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Building on a swamp: institutions for industrial policy

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Working Paper

Abstract

The success of the Asian Miracles derived from their industrial policies that followed the same key principles, namely, the pursuit of sophisticated sectors, export orientation, and competition with accountability. They also relied on a similar institutional setup, in which a leading agency oversaw the conduct of industrial policy in line with these principles. We illustrate the role of these agencies in the development of semiconductors in Taiwan and the automotive industry in Korea, arguing that their action was characterised by the 4A model: Ambition-Agency to develop sophisticated and export-oriented industries led by domestic firms; Autonomy from undue political or rent-seeking meddling; Accountability, both internally and externally, namely, vis-à-vis the executive, other government agencies, and the private sector; and Adaptability to the changing political and economic conditions.

Introduction

Many countries in the Asia-Pacific region have grown at relatively high and sustained rates over the past half century. Such economies as Bangladesh, China, India, Indonesia, Malaysia, and Thailand reached middle-income status. However, the performance of the Asian Miracles—Japan, Korea, Taiwan, Singapore, and Hong Kong—reaching high-income status within a generation, remains an exception, even in Asia. The stakes are high in explaining the growth gap as it largely translates to the gap in living standards with large negative implications for people at the bottom of the income distribution. The standard growth recipe, or the Washington Consensus "narrative" (Cherif, Enger, and Hasanov 2024), centred around the provision of public goods, macroeconomic stability, and a conducive environment for investment and business cannot explain the divergence in growth outcomes. Indeed, many countries in the Asia-Pacific region, especially middle-income ones, have been scoring relatively high along these dimensions, and higher than the Asian Miracles in the 1970s and 1980s, at the onset of their high growth period. Meanwhile, the rich (and growing) literature, arguing that the success of the Asian Miracles stems from their industrial policy (IP), offers a compelling case for the importance of industrial policy in achieving high sustained growth (e.g., Johnson 1982, Amsden 1989, Chang 2002, Evans 1995, Wade 1990, Cherif and Hasanov 2019a).

While many countries in Asia applied some sort of industrial policy, what distinguished the Asian Miracles from the rest of Asia and other developing countries was the key principles they followed (Cherif and Hasanov 2019a): state intervention to correct market failures and steer resources into sophisticated sectors, led by domestic firms; export, export, and export; and encouraging competition among domestic firms and accountability for the support received. These principles ensured that their industrial policy led to a continuous expansion of the set of tasks and capabilities, sustaining high productivity growth (Lucas 1993) and avoiding the pitfalls of import-substitution industrialisation, or ISI (Cherif and Hasanov 2024).

To translate these principles into practice, the Asian Miracles developed a specific institutional apparatus unlike most other developing economies. At its core, there was a leading agency such as the Ministry of International Trade and Industry (MITI) in Japan or the Economic Planning Bureau (EPB) in Korea, which had two major tasks: (i) targeting specific sectors and coordinating among the different agencies, ministries, and firms to

implement the comprehensive set of policies needed and potentially unknown *ex ante*; (ii) accumulating the context- and sector-specific knowledge required to uncover and formulate these policies, akin to the concept of *metis* (Scott 1998). It entails knowledge of technologies, value chains, markets, and local and international conditions. A substantial part of this knowledge cannot be easily codified, and it is typically the result of trial and error, or experimentation, and continuous communication with and feedback from all the stakeholders, that is, "embeddedness" (Evans 1995).[1]

The need for a leading agency to target specific industries stems from the existence of the myriad requirements that are necessary for an industry to emerge and grow. These include tackling market failures preventing the emergence of sophisticated industries that are conducive to sustained productivity growth. These market failures include learning externalities and coordination failures resulting in subpar investments, or none at all, without other firms entering the industry and the state providing industry-specific quasi-public goods such as specialised training and infrastructure. Broad or horizontal mandates and responsibilities scattered across various agencies and ministries—fragmented mandates of the state—make meeting these requirements hard in the presence of high coordination costs and political economy constraints.

A leading agency takes up on this coordinating and implementing role. In other words, developing a high-tech sector requires many policies, some akin to "soft" industrial policy tools, e.g., wet labs, catalyst finance, or export promotion, and others "hard" tools such as direct financial support (e.g., subsidies) although the latter is not necessarily needed (Cherif and Hasanov 2024). A successful IP cannot be summarised by a single tool such as a subsidy or a cheap loan, and to a large extent, it cannot be set *a priori* as industry-specific quasi-public goods and market failures, coupled with the appropriate policies to tackle them, are largely unknown, requiring an institution to accumulate the knowledge to uncover and implement them.

While the institutional setup, centred around a leading agency, can be described the *hardware* of the institutions for IP, the *software*, that is, the operational design for a set of actions, is embodied in the 4As model. The 4As are (i) Ambition-Agency, that is, ambitious goals and the agency to achieve them; (ii) sufficient Autonomy to design policies and experiment without undue meddling; (iii) Accountability to ensure the alignment with the

[1] For more details, see forthcoming Cherif, Hasanov, and Xie (2025).

goals along the three dimensions: vertical, vis-à-vis the executive; horizontal, vis-à-vis other government agencies and firms; and internal, within the leading agency; and (iv) Adaptability to changing conditions (e.g., economic, technological, and social).

In the next two sections, we illustrate the role of the leading agency and the 4As framework in the development of two sophisticated industries, semiconductors in Taiwan and automotive in Korea. We conclude by drawing lessons for the economies of the Asia-Pacific region.

