturer in the world by 2049—the 100th anniversary of the establishment of the People's Republic of China.

This action plan targets 10 key sectors:

1) New-generation IT industry

2) Numerical control tools and robots

3) Aerospace equipment

4) High-tech ships

5) Railway equipment

6) Energy saving and electric vehicles (EVs)

7) New materials

8) Biomedical and medical devices

9) Agricultural machinery

10) Power equipment.

4.3 Selected sectoral policies

A selection of sector policies currently being implemented in China is summarised in the following table.

Table A4. Selected sectoral policies in China

Sector	Strategy	Notes
Electric Vehicles	Development plan for the EVs industry (2021-2035) issued in **2020**	• **Target**: sales of new EVs to account for 20% of total new vehicle sales by 2025
Photovoltaics	Action Plan for the Innovative Development of the Smart Photovoltaic Industry (2021-2025) issued in **2021**	• **Aim:** improving the role of China within the global value chain of photovoltaics
Energy Electronics	Guiding Opinions on Promoting the Development of the Energy Electronics Industry issued in **2023**	• **Aims:** make the energy electronics industry effectively support the large-scale application of new energy sources
Biogas	Guiding Opinions on Promoting the Industrialization of Biogas Development issued in **2019**	• **Main target:** the annual production of biogas will exceed 10 billion m^3 by 2025
Robots	Development plan for the robot industry during the period of the 14th five-year plan (2021-2025) issued in 2021	• **Aim:** achieving over 20% annual growth of the income in the robot industry by 2025
Big data	Development plan for the big data industry during the period of the 14th five-year plan issued in 2021	• **Main target:** big data industry to exceed RMB 3 trillion (~US$ 411 billion) by 2025
Medical devices	Development plan for the medical device industry during the period of the 14th five-year plan issued in **2021**	• **Main target:** to establish the capacity to comprehensively satisfy the demand of public health and healthcare by 2025
Industrial machinery industry	Action Plan for the Development of Intelligent Inspection Equipment Industry (2023-2025) issued in **2023**	• **Main target:** deepen the application of intelligent inspection equipment, and incubate over 30 start-ups and SMEs in the sector
	Action Plan for the Development of Basic Electronic Components Industry (2021-2023) issued in **2021**	• **Main target:** the sale volume of electronic components to reach RMB 2100 billion (~US$ 290 billion) and have 15 enterprises with more than RMB 10 billion (~US$ 1.4 billion) annual income
Software and integrated circuits	Policies for High-Quality Development of the Integrated Circuit Industry and Software Industry in the New Era issued in **2020**	• **Aim:** support the ICT and software industry, and deepen international collaboration

Note: the selected policies outlined in the table are led by the State Council, the various Ministries, and other public bodies such as National Energy Administration, the People's Bank of China (PBOC), the State Administration for Science, Technology and Industry for National Defence (SASTIND), and the State Administration of Work Safety.

Source: Various sources, links available in the table (most of the references are in Chinese).

5. Korea

5.1 Special Measures Act on Strengthening and Protecting Competitiveness of National High-Tech Strategic Industries (the 'Special Act')[20]

Enforced in August 2022, the 'Special Act', aims to ensure national and economic security, promote national strategic technologies, and improve Korea's competitiveness in the high-tech strategic industries.

Through the Special Act, Korea's Ministry of Trade, Industry and Energy (MOTIE) has designated the following sectors as 'national high-tech strategic industries': [21]

- **Semiconductors**
- **Displays**
- **Secondary batteries**
- **Biotech industries.**

5.2 First Basic Plan for Nurturing National Strategic Industries (2023-2027)[22]

After the implementation of the 'Special Act' in August 2022, the Ministry of Trade, Industry and Energy (MOTIE) issued its first plan to address the development of the designated national strategic industries in May 2023. This plan includes an investment of over KRW 550 trillion (~US$ 400 billion) by 2027.

