INTERNATIONAL MONETARY FUND

Institutions for Industrial Policy

The Foundation of Economic Development

Reda Cherif, Fuad Hasanov, Gary Xie

WP/26/63

2026
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WORKING PAPER

 WP/26/63

IMF Working Paper
Institute for Capacity Development

Institutions for Industrial Policy: The Foundation of Economic Development

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Authorized for distribution by Oussama Kanaan
March 2026

ABSTRACT: We propose an institutional architecture for the successful implementation of industrial policy inspired by the Asian Miracles—Japan, Korea, Taiwan Province of China, Singapore, and Hong Kong SAR. The key institutional arrangement is a leading agency, accumulating sector-specific knowledge through continuous experimentation and feedback from markets, to design the sector- and context-appropriate package of policies, which is *a priori* unknown, and coordinate its implementation. We also postulate a 4A model of institutional features of the leading agency: Ambition-Agency, Autonomy, Accountability, and Adaptability. We draw strong parallels with the rise of independent central banks, inferring concrete steps to achieve these characteristics.

RECOMMENDED CITATION: Cherif, R., F. Hasanov, and G. Xie. 2026. *Institutions for Industrial Policy: The Foundation of Economic Development*. IMF Working Paper WP/26/63. Washington, DC: International Monetary Fund.

JEL Classification Numbers:	O25, O31, O43, O17, L52, N15
Keywords:	Industrial Policy; Technology and Innovation Policy; Economic Growth; Institutions for Development; Planning Agencies; Asian Tigers
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*We would like to thank participants at the PAFTAD 42-Peterson Institute for International Economics conference for helpful feedback and discussions and are particularly thankful to Shiro Armstrong, Mary Lovely, Mari Pangestu, Danny Quah, and Jeffrey Schott. We also thank Meriem Ait-Slimane, Alexandre Balduino Sollaci, Sandra Baquie, Corinne Delechat, Yukun Ding, Fabien Gonguet, Tristan Hennig, Sandile Hlatshwayo, Patrick Imam, Samir Jahan, Oussama Kanaan, Masahiro Nozaki, Andrea Pescatori, Sergio Rodriguez, Andres Valenciano, Robert Wade, and Aleksandra Zdzienicka for useful comments. All remaining errors are ours.

WORKING PAPERS

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Contents

Introduction

It probably would not be an exaggeration to state that the second and third decades of the 21st century might be remembered as the time of the Great Resurgence of Industrial Policy and the controversy around it.[1] In this debate, there is a broad consensus around the economic rationale for state intervention to change the economic structure and promote specific industries; that is, the economic theory behind industrial policy is as orthodox or mainstream as it can be. The basic idea is that in the presence of externalities and imperfect information, the market would fail to reach the social optimum.[2] There is also mounting empirical evidence in addition to historical case studies or cross-country analyses that the handful of Asian economies such as Japan and Korea, which made it from middle- and low-income to high-income in the second half of the 20th century,[3] relied heavily on industrial policy.[4]

However, despite the theoretical and empirical support for industrial policy, the idea of pursuing it, especially in developing economies, and even among those who are convinced by the economic arguments, is not widespread although it picked up in recent years (Evenett et al. 2024; Juhasz, Lane, and Rodrik 2024). At its heart lies the perceived difficulty of "intervening" in or "distorting" the workings of the market as the state action is laden with government failures. In developing economies, state intervention is usually done in the context of pervasive corruption and lack of financial and human resources while requiring high levels of accountability and competence. In addition, those arguing against industrial policy invoke political economy arguments, suggesting that targeted interventions could only succeed in some centralized and authoritarian regimes (Johnson 1999). Ultimately, even if there are market failures to correct, policymakers are advised to stick to a "do no harm" approach, justifying falling back to the Washington Consensus policies[5], as an admittedly inferior second best, albeit arguably a less risky path, at least in the short run.

In this paper, we tackle this challenge and explore how to conduct successful industrial policy from the perspective of the institutional design, arguing that developing economies can walk in the footsteps of the Asian Miracles. We build an architecture of the institutions needed to conduct industrial policy in two steps. First, we justify the institutional setup, or the "hardware," centered around an agency to target sectors, accumulate knowledge about these sectors, and coordinate all the policies, across state agencies involved, and between the state and the private sector. Second, we explain the key features of the agency's structure and actions and how to concretely achieve them, that is, the institutional "software." We propose a 4A model to illustrate these key features: (i) Ambition-Agency in setting goals and having the ability to implement the policies needed to attain them; (ii) Autonomy in running its operations in accordance with the mandate, including autonomy from political interference; (iii) Accountability in the agency's interactions with various actors—internal or within the organization, external or vis-à-vis the sectors supported, and vertical or vis-à-vis the executive power in terms of the agency's mandate; and (iv) Adaptability in understanding and responding to various economic and political changes vis-à-vis the agency's goals and internal structure, relations with other parts of the state, and sectors supported.