Building a silicon dragon: Taiwan's semiconductor industry

In the 1960s, the odds were stacked against Taiwan's successful development of the semiconductor industry, one of the sophisticated industries of the time. Domestically, private firms were unwilling to assume the risks of investing in the new field, at the limit of the global technological frontier. Taiwan, which was barely a middle-income country (Chief and Hasanov 2019b), also lacked the human capital to support an indigenous technology-based manufacturing. It only had 2,000 science and engineering graduates every year for a population of about 12 million, much lower compared to its size than the average in countries with established companies. Internationally, the semiconductor industry was already well-established in other industrialised countries, and the market was dominated by large and vertically integrated companies (Greene 2009).

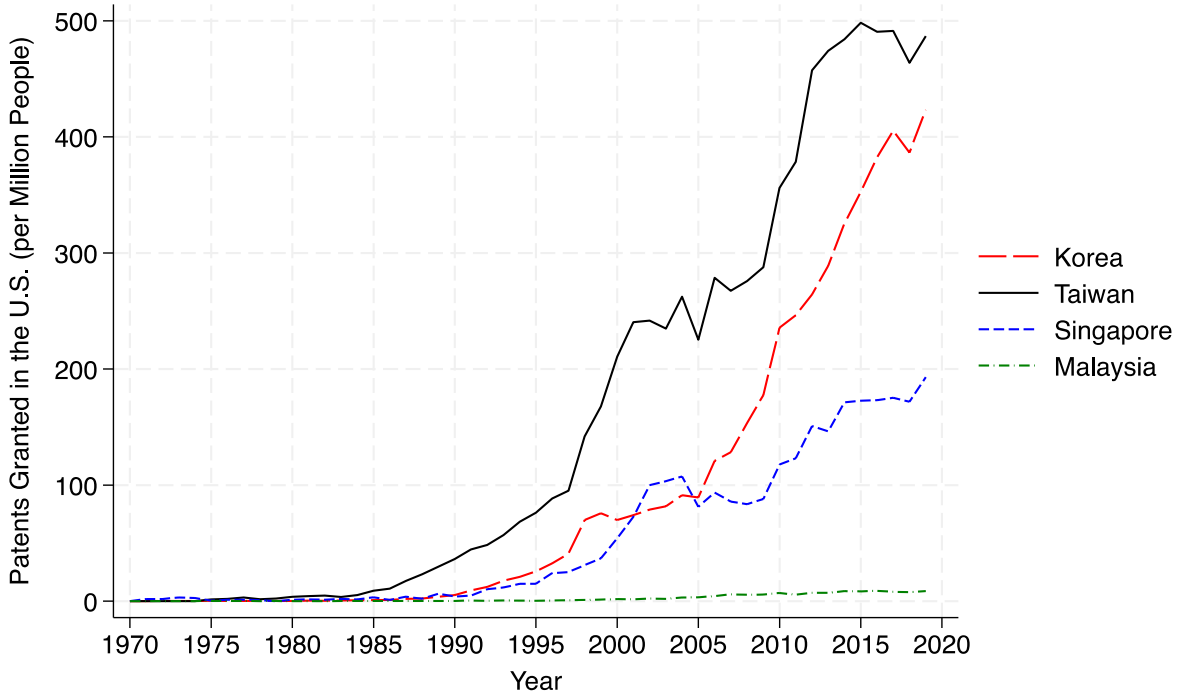
However, within two decades, by the late 1980s and early 1990s, Taiwan emerged as one of the world's largest exporters of semiconductors. Newly created small firms, which grew rapidly, sprang to the forefront of the technological frontier, leading the world in innovation and production (Mathews 2006). For example, in 2013, Taiwan's TSMC was the largest semiconductor manufacturer in the world, taking 50% of international market share (Cherif and Hasanov 2015). The yearly production value of Taiwan's IT industry went from 100 million dollars in 1981 to about 6 billion dollars in 1990 and 34 billion dollars in 1998 (Huang 1995).

Not only did Taiwan become a major manufacturing hub, but it also leapfrogged to the technological frontier and innovation within a generation. Taiwan's firms created a dynamic environment that encouraged competition and research and development (R&D) spending. As Saxenian and Hsu (2001) observed, Taiwan ranked above all G7 countries

except the United States (US) and Japan in per capita patent grants by the late 1990s (Figure 1).

Taiwan's "miraculous" change from poverty in the 1960s to the successes of the 1990s cannot be explained by the working of market forces alone. In his seminal study, Wade (1990) gives a detailed account of the context and actions that led to Taiwan's emergence as a powerhouse for the semiconductor industry and shows how the market was governed by the *institutions*. This section illustrates the role of the leading agency to support semiconductor industry through the lens of the 4As framework and shows a path for replicability, emphasising the actions rather than the policies.

Figure 1. Annual US Patent and Trade Office Utility Patents Granted (1970-2019)



Source: USPTO.

Ambition-Agency

Taiwan's industrial development was spearheaded by the Council for Economic Planning and Development (CEPD). The CEPD matched the roles of the leading agency in terms of both sector-specific, including electronics, and cross-sectoral coordination. However, the CEPD was not alone, and it worked in coordination with other institutions to develop semiconductors. We highlight two institutions, which played complementary roles to the

CEPD, specialising in manufacturing and technology, and which were not involved in economy-wide tradeoffs. If one thinks of the Taiwanese leading agency as a network of agencies replicating the structure of Japan's MITI, the CEPD would be the umbrella institution, encompassing vertical sector-specific "departments" where context- and sector-specific knowledge, *metis*, was accumulated.