In September 2023, the government published a 'Follow-up action plan for fostering high-tech industry global cooperation'. In this updated policy paper, the government provides subsidies for KRW 400 billion (~US$ 295 million) in 2024 and KRW 2.2 trillion (~US$ 1.6 billion) over the next five year "in order to enhance the competitiveness of our industries and stimulate new growth engines".[23]

5.3 Selected policies targeted to domestic high-tech industries

Table below outlines selected sectoral policies issued by the Ministry of Trade, Industry and Energy (MOTIE) as well as the K-CHIPS ACT, the national strategy to support semiconductor value chain, approved by the National Assembly in March 2023.

Table A5. Selected sector policies in Korea

Sector	Strategy	Description
Semiconductor	Act on Restriction of Special Taxation (K-Chips Act) approved in March 2023 and led by the National Assembly	• **Key actions:** Providing a 25% to 35% tax credit for semiconductor facility investment, and 30%-50% tax credit for relevant R&D investments. **Additional sources:** Arrian Ebrahimi and Joon Kang (2023). South Korea's Semiconductor Funds Highlight a Partisan Battle
Display	Display Industry Innovation Strategy issued on 18 May 2023 and led by MOITE	• **Key actions**: tax credit; deregulation; public investment in R&D of KRW 1 trillion (~USD 738 million). **Additional sources:** Korea's Ministry of Trade, Industry and Energy (2023). MOTIE announces innovation strategy for Korea's display industry
Secondary battery	Secondary Battery Industry Innovation Strategy issued in November 2022 and led by MOITE	• **Key actions:** government R&D investment of over KRW 1 trillion (~USD 738 million) by 2030. **Additional sources:** KDI (2022). Ministry of Trade, Industry and Energy announces joint public-private "Secondary Battery Industry Innovation Strategy" Batteries Europe (2023). Battery Innovation System of South Korea; STIP COMPAS (2023). The innovation strategy for the rechargeable battery industry
Biotech	Bio Economy 2.0 Initiative issued on 20 July 2023 and led by MOITE	• **Main target:** increase Korea's bio economy production and export value to USD 74 billion and USD 50 billion, respectively, by 2030. **Additional sources:** Korea's Ministry of Trade, Industry and Energy (2023). Korea announces Bio Economy 2.0 Initiative

Source: Various sources, links available in the table (some of the references are in Korean).

APPENDIX B

Singapore's Biomedical Cluster[24]

· In 2000 the Singaporean government launched a strategy to develop the biomedical industry within Singapore, and in late 2003 it launched Biopolis, a purpose-built campus, which has become an example of global best practice in the formation of an innovation cluster.[25]

· Since then, Singapore has managed to move from a pharmaceutical manufacturing outpost to a location for biomedical activities across the whole innovation and manufacturing value chain.

· The government of Singapore has acted as a leading development agent in the development of the domestic biomedical manufacturing industry, which encompasses the combination of the activities of the pharmaceutical and medical technology sectors.

· The early stages of Singapore's strategy focused on the development and attraction of scientific talent and proactive pursuit of Foreign Direct Investment (FDI). These efforts have materialised recently, with many companies locating manufacturing, research and management activities in the country.

· The Singaporean government led the coordination of public organizations supporting manufacturing and innovation, including the Economic and Development Board (EDB), the Agency for Science, Technology and Research (A*STAR), the Ministry of Trade and Industry, the Ministry of Education, the Ministry of Health and the National Research Foundation. EDB and A*STAR through the Biomedical Research Council (established in 2000), have played particularly important roles.

· The efforts to create a biomedical manufacturing sector in Singapore are widely regarded as an economic success. As of 2019, the biomedical manufacturing sector represents 20% of total manufacturing value added (S$19.57bn, or £11.14bn), equivalent to 4% of Singapore's GDP (Figure 1).