[1] See Cherif, Engher, and Hasanov (2024) for a study of economic growth narratives.

[2] For example, Krugman (1987).

[3] Chandra, Lin, and Wang (2013) and Cherif and Hasanov (2019b).

[4] See, among others, Amsden (1989), Wade (1990), Woo (1991), Chang (2002), Cherif and Hasanov (2019a), and Lin and Wang (2020).

[5] Or its reincarnation as "Structural Reforms" and more recently, "Washington Constellation" narratives (Cherif, Engher, and Hasanov 2024).

To infer the institutional "hardware," we propose a stylized theory of institutions for growth and economic development with a "leading agency" at the core of this institutional setup. It is based on fairly simple assumptions about what matters for the economy to achieve high and sustained growth: (i) the sectoral structure of the economy, which in turn depends on *a priori* unknown sector-specific and context-specific policies, including but not limited to tackling the myriad of market failures; (ii) the non-monolithic state as sector-specific policies (that is, an industrial policy) fall under the purview of different parts of the state; and (iii) the stock of knowledge about these policies is sector- and context-specific, not easily transferable and tacit to a large extent, and can only be accumulated through continuous experimentation and feedback from the "trenches" (e.g., firms, other agencies, and markets), which we describe as *metis* (Scott 1998). Moreover, the policies required for the successful development of a sector are not necessarily consistent with the mandates and priorities of other ministries and agencies; that is, the power structure matters as well. We infer that a key institution—we call it a "leading agency"—is necessary for the conduct of industrial policy to target sectors, to be the seat of the accumulation of knowledge (Stiglitz and Greenwald 2015) about sector-specific and context-specific policies, and to coordinate among the different agencies, ministries, and the private sector. We also conclude that the internal structure of this agency should be organized around both sector-specific and cross-sectoral departments.

As the full institutional architecture would not be complete without the "software," that is, the features of the agency defining its operations and actions, a 4A model summarizes the four crucial elements the leading agency needs to possess to succeed in its actions. First, *Ambition* in the mandate entails aiming at spurring internationally competitive and innovative domestic firms in sophisticated sectors and having the *Agency* to pursue this goal. Second, *Autonomy* ensures that the policies pursued in the targeted industries are not hindered by political or private sector interference and that the institution has the financial and human resources and power to fulfill its mission, including the "convening" power to coordinate all the stakeholders in the private and public sectors. Third, *Accountability* has to be present along three important dimensions: (i) ensuring the agency's responsibility to the executive branch in fulfilling its mandate, (ii) having control systems within the agency to ensure transparency, efficiency, and adherence to goals, and (iii) holding firms accountable for the support received, that is, checking the progress against targets set, ensuring competition, and pursuing corrective actions when necessary (e.g., restructuring firms and/or redirecting support). Fourth, *Adaptability* of the agency refers to the agency's ability to adapt to changing political, economic, and technological conditions by continuous feedback from the private sector and export markets and to anticipate and adjust the focus, tools, and internal structure accordingly. There is always a risk for any agency to fall prey to corruption, capture, nepotism, or incompetence. However, these four features, we argue, are indispensable for the agency to succeed at its mandate and mitigate those risks, and we discuss what can be done to achieve the 4As.

To validate our theory, we illustrate all the aspects of the institutional architecture described using the examples of the Asian Miracles—Japan, Korea, Taiwan Province of China, Singapore, and Hong Kong SAR. We show striking similarities in terms of the main features as well as the variations given the different political economy contexts. The Asian Miracles did set up leading agencies with similar mandates and organizational structures, including sectoral departments to accumulate *metis* and cross-sectoral departments to manage tradeoffs and set priorities, at the onset of their miraculous growth. Several of these economies faced initially capacity constraints and policy tradeoffs that are typical of low-income countries. These included lack of financial resources, high inflation and borrowing costs, lack of infrastructure, poor governance, scarcity of skilled workers, and low capacity in the civil service. For example, Korea's income per capita in the early 1970s was lower than Ghana's, which did not preclude the leading agency from learning how to conduct industrial policy effectively. We also show that there was a rationale to how close the leading agencies were to the political

executive and how they operated institutionally to implement policies through councils or extended prerogatives given to agencies, depending on the different power structure of the economies the agencies had to operate in (that is, stable vs. prone to political cycles and the extent of centralization of the state). In other words, we argue that there is an adapted design to each power structure situation, including a high-turnover democracy like Japan or a "laissez-faire" non-democratic economy like Hong Kong SAR in the 1970s-1980s. We thus challenge the general view that an authoritarian centralized system or, at the other extreme, a full-fledged democratic system is necessary for the successful conduct of industrial policy.[6]