The most important institution in the CEPD's effort to support semiconductor industry was the Industry Technology Research Institute (ITRI). ITRI was created in 1973 with the intent to develop sophisticated industries in Taiwan. Its creation was itself the result of the aggregation of several sector-specific institutes, including electronics, machinery, and standards and measurements. Shortly after its creation in 1947, ITRI acquired the Electronics Research Services Organization (ERSO), a newly created institution that would play a key role in the development of the future giants such as TSMC.[2] In the 1980s, ITRI employed more than 4,000 specialists in electronics, including scientists, technicians, and engineers, all dedicated to developing the private sector in sophisticated industries. It is probably the best illustration of the public sector's mighty effort to accumulate specialised knowledge, *metis,* and, as it turned out, with substantial returns in the future.

The early efforts to target electronics had started in the 1960s followed by a landmark establishment of ITRI in 1973, but these efforts became better coordinated and received more attention and resources in the late 1970s after the creation of the CEPD in 1977. Semiconductors were intentionally targeted by the CEPD, which drafted medium-term plans articulating the ambitions and mobilising resources to achieve its aims. The sixth four-year plan, promulgated in 1974, encouraged technological research (Gold 2015) before being replaced by the six-year plan in 1976 with the same focus. At the sectoral level, the 1979 Science and Technology Plan gave detailed guidelines for the medium-term development of Taiwan's innovation and research capabilities (Greene 2009). These plans helped identify the level of ambition and the coordinated efforts to promote technological research.

Although the CEPD was nominally a planning agency and relied on formal multi-year plans, in practice, it behaved in stark contrast to the typical planning agency of the rest of the developing world. Instead of producing detailed metrics to be achieved such as production targets (or local content requirements) and creating unintended incentives, the

[2] See Wade (1990), page 98 footnote 20.

plans specified priority industries, as a signal to all the agencies and the private sector for entry and coordination, dedicating the resources and offering guidelines to achieve the targets. To assess its success, it relied on market signals difficult to falsify such as export performance.

Interest alignment between the leading agency and the political executive was a necessary prerequisite for the state to start formulating its ambition, and Taiwan's semiconductor research efforts kickstarted after a change of leadership to one that was more sympathetic to technological upgrading. Greene (2009) observes that the Taiwanese regime was uninterested in technological industry policy in the 1960s. Discussion about technological upgrading was limited to academics and foreign advisors, largely dismissed by public agencies. However, in 1972 Chiang Ching-Kuo's appointment as the Premier brought about a shift in the policy discussion. Chiang Ching-Kuo was more friendly to foreign advisors than his father, Chiang Kai-Shek, and was more interested in technological upgrading as shown by the flurry of initiatives that followed. Chiang Ching-Kuo approved plans to establish and fund new institutions such as ITRI and ERSO to lead R&D efforts. After assuming leadership in 1975, Chiang Ching-Kuo approved plans to build the Hsinchu Science Park that officially opened in 1980, another landmark that became Taiwan's Silicon Valley and a powerhouse for its technological upgrades. These agencies and projects led by the Economic Planning Council (1973-1977) and its successor the CEPD (1977-2014), played a major role in leading the economy's research efforts.

Taiwan recruited heavily from both domestic and foreign elites to formulate its ambitions in the semiconductor field. Domestically, Chiang Ching-Kuo recruited top bureaucrats, who had a vision of technology exports as an engine for growth, such as Li Kwoh-ting to lead the effort, influencing and protecting the CEPD and ITRI.[3] Taiwan also sponsored thousands of students to pursue their graduate studies in engineering and sciences abroad, with a particular emphasis on electronics, especially in the United States. Sometimes the entire graduating class of Taiwan's most elite universities (Taiwan National University, Jiaotong University, and Qinghua University) would be sent abroad, concentrating on the Silicon Valley (Greene 2009) and creating a "community of excellence in engineering." [4] [5] For two decades, the vast majority of these students would not return, settling in the US

[3] He was appointed as Minister without Portfolio in 1979 in charge of technology promotion (Yu 2007). He was known later as Taiwan's "Godfather of Technology."

[4] See Cohen and DeLong (2016) on Hamiltonian economics and US economic history.

[5] The sense of community of Taiwanese in the Silicon Valley was actively promoted by organisations set up by the Taiwanese public sector for this purpose (Cherif and Hasanov 2019b).

and later playing an important role in setting up links between Silicon Valley and Hsinchu Science Park. Meanwhile, the first returnees were crucial in starting projects and leveraging their personal relations with the electronics community in the US

Taiwan's willingness to consult foreign experts and recruit elites, regardless of their backgrounds, helped push forward its ambition. Taiwan established the Science and Technology Advisory Group (STAG) in 1979, an advisory institution that held *de facto* veto power over technology policy. It was composed of internally recognised experts in the industry and almost entirely of foreigners of non-Chinese descent (Greene 2009).[6] STAG was a shortcut to import specialised knowledge, *metis*, in the early stages and it played a critical role in shaping Taiwan's ambition by promoting technological leapfrogging and clustering early on (Fuller 2002 and Greene 2009).

Autonomy

Taiwan's CEPD and ITRI had autonomy from the political process, which helped them develop policies. The agencies achieved their autonomy through a three-pronged strategy, similar to how central banks achieved their independence in the 2000s and 2010s: personnel, financial, and policy/operational independence (Cherif, Hasanov, and Xie 2026).