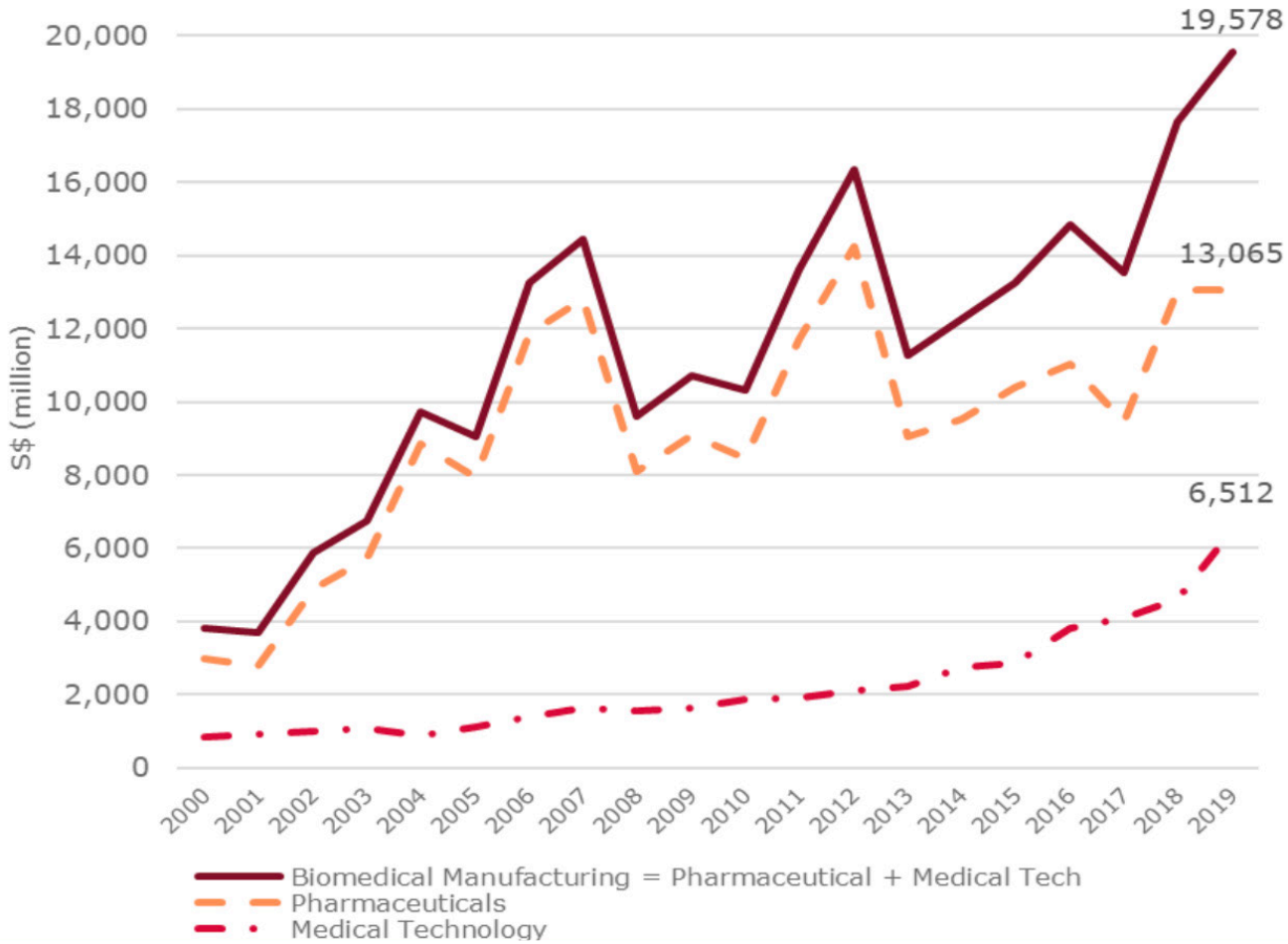
· The policy measures that supported the strategy included: government-sponsored global headhunting of the world's top scientists; publicly funded research institutes and a biomedical science park; scholarship programmes for human resource formation in leading global and local universities; government venture capital for private-sector industrial projects and holistic integration of research activities; as well as more traditional tax incentives and IP frameworks.