We distill from the experience of the Asian Miracles that in key aspects, especially in terms of how these leading agencies acquired autonomy, there are striking parallels with how another prominent agency, the central bank, achieved in practice *independence* in many countries. The institution of the central bank is arguably the best example of how to build effective economic institutions, even in low-income economies or low-capacity states. The central bank independence mostly stems from independence in personnel management, financial resources, and policy formulation and implementation. Most observers would agree that the central bank is an outstandingly competent agency in many economies, thanks to elite recruitment and superior governance, among others. The staggering success of central banks at the turn of the 21st century as "leading inflation-taming agencies" all over the world, including in developing economies, is a testament to this competence and independence.

We argue that the success of creating independent and competent central banks is evidence that the blueprint of the Asian Miracles' institutional architecture can be successfully adapted to the political and economic context of most economies. Although keeping a lid on inflation and managing short-term macroeconomic fluctuations are important, long-term growth is far more important for developing economies as it is key to reaching high-income status while explaining most of poverty alleviation across countries (Lucas 1988 and Pritchett 1997). As the central bank is charged with the conduct of monetary policy to smooth short-run economic fluctuations, a leading developmental agency to conduct industrial policy for long-run growth is needed as well. In fact, central banks gained a prominent role in managing short-run economic expansions and contractions, fulfilling an important mandate to maintain full employment. Keynes emphasized in his writings the role of government policy in both correcting the malfunctioning of the economic engine in the short-run and promoting long-run economic health.

Lastly, we contend that in the long-run, an economic growth miracle cannot be achieved only by smoothing economic fluctuations and ignoring market failures or relying only on purely horizontal policy (Cherif and Hasanov 2025).[7] In fact, Lucas, in discussing long-run growth of developing countries, stressed that once one understood the importance of growth, everything else mattered much less (Lucas 1988). Indeed, many countries have lacked such a focus on long-run growth despite promoting various growth or structural reforms in hopes of fostering growth. We argue that to support high and sustained growth, entailing building sophisticated sectors with domestic innovative firms competing globally, requires a leading agency—one of the key missing ingredients in the growth recipe—with a clear mandate and relevant institutional features to conduct industrial policy, tackling various government and, more important, market failures. This agency for long-run growth and economic development would function as a complement to the central bank, which has been a key institution for managing short-run economic fluctuations, including taming inflation. In addition, similar to a central bank, this leading agency, in implementing its mandate, would take into account other

[6] See Ang (2025).

[7] As Ha-Joon Chang has emphasized in his influential work that any policy, including education and infrastructure, would promote (or hinder) different sectors (e.g., Chang 2007).

economic objectives, including external and internal macroeconomic stability, to ensure that its policies lead to sustainable growth.

The economics literature on the institutions for growth and development is vast and draws from different schools of thoughts and disciplines (e.g., rational choice, political science, sociology, and history). Representing the dominant view in economics, Acemoglu and Robinson (2012) emphasize inclusiveness, defined by the rule of law and the enforcement of private property with a free market, rather than extractive institutions as a key determinant of growth, building on the path dependency literature (e.g., Acemoglu, Robinson, and Johnson 2001). Chang (2011) argues that both the theoretical and empirical foundations of the prevalent view have weaknesses such as a neglect of the reverse causality running from development to institutions and a poor understanding of the process of changes in the institutions themselves.

There is, in parallel, a rich literature focused on comparative studies of planning agencies in East Asia (White and Wade 1988; World Bank 1993; Evans 1998; Kuznets 1988, Ohno 2012). These studies often analyze how markets and institutions interact and identify many of the key institutional characteristics we describe in this paper (e.g., elite recruitment, autonomy, and accountability). It is worth highlighting Ohno (2012), who discusses the key characteristics for successful development. In addition to leadership, national mindset, and policy content, he emphasizes policy procedure and organization needed for the conduct of industrial policy. Ohno describes the pros and cons of different structures of the institutions for development in East Asia. Andreoni and Chang (2019) is another important contribution on which we build, analyzing industrial policy through the lens of structural interdependencies and political conflict and emphasizing the need for aligned policy packages and effective government conflict management.[8] In-depth studies of institutions for industrial policy in specific contexts such as Japan (Johnson 1982, Okimoto 1989), Singapore (Soon and Tan 1997), Taiwan Province of China (Wade 1992), and Korea (Woo 1991 and Greene 2009), or comparative analyses such as Dollar and Sokoloff (1994), Cheng, Haggard and Kang (1998), and Rodrik (2008) offer a wealth of information about leading agencies, from which we also draw.