In terms of personnel independence, the establishment of STAG illustrates well the flexibility in the recruitment, including of foreign talent. ITRI also appointed many technocrats who had previous experience in the technology field. Taiwan was able to resist political interference in the appointment of its staff as entrance was often based on competitive exams and outside of the standard public wage schedule. The incentive to attract talents to these institutions was not always in the form of compensation given the prestige they had in society (Wade 1990, page 214).

ITRI, which had the largest outlays on technology development, had financial independence. The agency did not need to appeal to the Legislative Yuan for budget approvals. Instead, it received its funding through the executive directly. Since ITRI was in effect subsidising firm research and giving away its technological research for free, relative financial independence was important as it minimised the possibility of directing benefits from new research to reward political supporters. Instead, ITRI was effective in providing

[6] Including Pat Haggerty, former CEO of Texas Instruments and former member of the National Academy of Sciences, and B.O. Evans, former VP for development at IBM (National Research Council 2013).

the technology to smaller firms and former government employees with a strong understanding of the industry for spinoffs.

While support for the semiconductor industry was guided by the CEPD's multi-year plans, ITRI had significant flexibility in interpreting and executing these plans. It could rely on its staff to make policy decisions on research development and corresponding allocation. This independence helped enhance ITRI's effectiveness in its operations and policy formulation and execution.

Accountability

As a key element of a success or failure of policy implementation, getting accountability right is crucial. In its earlier stage of development, ITRI, the leading agency's arm in semiconductor development, had a strong internal hierarchy that centralised accountability and sector-focused units. However, in later stages of development, as the private sector took over, ITRI had a more dynamic internal structure in which accountability was decentralised. ITRI had both vertical and horizontal units to keep it shielded from outside interests and maintained strong relationship with the ministry in charge of science development.

In the 1980s, the biggest threat came from political disagreement about the ambitious industrial policy undertaken. As Fuller (2002) observes, the usage of government funds to promote the semiconductor industry was highly controversial within the KMT elite, who saw it as a waste of money. It was pushed through only with the strong political support of Chiang Ching-Kuo. As a result, ITRI was highly centralised with decisions made at the top to decrease the chance of political interference by opponents within the government and to ensure a high level of accountability. ITRI was given targets to negotiate R&D apparatus-licensing foreign technologies on behalf of Taiwanese firms. Its progress was closely monitored by the ITRI executives and Chiang Ching-Kuo himself.

Furthermore, ITRI was divided into different laboratories each focused on a different part of the semiconductor industry. The laboratories offered training and gave away the publicly financed research to form private companies. Since Taiwan's semiconductor industry was based on startups, each specialising in a specific sub-sector of semiconductors, there was a minimum interaction between the different vertical sector-specific units within ITRI. However, as Taiwan's semiconductor industry became more developed, ITRI turned to be less hierarchical and had more vertical and horizontal units.

That is, its accountability structure became more decentralised within the different units within the agency. As Callon (1995) remarks, by the 1990s, ITRI became more concerned with firms' flexibility, speed, and its ability to innovate and compete with outside firms. Instead of setting centralised targets, it gave medium-level officials more flexibility to institute change, decentralising the accountability structure. As the sectoral structure became more complex and more self-sustained, the public sector's role faded as did the need for a rigid internal hierarchy.

To impose accountability on the firms receiving support (and keep out business interests), ITRI's both vertical and horizontal units supported its independent operations. As IEK (2012) shows, ITRI's structure included not only core labs focusing on sector-specific technologies but also linkages and focus centres concentrated on industry-oriented research and technology integration. The business development units' focus on the horizontal commercial application of research projects made certain that the technology promotion was leading to commercial viability. This more complex structure helped make ITRI more internally accountable against sector-specific special interests.

ITRI had a close relationship with the executive and the CEPD, coordinating efforts between the National Science Council and ITRI and making other agencies accountable for the policies assigned to them. ITRI had a strong working relationship with the executive and the ministry involved in the development of scientific technologies; that is, it was under strategic oversight, without being micromanaged. The National Science Council, which was renamed the Ministry of Science and Technology in 2014, was one of the chief ministries involved in the development of Taiwan's semiconductor technology.

Adaptability

Lastly, adaptability of the leading agency to changing economic and political conditions supported sustained growth of the industry. As described earlier, the Taiwanese leading agency (understood as a network at the centre of which was the CEPD and spearheaded by ITRI at the sectoral level) was able to adapt to changes while implementing its ambitious programme, thanks to the following: (i) its access to executive power helped circumvent bureaucratic hurdles; (ii) a holistic approach to policy formulation stemmed from a broad and flexible mandate; (iii) monitoring channels were set to evaluate compliance and adapt their goals accordingly; and (iv) an evolving institutional structure supported the agility of the agency.

The Taiwanese agency's elevated status within the bureaucratic structure gave it political access and helped in coordinating efforts to push forth with developing the semiconductor industry. For example, the CEPD was chaired by the Premier while ITRI directly reported to the Executive Yuan, allowing it to bypass Taiwan's bureaucratic structure to ensure efficiency. This access helped ITRI to expedite investment decisions, adapt quickly to changes, and invest in sectors of the semiconductor industry. For example, ITRI often invested public funds in core technologies and spun them off to become private companies, handing them the state-funded technological research for free (Fuller 2002). In the 1980s, ITRI and ERSO created a total of 18 firms in different subsectors of the semiconductor industry. ITRI had a full control of its investment target based on the needs of domestic and international companies.