· The attraction of activities across the biomedical manufacturing chain, including R&D, supported increased investments in basic science.

· Through this whole-system approach, Singapore was able to meet and exceed its value added targets for the biomedical manufacturing industry, which were set every five years up to 2015.

· Biomedical manufacturing job targets were reached at each juncture of the strategy. However, the targets to increase R&D to a proportion of GDP were not met, and the ratio of public to private spending on R&D in the biomedical sector still lags behind the national R&D average.

Figure 1 Singapore: Value added in biomedical manufacturing, 2000–201



Source: Cambridge Industrial Innovation Policy (2021). Singapore's Biomedical Cluster - Lessons from two decades of innovation and manufacturing policy . IfM Engage, University of Cambridge.

Taiwan Industrial Strategy – Semi-conductors

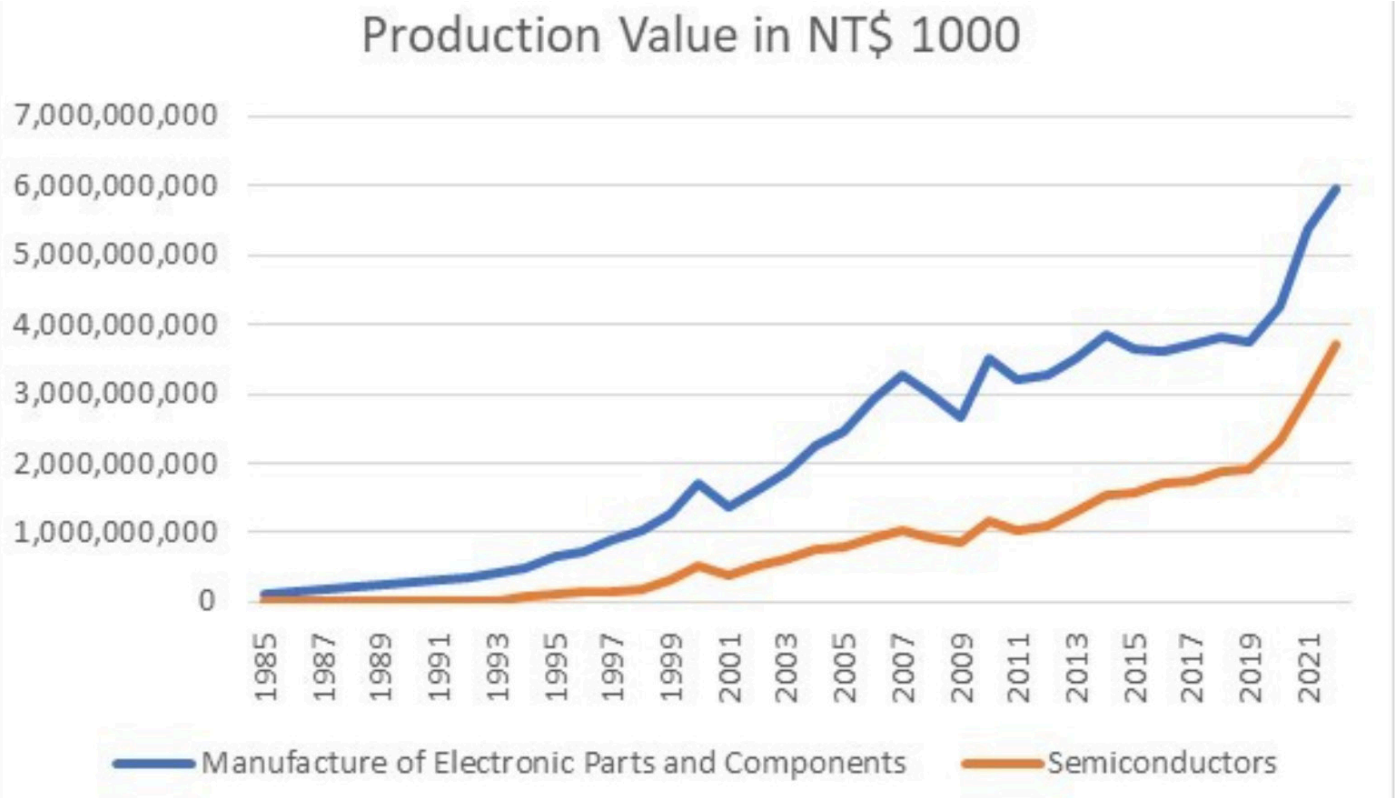
Taiwan entered the semiconductor supply chain in the 1960s along with other East Asian countries including Hong Kong, Singapore, Malaysia and South Korea. This contribution to the supply chain was to assemble and package semi-conductors that were designed and manufactured in the United States. General Instrument and Texas Instruments both set up assembly plants in Taiwan.