A wave of studies on the topic of industrial policy and institutions sprang out in the mid-2020s. It mostly overlaps with the older work and with this paper in terms of the needed qualities of institutions to increase the success of industrial policy, e.g., competence, data and evidence-based approach, and consensus and coordination, echoing concepts such as “embedded autonomy” (Evans 1995).[9] We differ from this literature in three important aspects: we tackle simultaneously the structure and the behavior of the institutions; we propose a stylized theory, evidenced by the study of the institutions of the Asian Miracles; and importantly, we infer relatively precisely the elements required to achieve these key features of institutions, drawing parallels with successful and autonomous central banks as well as the history of the Asian Miracles.

Our conclusions differ from this literature in general as to how market failures justification should guide industrial policy in practice. It is in general assumed that a good practice consists of identifying precisely the market failures at play and tackling them with specific policy tools. In stark contrast, we suggest that many market (and government) failures at play are unknown *a priori* or they are uncertain and changing over time while interacting in complex ways. Identifying the plausibly extensive package of policies to tackle them requires accumulating *metis* through experimentation and feedback. This also suggests that empirical studies of the relative effectiveness of industrial policy, based on a narrow set of policies, typically tariffs or subsidies,

[8] They introduce the concept of the “Policy Package Matrix” as a tool to strategically coordinate industrial policy measures, moving beyond simplistic market-failure justifications.

[9] Criscuolo et al. (2022), Juhasz and Lane (2024), and OECD (2024).

and structural reform packages (e.g. improving regulations) based on regressions on a large set of countries and/or firms do not necessarily contradict our conclusions.[10]

Building on the diverse literature on institutions for development, we provide a relatively parsimonious organizing framework justifying how institutions should be structured and managed to conduct industrial policy. We differ from a large strand of the literature on institutions in that we put industrial policy to target sectors and tackle market failures[11] at the center of development, abstracting from other more indirect objectives such as health care or general education. From a large part of the other strand of the literature, which believes in the active role of the state, we differ in the sense that we are totally agnostic about the array of policy tools to be used.[12] Strikingly, in our framework, the leading agency is not defined by the tools it uses or the emphasis it puts on tackling market failures vs. providing sector-specific quasi-public goods (described as "soft" industrial policy tools).[13] Depending on the context, policies may or may not include subsidies, tariffs, and cheap financing and should encompass a wide array of actions that are not traditionally associated with industrial policy (e.g., changing legislation on bioethics to spur the biotech sector as Singapore did).

We strongly emphasize the anti-planning aspect of the leading agency, or the anti-"seeing like a state," in the sense that one of the agency's primary roles is to accumulate *metis*, that is, a context- and sector-specific knowledge (Scott 1998). As we argue in this paper, these leading agencies had mandates with objectives such as the development of specific industries, but it was not immediately translated into detailed planning that led to some of the large-scale disasters of the past, as described in Scott (1998). Instead, the agencies were given expansive latitude to interpret and translate these objectives and adapt their policies to their current knowledge.[14] This knowledge was mostly achieved through a bottom-up approach, experimentation, and embeddedness (Evans 1995). Finally, by including Hong Kong SAR in our study, we show that a leading agency is not necessarily a single entity (though it is often so), and it can be understood as the central node of a network of a small number of tightly knit organizations.

As many countries regularly re-examine their approach to industrial policies, studies on the institutional arrangement of leading agencies are much needed to understand how states can play a positive role in facilitating growth and economic development, especially in developing countries. This paper constructs a framework that could be applied to institutions in both developing economies and advanced countries.

The structure of the paper is as follows: Section 2 introduces a stylized theory from which we infer the institutional setup or "hardware" required to conduct industrial policy centered around a leading agency. Section 3 suggests the 4A model describing the features and behavior of the leading agency (Ambition/Agency, Autonomy, Accountability, and Adaptability) and the concrete steps followed by the Asian Miracles to achieve these traits, that is, lessons for today. Section 4 offers two case studies on the development of electronics in Taiwan Province of China and the automotive industry in Korea, illustrating our institutional framework. Section 5 concludes the paper. The Appendix provides a brief historical background on the creation of the leading agencies and highlights additional commonalities among their mandates and how they pursued them.

[10] For example, Baquie et al. (2024), Budina et al. (2023), Juhasz, Lane, and Rodrik (2024).

[11] By market failures we mean specifically the market imperfections that prevent structural transformation, which do not necessarily fully overlap with the broader understanding of market failures (e.g., pollution and intellectual property rights)

[12] In doing so, we build in particular on Andreoni and Chang (2019).

[13] See Harrison and Rodríguez-Clare (2010) and Wade (2012).

[14] This contrast was also described as "planning-rational" vs. "planning-ideological" by Johnson (1999).