The CEPD and ITRI applied a holistic, or comprehensive, approach that encouraged competition instead of selecting the most well-connected companies to subsidise. Fuller (2002) remarks that Taiwanese semiconductor industry's development was marked by its ability to capture the global need for outsourcing as many established international companies sought to reduce the costs of their supply chain. ITRI played an important role to foster a competitive environment in which Taiwanese firms would receive government help to jumpstart their companies but would still need to compete domestically and internationally.

ITRI's approach helped create a dynamic innovation-based environment where firms had to continue to adapt, causing further technology diffusion to other firms, stimulating innovation within the entire economy. Economies need to constantly adopt innovation to move up the value chain or enter new products and tasks (Cherif and Hasanov 2019b). ITRI's holistic approach helped Taiwan constantly innovate and adapt to international trends, moving up the chain and entering new sectors from semiconductors in the 1980s to PCs in the 1990s and finally to biotechnology and other internet-based services in the 2000s (Saxenian and Hsu 2001).

The monitoring channels allowed the CEPD and ITRI to adapt their policies to better support the semiconductor industry. Since ITRI was able to create private firms, it had close relationship with these firms and was able to collect first-hand information on the development of the industry. Many of the firms were headed either by former government employees or those with strong connections to the government. However, these firms needed to play by market rules through developing export markets, instead of relying on

government support, which enhanced their competitiveness (Fuller 2002). The close relationship between the Taiwanese semiconductor industry and the government agencies developed an indirect monitoring link outside of the bureaucracy, which helped inform the CEPD and ITRI on their decisions to capture foreign markets and adapt policies accordingly.

ITRI changed its *modus operandi* with time, abandoning its highly successful spinoff system and emphasising its service organisation. Indeed, UMC and TSMC, two dominant companies in the semiconductor global market, were spun off from ITRI's lab ERSO (Cherif and Hasanov 2019b). In the 1990s, and as a result of lobbying from the same companies it spun off, the programme was discontinued, potentially reducing the startup pipeline ITRI managed to create in its earlier days.

Entering sophisticated sectors: Korea's automotive industry

Korea's automotive industry started from humble beginnings in the 1950s, when Korean companies only manufactured low value-added car parts for foreign brands. Its domestic manufacturers lacked the technology to produce competitive original models and the barriers to entry were substantial. As late as the 1970s, the government had so little trust in the quality of domestic manufacturers that it forbade Korean manufacturers from producing components related to vehicle safety (Green 1992).

However, by the 1980s, Korean companies such as Hyundai and Kia were competing with the most prominent international brands in the American and Canadian markets. With the strong state support and drive to develop the industry in the mid-70s, production started picking up as well until the mid-80s when a clear sudden rise in Korean car manufacturing and exports occurred, catapulting the car industry to a new level. Korea's car production increased twenty-fold during the 1980s from a meagre 50,000 annual production to over one million by the end of the decade. Korean cars started to be favoured by consumers for their price and quality. In 1987, during Hyundai's second year of presence in the US market, while overall car sales in the US decreased by 10 percent, Hyundai's sales increased by 56 percent (Green 1992).

Ambition-agency

The path of the automotive industry in Korea is illustrative of the importance of defining properly the ambition of the leading agency and its alignment with the executive's goal. The success at industrial policy is related to the level of ambition along three dimensions: the sophistication of the sector, export-orientation, and domestic technology creation (Cherif and Hasanov 2019a). Korea's bet on the automotive industry matches the sophistication criteria at the onset. However, its ambition in terms of export-orientation and domestic technology creation came only later as a result of a lack of agency by the institution in charge. This lack of agency, derived from a misalignment in the goals of the institution with those of the executive was corrected with the change in leadership.

Although the automotive industry was identified as a key sector for development in President Park Chung-Hee's 1973 Heavy Industrial Drive, there was a misalignment in the goals between the executive and the leading agency in the 1970s. The medium-term goals set by Korea's EPB and the Presidential Palace framed the stated ambitions for the industry. During the import substitution industrialisation of the 1970s, the 1974 Long-Term Automotive Production Plan helped set out state support for the automotive industry. Korea offered preferential loans (at a negative real interest rate) and direct subsidies to encourage firms to build up domestic capacity.

While the EPB was advocating for liberalising the sector and promoting the international competitiveness of Korean firms, President Park was more interested in using direct subsidies and tariffs to enhance the domestic heavy industrial capacity of the automotive industry. The ideological rift between the EPB and the Presidential Palace caused President Park to appoint Oh Won-Chul, Assistant Minister of Ministry of Commerce and Industry (MCI) and a hardline believer in state-centred industrialisation, to lead the development of the automotive industry (Green 1992). The EPB was *de facto* largely bypassed by the Presidential Palace in formulating an industrial policy for the automotive industry.

As a result, in the 1970s, Korea's automotive industry was mainly focused on the domestic market rather than the global market, and the sector was suffering from the typical ills of import-substitution industrialisation (Cherif and Hasanov 2024). Due to low technological value-added, the sector was not particularly lucrative, reporting profit rates 30 percent below the average in the manufacturing sector (Green 1992). But even these lower profit rates were misleading as a measure of the true competitiveness of these firms. The

industry was indeed building capabilities and learning, but it was still relying on imported critical inputs and technologies, placing a burden on the economy, e.g., by contributing to higher external debt, higher prices, and lower quality.[7]

The change of the executive after President Park's death in 1979 and the 1980 oil crisis brought about a realignment of interests between the EPB and the new President, providing EPB with agency to act on its ambition. Due to the higher price of oil, automotive demand plummeted and all three domestic carmakers in Korea: Hyundai, Daewoo, and Kia, faced bankruptcy. A report by the Korean Institute of Economics and Technology (KIET) identified an urgent need to reach economies of scale and compete on foreign markets, especially the United States to achieve the demand quantity needed for the industry to survive (KIET 1982).