By 1985 Taiwan had become a leader in assembling semiconductor devices, testing them and attaching them to plastic or ceramic packages. While Taiwan had plenty of jobs in the sector it captured only a very small share of the profit. Most of the money in the chip industry was made by the design and production of the most advanced chips. Moreover by the mid-1980s, the assembly jobs looked like they might increasingly shift to China given the significantly lower wages. The Taiwan government realized that to boost growth across the economy, it would need to advance beyond assembly and move into fabrication or face losing its position in the semi-conductor supply chain.

Morris Chang, who had worked for Texas Instruments between 1958 and 1983, had played a leading role in building up the global semiconductor industry. In 1985 he was asked by Minister KT Li to set up Taiwan's advanced capabilities and was put in charge of the Industrial Technology Research Institute. Chang proposed to develop Taiwan as a fabrication centre and manufacture chips designed by customers. Crucially, Chang's concept was not to play catch up – but instead do something different that would add value to the industry. He had already proposed this idea to Texas Instruments but they rejected it, however, this idea had also started to gain traction in Taiwan since the early 1980s.

This led to the formation of TSMC which the government provided 48% of the startup capital. Chang convinced Phillips, the Dutch firm, to transfer its technology production to Taiwan for a 27.5% stake in TSMC. The rest of the capital was raised from wealthy Taiwanese who were asked by the government to invest. Chang then employed a team of highly experienced professionals who had worked for him in the US to build up TSMC's capabilities as a fabrication facility.

Between 1985 and 2022 the compound annual growth rate (CAGR) for manufacture of electronic parts & components was 11% pa, while semiconductors which is a subsector of electronic parts grew at an astonishing 21% pa.



Source: MOEA, ROC

Although TSMC subsequently became the anchor for the sector – crucially this stimulated innovation and development across the broader semiconductor supply chain raising the contribution of semiconductors to around 15% of GDP. TSMC alone contributes about 4.5% of Taiwan's GDP.

Key Takeaways:

· The industrial strategy was developed by a world leading expert from the private sector who employed a highly skilled team and which was consistently supported by government over the long term.

· The strategy was not to play catch up, but to do something innovative and add value to the industry.

APPENDIX C

Sectoral Productivity Performance of the UK economy since 2010

Labour productivity or value added per hour increases when firms are able to raise their competitiveness and generate higher value added for their products and services - sometimes described as the within effect. In addition, labour productivity increases when labour moves from lower value-added sectors to higher value-added sectors - often described as the between effect. Value-added per hour varies widely across sectors from Mining & Quarrying (North Sea oil & gas) generating the highest level of value-added per hour at £144.41, to Accommodation & food service activities which has the lowest at just £20.14 per hour. (Table 1)

Table 1: Variation in value-added per hour by sectors

Selected industry aggregations	Value added per hour - 2021 prices
Whole Economy	£40.02
Mining & quarrying (North Sea oil)	£144.41
Electricity, gas, steam & air conditioning	£132.84
Financial & insurance activities	£96.28
Information & communication	£51.84
Manufacturing	£45.85
Construction	£31.59
Administrative & support service activities	£24.60
Transportation & storage	£23.87
Agriculture forestry & fishing	£21.02
Accommodation & food service activities	£20.14
Source: ONS	

Examples of the within effect include Apple successfully enticing consumers through marketing and design to pay more for their products than equivalent providers, and Tesla innovating with a mass-produced electric car. Examples of the between effect include the shift from agriculture to manufacturing during the Industrial Revolution. More recently between 2010 – 2021, the computer programming sector (Information & Communication) contributed 0.7% to productivity growth through the between effect due to an increase in its labour share due to growth in the digital economy.