Institutions for Industrial Policy

The successful implementation of a Technology and Innovation Industrial Policy, or Industrial Policy, Asian Miracle Style (Cherif and Hasanov 2025) relies on the "right" design and operations of the institutions in charge of it. We explore an architecture of these institutions and propose a blueprint for their design and features. First, taking an analogy from a computer design, we split the architecture of institutions into hardware and software. *Hardware* is the institutional structure, including a description of key roles, mandate, and setup, which are adapted to the political economy context of an economy. *Software* is the operational design and a set of instructions to run the hardware of these institutions.

We argue that for the successful implementation of industrial policy, the *hardware* is a network of institutions with a leading agency at its center. In terms of *software,* the 4A model proposed describes the key features needed for the agency's effectiveness. The 4As are Ambition-Agency, Autonomy, Accountability, and Adaptability.

Hardware: The Institutional Structure

In this section we lay the ground for the institutional design or structure for the conduct of industrial policy. We interpret this as the "hardware" of institutions, that is, the purpose and organization of the institutions. We infer this setup from a stylized theory of institutions, stemming from assumptions about how the state and the economy work. The need to accumulate a special type of knowledge to identify the needed policies over time plays a central role in our framework.

We assume the following:

- **Assumption 1. Non-monolithic state:** The state is not made up of a single unitary structure, and state policy actions are scattered among many agencies and ministries, which are endowed with their own specific mandates and objectives.
- **Assumption 2. Sectoral structure of the economy:** The economy consists of different sectors, existing and potential. Each sector has its own set of requirements needed to develop, including tackling sector-specific market failures and providing sector-specific public (and quasi-public) goods and services. The sectors differ in terms of their scale, productivity, technological, learning, and spillover potential. We describe the sectors that are superior along these dimensions as "sophisticated."
- **Assumption 3. Sector-specific requirements and industrial policy**: The performance of a sector depends on the extent to which policies implemented fulfill the sectoral requirements (as defined in Assumption 2). The state needs to tackle not only "government failures" (public goods, regulations, education, etc.), which broadly translate into horizontal or general policies, but more important, a myriad of sector-specific "government and market failures," necessitating vertical or sector-specific interventions.[15]
- **Assumption 4. Policy design and sector-specific knowledge:** Uncovering sector-specific requirements and the associated industrial policies requires learning to acquire a set of specialized knowledge. The full package of industrial policy actions are a priori unknown and shifts over time, and

[15] See Rodrik (2005) for more details on government and market failures.

uncovering them requires learning and continuous accumulation of knowledge, which we describe as *metis*,[16] that is, a context-specific, dynamically accumulated, and mostly tacit knowledge stock that can only be acquired through experimentation, feedback from the private sector and other state agencies, and action. It involves gathering information and feedback along multiple dimensions of policy and private sector actions.

- **Assumption 5. Power structure:** The state of political economy is important for policy implementation. The required policy actions for the performance of a sector can interfere with the objectives and actions of other state or private sector actors, within the public sector (e.g., turf battles, nepotism) and outside of it (e.g., corruption, rent seeking). Different power structures produce different institutional structures and economic outcomes.

Assumptions 1, 2, and 5 are fairly standard in the literature, although they generally belong to different fields, that is, theories of institutions, growth, and political economy, respectively. Assumptions 3 and 4, however, differentiate our framework from the standard approach to the theory of economic growth and institutions. The direct role of the state in shaping the structure of the economy, besides providing public goods, and the importance of the accumulation of sector-specific knowledge we describe as *metis*, are novel, to our knowledge. In other words, we argue that industrial policies cannot be ignored in accounting for sustained economic development and growth (Cherif and Hasanov 2019a) while "learning-by-doing" through experimentation, feedback, and action to build specialized knowledge and identify policies is key to the effective functioning of institutions. The Asian Miracles achieved it by devising an institutional "system" or architecture that, we argue, can be replicated.

Sector Targeting and Coordination

We assume that the state, taken in its totality, performs a set of policy actions, which is scattered among many agencies and ministries. We denote the state's action *G* such that:

$$G=\{x_1,..,x_i,\ldots,x_n\}$$

which consists of policy actions x_i, a subset of a large universe of plausible policy actions, that is, all the possible x $(n<<N)$.[17] These actions could span a wide array of policies such as investment in specific infrastructure, training of technicians, or regulation. To simplify further, we assume that action x is either zero or one, that is, either the action is taken or not.[18] In practice, these policy actions are not taken by a single public agent, ruling out the absolute centralization of decision-making. Policy actions are divided into subsets, each falling under the purview of a different part of the government such as local governments, municipalities, ministries, various agencies like export promotion agency, central bank, public universities, or state-owned enterprises (SOEs). We assume that there are k parts of the government, each deciding its own subset of policy actions among the possible policy actions under their respective purview:

$$G_1,\ G_2,\ \ldots,\ G_k$$

[16] See Scott (1998).