Subsequently, Korea's industrial policy shifted from the import-substitution oriented policies of the 1970s to export promotion targeting North American markets in the 1980s. The policy preference of the EPB aligned with that of the new Presidency, and EPB reemerged to the forefront as the main agents for the automotive industry. It thus focused on a model with a stated ambition of promoting R&D and industrial upgrading to promote the competitiveness of Korean cars. The 1982 Automotive Industry Rationalisation Policy helped define the ambitions and plans of the new government. Manufacturers were required to report export targets and were rewarded or punished based on their export numbers. In the plan, the EPB also encouraged domestic innovation instead of allowing multinational corporations (MNCs) to take the reins. MNCs were not allowed to take a majority stake in Korean manufacturers. Instead, EPB focused on cultivating the ability of local firms to create new products based on the design of their foreign partners or companies they had licensing agreements with (Lee 2002). These policies encouraging domestic technology creation and export-orientation were in stark contrast to those conducted in Malaysia, Brazil or Mexico at the time (Cherif and Hasanov 2019b, 2024).

While the EPB preferred domestic innovation and was cautious toward MNC involvement, the Korean automotive industry nevertheless recruited heavily from both domestic and international elites. It helped the agency formulate specific policies and support the

[7] The related literature would largely conclude that protectionism was a necessary stepping stone, and that a successful industrial policy cannot be conceived without it. In contrast, we do not assume that it is necessary, which is illustrative of the "tools-free" approach we adopt. Moreover, the EPB's internal report itself confirmed the limits of this strategy (EPB 1980).

industry, and it did not prevent partnerships with MNCs. The EPB recruited exclusively from Seoul National University, the nation's best institution, throughout the key period of development. It also encouraged firms to take on foreign experts. For example, as Hyundai was developing Pony, its first successful export product and one of Korea's first "indigenous" design models, it hired a former managing director of British Leyland, an UK-based competitor, to help make its development plans. Hyundai also worked closely with Italian firms and Mitsubishi from Japan to acquire important technologies (e.g., engine) and designs (Huang 2002).

Autonomy

The EPB had sufficient autonomy to implement its key functions, foreshadowing how modern central banks acquired their independence. The EPB had policy independence, thanks to its proximity to the centre of power and its goal alignment with the executive, which in the case of the automotive industry became fully aligned after 1980. In terms of personnel independence, the EPB was insulated from external pressures for appointments. It recruited its staff through a meritocratic system and promoted them based on seniority. This system, to some extent, made sure the EPB did not have strong ties with outside special interests. Moreover, the existence of a sectoral department dedicated to the automotive sector, within the Ministry of Commerce and Industry (MIC), in the Industrial Development Bureau's Heavy Industry Division, ensured that the EPB relied on experts who were accumulating specialised industry knowledge in all aspects (Amsden 1989, Kim 1997, and Woo 1991).

In terms of financial independence, like ITRI, the EPB did not need to ask the legislature for budget. Instead, it was able to keep its budgetary independence. It formulated policies and a system of financial incentives for automotive firms to export without needing to seek financial approval. The EPB's strong relationship with the President helped them implement policies without systematically requiring the legislature's approval.

Accountability

The EPB's effort to manage the highly lucrative automotive industry attracted both political and business pressures. The political elites were resistant to many of the structural changes needed for a successful automotive export industry while the EPB

needed to insulate itself from competing commercial interests.[8] The EPB had a strong internal hierarchy, i.e. internal accountability, to insulate itself from outside interests but initially lacked vertical and horizontal units in its structure. As the economy became more complex, however, the EPB developed more complex structures in its decision-making process.

In terms of turf battles, the EPB faced fierce opposition from the Ministry of Finance (MOF) over reforms in the 1980s. The MOF was primarily concerned over the EPB taking over monetary policy. For example, during the peak of the boom period in 1977-1987, money supply (M2) grew by more than 35 percent per year. However, thanks to stabilisation policies initiated by the EPB in 1980, the growth rate dropped to 8 percent by 1984 (EPB 1988). Due to its strong internal hierarchy and accountability, the agency carried out the policies it deemed necessary, often bypassing the minister of finance. It instituted credit controls and regulated big banks directly to decrease loans and credit supply. These policies helped create a more stable monetary environment to encourage the exports of the automotive industry, among others. The EPB was able to balance the concerns of inflation and unemployment simultaneously, without needing to bow to political interests (Lee 2002). This accountability through insulation from outside political interference helped the EPB achieve its industrial ambitions.

On the business side, the EPB insulated itself from the conflicting business interests of auto assemblers and auto parts manufacturers. The auto part manufacturers wanted a higher local content requirement to protect their industry. Meanwhile, assemblers preferred a more liberal system where they could choose the best and cheapest parts from global sources, putting competitive pressure on domestic suppliers. Out of the two competing interests, the parts manufacturers were better organised. The Korean Auto Industries Cooperative Association (KAICA), founded in 1962, had a powerful business voice (Lee 2002). The EPB's strong internal hierarchy helped shield it from lobbying. As the decision-making process was centralised within the top executives in the EPB, who had the political standing to resist business interests, the EPB was essentially accountable to the executive for implementing its mandate.