A sectoral disaggregation of the economy helps to understand which sectors are driving productivity growth and crucially whether that contribution is coming from increased value-added or an increase in the labour share. When sectors such as manufacturing increase their value-added through more automation there is a tendency for labour share to reduce. If the sector is internationally competitive the within effect will significantly outperform any negative re-allocation effects, whereas less competitive firms will only experience marginal increases.

Unfortunately for the UK, while the private sector economy experienced an overall increase in value-added between 2010-2021 of 15.7%, it was impacted by a significant negative contribution of -13.3% as labour share moved towards lower value-added sectors. This is why overall private sector productivity growth between 2010-21 was just 2.4% or 0.2% per annum as highlighted in Table 2 indicating poor competitiveness across many sectors.

Table 2: Sectoral contribution to productivity growth

Broad Sector	Within Effect 10-21	Between Effect 10-21	Total LP Productivity Growth 2010-21	Share of GVA 2021
Public Sector	-1.5%	3.3%	1.8%	20.2%
Administrative & Support services	1.0%	0.3%	1.3%	5.1%
Professional & Scientific	-0.5%	1.7%	1.2%	7.7%
Information & Communication	12.8%	-12.0%	0.7%	6.5%
Construction	0.6%	0.1%	0.7%	5.9%
Agriculture	0.4%	-0.2%	0.1%	0.8%
Wholesale & Retail	-0.6%	0.8%	0.1%	10.5%
Financial Services	0.2%	-0.1%	0.1%	8.8%
Utilities	0.3%	-0.2%	0.1%	2.9%
Accommodation & food service	0.0%	0.0%	0.0%	2.4%
Arts, recreation & other services	-0.2%	0.0%	-0.2%	2.8%
Manufacturing	3.5%	-3.8%	-0.3%	9.7%
Transportation & Storage	-1.1%	0.6%	-0.5%	3.3%
Mining & Quarrying	-0.6%	-0.3%	-0.9%	0.8%
Total (excl real estate activities)	14.2%	-10.0%	4.2%	
Total Private Sector (excl real estate activities)	15.7%	-13.3%	2.4%	

Source: ONS (GEAD Sectoral disaggregation based on Tang & Wang 2004)

Table 2 indicates that 21% of the private sector economy contributed negatively to productivity growth. For example, while the UK manufacturing sector experienced a 3.5% increase in value-added, its fall in labour share of -3.8% resulted in an overall -0.3% contribution to labour productivity. In addition, the decline in North Sea oil and gas extraction, which is a high value-added sector, will continue to generate a negative contribution as its labour share declines.

Of further interest is the fact that 42% of the private sector economy was static between 2010 and 2021, and in terms of the sectors experiencing growth (37% of the private sector economy) only Information and Communication has a higher than average value added across the economy.

The important point to understand about the figures is that it is difficult to see any way that the economy can achieve a growth rate of, for example, 2.5% which is the sort of figure we should be aiming at, without at least maintaining, and preferably increasing, the proportion of high value-added manufacturing companies in the economy.

The contribution of North Sea Oil is bound to fall, and it is difficult to see any way we can increase the contribution from Financial Services. Any strategy here is likely to be defensive. It should, however, be possible to increase the contributions of the professional and scientific, and the information and communication industries.

All this suggests that we should focus the government's efforts and industry sector strategies on high value-added manufacturing; the professional and scientific, and information and communication industries, and the new green industries.

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