[17] This is akin to Hirschman's view of development, essentially consisting of the ability to take a multitude of decisions across many parts of the government (Hirschman 1958).

[18] By action taken, we assume that three aspects of the action are fulfilled (or not): speed, scale, and quality.

The institutional setup is that many parts of the government are faced with a myriad of possible actions and have different objectives or mandates, and it is a collective coordinated action. Each part of the state decides on its policy action set based on its mandate and given its constraints in terms of financial and human resources.

The crucial element in the institutional setup is the objective function defined by the mandate *M*, which is largely horizontal, or cross-cutting, in nature. In most countries, many key state agencies (e.g., ministries) have "horizontal" objectives, reflecting the standard growth narratives in vogue since the mid-1980s (Cherif, Engher and Hasanov 2024). In other words, a typical ministry or agency has no specific sector to target. This does not mean that the "horizontal" objective of the ministry does not influence the outcome of sectors. For example, the Ministry of Education is in charge of pre-school to high-school curriculum. Having a good pre-school program is shown to have long lasting benefits (Heckman 2008, Heckman et al. 2013), but ultimately the lack of technicians or specialized engineers in, for instance, electronics will be a binding constraint to develop the electronics sector even in the presence of optimal private sector actions. The same applies to transport infrastructure. The decisions to construct roads, ports, and airports do not always consider existing industrial activities, but more important, they almost never consider future industrial sectors in a setup of horizontal policies with no sectoral targeting. New sectors also often require simultaneous investments in both upstream and downstream sectors, therefore making it highly costly for a single firm to make the unilateral decision to move into new sectors, a market failure, requiring state intervention (Murphy, Shleifer, and Vishny 1989).

In contrast to a horizontal approach, an *industrial policy* approach has a sector-specific focus. In the horizontal approach, many agencies pour most of their resources into general-purpose actions like primary education programs or transport infrastructure without any targeted industry since there is no sector-specific focus. In the industrial policy approach, there is a sector targeting and sector-specific focus, and resources are directed to alleviating the specific constraints inhibiting the development of these sectors. In addition to general-purpose actions, agencies will need to pursue purpose-specific actions like building specialized infrastructure or providing specific skill training, for example, for electronics or biotech sectors. There could be a myriad of constraints to be addressed that may go beyond the general-purpose actions. In addition, agencies need to know which purpose-specific actions to take that are designed to solve certain challenges in certain sectors.

To illustrate horizontal and industrial policy approaches, first we assume, for simplicity, that there are two sectors in the economy: a non-sophisticated sector, denoted *C*, and a sophisticated sector, denoted *S*. The output of each sector depends on a predetermined subset of policy actions, some of which are unknown to the government *a priori* and are defined by $C(y_c; x_1,\ldots,x_c)$ and $S(y_s; x_1,\ldots,x_s)$, where *y* is a set of actions taken by the private sector. We do not explicitly model the private sector, assuming that it is doing its job given the state actions, but one can assume that policy actions may create incentives and disincentives for production. We assume that functions *C* and *S* are strictly increasing with respect to the relevant policy actions, and they are unaffected by actions outside of the predetermined set although there could be some overlap between the two sectors' sets. By nature, a sophisticated sector would require more sector-specific policy actions, and more of them would be unknown to the state agencies *a priori*.

In our framework, a horizontal approach may not address all the constraints of sophisticated sectors, and an industrial approach is needed. For example, in Figure 1, the actions of agencies G_2 and G_3, say, ministry of transport and ministry of education, would mostly provide support for the non-sophisticated sector *C* while only scratching the areas of the sophisticated sector *S* as indicated in the intersection between *C* and *S* by G_2 and G_3. That is, these agencies would be typically focused on roads and general education without any *priori* sector-specific focus. These agencies might neglect other actions such as those that are specific to the

sophisticated sector *S* such as building wet labs for the biotech sector or training technicians for the electronics sector (essentially, leaving this to the market). Other agencies, G_4-G_6, which are not necessarily related to non-sophisticated sectors, may either ignore the policy actions needed to help sector *S* in practice, lack the mandate to do so, or simply not have sufficient resources (Figure 1). More important, even if they did focus on sector *S* with sufficient resources, in the absence of coordination with other agencies, there is much less chance of seeing the sector emerge or grow. For example, many developing economies have public research institutes in electronics (or biotechnology), and yet these alone are not sufficient to create the associated competitive, innovative, dynamic industries.