[8] Kim Joo-young, the father of Daewoo's founder Kim Woo-Jung (one of the major conglomerates involved in automotive), served as the principal of Gumi Primary School in North Gyeongsang Province during the time when Park Chung-Hee was a student there. This connection between Kim Joo-young and Park Chung-Hee, as his former teacher and principal, later played a significant role in fostering a close relationship between the two families. This personal bond likely contributed to the favourable treatment and support Daewoo received during Park Chung-Hee's presidency.

Adaptability

The EPB's privileged position among the bureaucracy helped it adapt to the changing currents of international trade. During the 1980s, the EPB had to deal with two notable events: the 1980 oil shock that necessitated a more export-oriented industrial policy and a relative liberalisation of trade to capture larger export markets, and the 1981 Voluntary Restraint Agreement (VRA) between Japan and the US to restrict Japanese automotive exports to the US, which opened up new opportunities for Korea.

The EPB's super-ministry status (within MCI) allowed it to coordinate Korea's trade liberalisation after the 1980 oil shock, thereby supporting a transition toward more export-oriented automotive industry. In an internal report, the EPB found that the import substitution policies of the 1970s resulted in high prices and low quality in the domestic market, ultimately weakening the competitiveness of not only the automotive assemblers, but also the entire supply chain (EPB 1980).[9] As the oil crisis depressed demand, domestic markets could no longer support large automakers and the focus on capturing foreign markets was needed. From 1980 onwards, the EPB used its powers to end different ministries' subsidisation policies. As Lee (2002) observed, in the 1980s, the Korean state changed from direct sector- and firm-specific intervention to functional and economy-wide intervention. The EPB's status helped it break through the silos between individual ministries and the large automakers and centralise the state support system to weather the 1980 oil shock. In other words, the EPB gained more power to define a direction of industrial policy and to coordinate it.

In addition, the EPB helped direct Korean carmakers to adapt to the 1981 Japanese VRA to capture American markets, illustrating the multi-faceted specialised knowledge, *Metis*, accumulated in the leading agency. As the US pressured Japan to sign the VRA, restricting the quantity of Japanese car imports, Japan shifted its production to higher value-added cars, abandoning the low price sub-compact car market. Seeing an opportunity, Korean automakers concentrated on this lower-end market, and Hyundai's Pony model, a sub-compact car, managed to generate good sales in the American market. The EPB played an important role in coordinating efforts to adapt to this changing market demand. While the original target concentrated on the automotive industry as a whole, the EPB's adaptation to develop sub-compact cars contributed to Korea's eventual success in the auto industry.

[9] See also Cherif and Hasanov (2024).

Table 1. The Expansion of Korea's automotive industry in the 1980s

Year	Export volume (number of automobiles)	Production volume (number of automobiles)	Percentage Exported
1981	26,283	133,084	20
1982	20,284	162,590	12
1983	24,510	221,019	11
1984	52,350	265,361	20
1985	123,110	378,361	33
1986	306,369	601,546	51
1987	546,310	979,739	56
1988	576,134	1,083,655	53

Note: Data from KAMA (2002). The figure shows the impressive growth of Korea's automotive industry throughout the 1980s.

Although the Korean government gave strong support to the largest automakers (Lee 2002), essentially creating internationally competitive firms in the industry, the state's approach still followed a holistic approach. In the case of the automotive industry, the EPB was especially focused on achieving economies of scale and economy-wide innovation spillovers, and it did not hesitate to adopt a hybrid approach by (i) halting the support and restructuring firms that could not become internationally competitive (in fact, most conglomerates, or chaebols, had an automotive subsidiary but only Hyundai-Kia "survived," itself a "forced" marriage by the EBP) and (ii) pushing for export orientation and maximum competition while (iii) limiting the number of domestic competitors if the EPB thought competition for resources would jeopardise the whole industry.[10]

Despite the close relationship between the executive and the chaebols, the EPB's concern for the survival and profitability of the industry helped it take seriously economies of scale and regulation of the conglomerates. For example, in 1981, out of concern that Korea's market is not large enough for three automakers to achieve economies of scale, the EPB forced Kia out of the passenger car market. As Korea benefited from auto exports with the industry attracting cheap loans, Samsung attempted to enter the market and establish a joint venture with Chrysler in 1989. However, the firm's decision was overruled by the EPB out of concern for its impact on domestic industries by increasing excessive competition among Korean firms. Samsung was only allowed back to the market in 1994, when the

10 Japan's MITI operated a similar market competition management playbook when it deemed the industry could destroy itself.

Korean automotive industry was more mature, and more competition was probably welcome.

In addition, the EPB's concern for productivity gains in the wider economy helped it encourage innovation spillovers within the automotive supply chain. While Korea supported the manufacturing of the automotive industry, it also emphasised domestic innovation. For example, from 1976 to 1980, while R&D investment continued to rise, private sector R&D grew at a much faster rate than government investment. While the total research investment of Korea tripled in 1976-1980, the share of private R&D grew from one-fifth in 1976 to one-third in 1980 (MOST 1985). The EPB encouraged automakers to invest in innovation instead of relying solely on government support. These private innovation initiatives consequently created innovation spillovers to other upstream industries resulting in economy-wide effects. The drive and ability of the EPB to support firms' R&D played an important role in the sustainable development of Korea's automotive industry.