We argue that the horizontal approach leads to *fragmented mandates* while an industrial policy approach generates *coordinated, or harmonized mandates*. The horizontal approach, by nature, can only support the non-sophisticated sector while it is not sufficient for the development of the sophisticated sector. Most horizontal actions like general roads and general education would support the growth of most non-sophisticated sectors like non-tradable services. In contrast, sophisticated sector requires not only horizontal actions but also sector-specific actions (Figure 2). In the absence of sector targeting and coordination, it is inconceivable that a high-tech sector would stand a chance to develop. The sophisticated sector *S* requires an array of public and quasi-public goods and policies, sector-specific infrastructure, and a sufficient number of trained specialized workers. For example, to develop a biotech industry, there is a need to have in close proximity a hospital equipped for clinical trials, a public research institute, access to wet labs, scientists, technicians, doctors, sufficient financing, and an adequate bio-ethics and pharmaceutical product safety regulation, as well as trade agreements with potential markets. These investments and policy actions across many agencies G_k (this includes in the previous example higher and vocational education, infrastructure, export promotion agency, public research institutes, and legislative, regulatory, and trade agreements) have to happen *simultaneously* and require strong coordination. In addition, many of these policy actions would be discovered through a process of learning-by-doing, experimentation, and feedback, and coordination across agencies is crucial for information and knowledge accumulation and flow as well as monitoring and execution.

The need to target and coordinate is even stronger once the multiplicity of possible sophisticated sectors is considered. A conscious decision to target a subset of sophisticated sectors based on country characteristics and policy objectives would need to be taken as resources are finite (Cherif, Hasanov, and Sarsenbayev 2024). The economic growth literature links growth potential to productivity gains driven by innovation and production in sophisticated sectors. These sophisticated sectors are sectors with high R&D intensity and strong linkages and spillovers in the economy.

Figure 1. Horizontal Approach: Fragmented Action of Agencies G_4-G_6

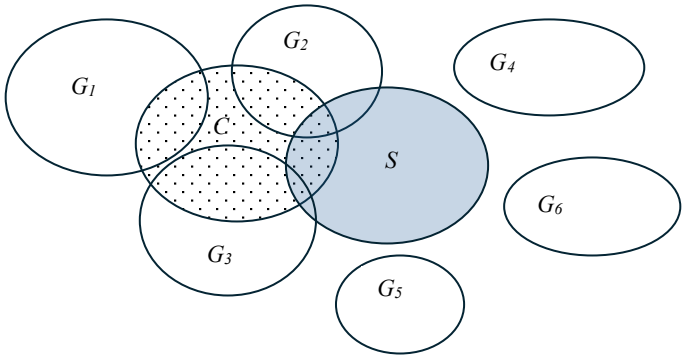
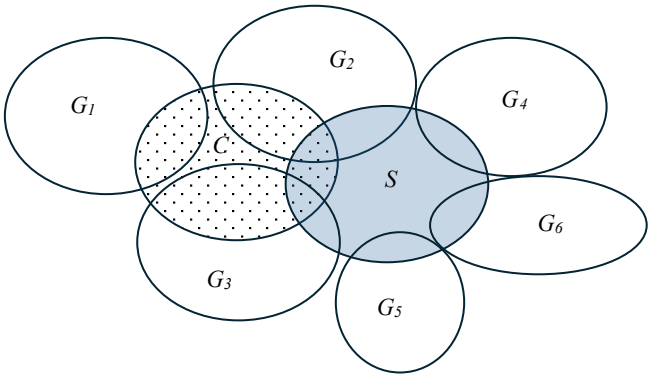


Figure 2. Vertical/Sectoral or Industrial Policy Approach: Coordinated Action of Agencies G_4-G_6



The key to building institutions for industrial policy is for the government not only to focus on fragmented mandates of each agency, G_k resolving *government failures* and providing public goods, but also to implement coordinated mandates designed to tackle *market failures*. Most institutions are designed for fragmented mandates to provide public goods such as general education or infrastructure and resolve government failures, for example, by setting regulations and easing business registration. Yet for a successful industrial policy, institutions with coordinated mandates to correct market failures are equally, if not more, important. These institutions would also focus on putting together what is needed for the development of a sector, especially a sophisticated sector *S*, not achieved with a horizontal approach, be it specialized skills, specific infrastructure, relevant regulations, or missing finance.

Enacting coordinated mandates requires strong coordination across agencies. With low coordination costs, power in the executive branch of the government ensures that the government agencies implement needed policy actions. In such a context, under a decentralized approach—strong coordination with low coordination costs—agencies work in tandem with a coordination function at the highest level of the executive. A high-level council cutting across government agencies could set objectives and a strategy and delegate policy actions to the relevant agencies while retaining the function of coordination and monitoring.