Table 2. The composition of R&D investments in Korea's Automotive Industry (1976-1980)

Year	Total R&D Investment (million won)	Share of Government Investment (compared to private investment)
1976	106,220	80%
1977	158,869	64%
1978	202,218	61%
1979	242,900	67%
1980	316,946	68%

Note: Data from Ministry of Science and Technology (MOST) 1985.

Lastly, to be able to adapt, the EPB had to gauge changing industry and global conditions, and it had both formal and informal channels of gathering information and monitoring.

In terms of formal channels, the EPB had their representatives in each ministry, in the form of the Planning and Management Offices (PMOs). The EPB's PMO in the Ministry of Science and Technology was able to report on the ministry's compliance with EPB policies (Jung 2011). This channel of communication ensured that the EPB, and by extension the President, had a clear awareness of the bureaucracy and the best way to help their targeted industry.

For informal channels, Park Chung-Hee had a strong relationship with the heads of major chaebols in Korea's automotive industry. On top of personal connections, Park Chung-Hee also hosted regular meetings with the chaebols to listen to their reports on export performance. These channels helped make sure the EPB had a good understanding of industry performance and was able to adapt its policy accordingly.

Conclusion: the way forward

The justification for industrial policy is built on strong arguments drawn from economic theory, including from the neoclassical school of thought. It includes tackling market failures stemming from learning externalities such as learning-by-doing, coordination failures, or information asymmetry. In addition, beyond market failures, there exists a myriad of context- and industry-specific constraints that policies must tackle for an industry to stand a chance in the global market, especially for sophisticated industries far beyond the current comparative advantage of an economy. We argue that to tackle those constraints and build the context- and sector-specific knowledge, or *Metis*, needed to identify a set of *a priori* unknown policies, and to coordinate their implementation among different parts of the government, there is a need for a leading agency in the fashion of those in the Asian Miracles.

The mere existence of such a leading agency, even with the appropriate mandate, would not be sufficient to ensure the success of industrial policy. Given political economy constraints and coordination costs, the operational design of the leading agency can be described by the 4As model: Ambition-Agency in setting the goals; Autonomy from undue intervention; Accountability along several dimensions (vertical, horizontal, and external) to perform its functions effectively; and Adaptability to the changing economic and political context. The illustration of this framework through the cases of Taiwan's electronics industry and Korea's automotive industry shows how these institutional features contributed to the success of these industries.

More important, the development of the chip industry in Taiwan and the auto industry in Korea illustrates that the leading agencies adopted a holistic and pragmatic approach to industrial policy. It shows that their institutions did not solely rely on the tools traditionally associated with industrial policy, namely, subsidies or tariffs. Rather, they relied on a wide array of policies, coordinating across all the relevant actors, including the private sector, and focusing their efforts on the whole industry rather than one firm. It

entailed, among others, training of engineers, specialised technicians, and other personnel, building technology parks, providing R&D support and technology transfers, and implementing supportive trade and competition policies. It also shows that there are different models of engaging with firms. While Taiwan's ITRI spun off startups, which grew rapidly into large firms, Korea relied on its existing chaebols and gave them strong incentives to enter the target industries. In both cases, the new industries were far beyond the economies' comparative advantage at the time, and in both cases, export orientation played a key role, providing a much-needed market signal for policymakers.

The main task ahead for economies implementing industrial policies would entail to first adapt the design of their institutions. This means identifying, within the existing institutional and power structure, an institution, or network of institutions, that is best suited to play the role of a leading agency with 4As defining its operational design and action. This institution would be given the appropriate mandate to support ambitious goals to enter sophisticated industries (along the line of the fist principle of TIP) and the agency to pursue the policies needed to attain them. The way to acquire agency would depend on the political economy setup, entailing proximity to the executive in centralised systems, or a political consensus around an independent leading agency in a more decentralised system to withstand political cycles. As shown by the experience of the Asian Miracles, talent recruitment to start building in-house technical capabilities and work toward the ambitious goals is critical.

The autonomy of the leading agency can be concretely achieved in the same way central banks achieved independence around the globe. It is through the triple independence of budget, personnel management, and policy formulation that most economies, with all sorts of political economy systems, achieved relative independence of their central banks and created islands of competence within the state administration.

As with central banks, adaptability would push the leading agency toward "embeddedness" (Evans 1995), a crucial nexus with the private sector, while the accountability framework would help avoid capture. Feeling the pulse of the global and domestic conditions would make sure that the country's growth model is continuously evaluated to ensure sustained sustainable and inclusive growth by pivoting toward new sectors and activities when needed.

This newly adapted institution—a leading agency—for industrial policy would be the starting point for the accumulation of context- and sector-specific knowledge, *Metis*, that is paramount for the successful conduct of industrial policy. As industrial policy is a process of learning and experimentation for both the public and private sectors through continuous mutual feedback, the leading agency will support accumulation of this specialised knowledge. It includes analysing the different potential sectors to target, understanding the market, trends, and bottlenecks, and devising a set of policies to make it work. The state needs to start to be able to learn and accumulate knowledge and capabilities, and the initial level of state capabilities is not necessarily the binding constraint. This holistic and pragmatic approach to industrial policy and institutional setup is in contrast to the standard setup of an ad-hoc, and often temporary, economic council that decides *ex ante* on a sectoral target and the tools, typically subsidies or tax credits and other incentives with potential sunset clauses, while brushing aside the key functions such as coordinating, learning, and adapting.

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