However, there are political frictions and informational costs to coordination in most environments. The political economy costs (e.g., turf battles, special interests, political cycles, etc.) and informational costs (e.g., data gathering, specialized knowledge creation and dissemination, monitoring, etc.) are not generally trivial. If these costs are relatively high and coordination is weak, a centralized approach is preferable, in which case, a leading agency, following an industrial policy approach to implement and coordinate policies across agencies, would be necessary. Lower coordination costs would move the needle toward more decentralization while higher costs would suggest more centralization, or the establishment of a leading agency. Political uncertainty would also warrant a structure centered around a leading agency. Political cycles, for example, would produce changing priorities, fragmented mandates, and stop-and-go policies, and a leading agency would provide policy continuity, paramount for success.

Coordination alone may not be sufficient to minimize costs and help implement industrial policy. Relying on a strong coordination amid the scatter of mandates across various agencies may prove to be short-lived or too costly, and more important, it assumes that a well-defined industrial strategy already exists. Moreover, an industrial policy approach is a "system" approach, akin to the National System of Innovation (NSI) (e.g., Lundvall 1992, Nelson 1993, and Freeman 1995). This approach requires mobilizing all tools and policy actions *x* (e.g., education, public research institutes, financing vehicles) across the whole government and its institutions and giving them a direction (without falling in the trap of "seeing like a state", Scott 1998). Coordination with fiscal, monetary, and financial policies to consider fiscal and financial costs and macroeconomic effects of the policies pursued is important as well.[19] The leading agency, a "leading hand of the state," at least in the initial stages of development (Cherif, Hasanov, and Zhu 2016), emerges as a key institution in the implementation of industrial policy with coordinated mandates, resolving both government and market failures and other bottlenecks.

A Leading Agency as the House of Knowledge or "Metis"

Even in a world with strong coordination across agencies and low coordination costs, there is a need for a leading agency since it is not practical or efficient to build a stock of specialized or sector-specific knowledge across many agencies required to implement industrial policy. This stock of knowledge, another key feature of the model, has to be built or accumulated in some institution or agency. This agency will need to deal with design strategies and action plans, acquiring sector-specific and cross-sectoral information and data, conducting industry and market analyses, and monitoring and assessing progress. Eventually, it also needs to decide whether to pull the plug or conditionally support various industries, firms, and projects while tackling political economic constraints. These policy actions are costly, knowledge-intensive, and prone to failures, including government failures (e.g., special interests, capture, corruption), and require information and learning.

Knowledge building and coordination are further inhibited by imperfect information and uncertainties. In a world where policy actions to make a sector succeed are known, or easily learned, it would be relatively easy to achieve coordinated mandates and implement industrial policy. A government would simply instruct all the agencies that the priority is the development of a specific sector, provided it has thought about it adequately. Every agency would know what it would need to do. But the world is complex and uncertain such that many policy actions are not known *a priori* and they may be changing as the environment changes (e.g., technology

[19] "Another way to secure dynamism and consistency in industrial policy is to give broad responsibility to one ministry and let this ministry do the designing and implementation of industrial strategies…Japanese industrial policymaking from the late 1950s to the early 1970s was the prime example of this model" (Ohno 2012).

and markets). Among the *a priori* unknown policy actions, we highlight those related to tackling market failures and providing sector-specific public and quasi-public goods, services, and regulations.

In the presence of many market failures, acquiring information and building knowledge for policy actions to resolve these market failures would not necessarily provide a simple mapping from knowledge to actions, making coordination difficult. There is a rich literature showing the importance of market failures as a factor in preventing development, that is, when the unconstrained market does not reach a socially optimal economic structure.[20] These studies rely on the presence of externalities such information asymmetry, spillovers, coordination, and learning-by-doing. However, it is difficult to deductively identify the precise market failures at play in a specific sector, and most likely, there is a myriad of various market failures precluding the sector's growth. This is even more difficult in a non-existing or nascent sector, and more important, in a sophisticated sector. How would one know *a priori* why an emerging market country does not have a vibrant biotech or an electronics sector? What market failures are plaguing it out of many possible ones? What quasi-public goods or regulations are lacking? Even when one has a candidate market failure like coordination failures, for instance, to address the need for multiple large investments and coordination across many firms like the "big push" argument (Murphy, Shleifer, and Vishny 1989), there is no certainty about which tool would be the most adequate to tackle it. It could be, for example, public procurement, R&D grants, or finance such as loans, or most likely, a combination of these. In other words, conditioning a policy action on the *a priori* precise identification of the market failure is not useful for implementing many coordinated policy actions simultaneously across agencies and the private sector.

There is a need to acquire a certain type of knowledge leading to "right" policy actions. This context-specific and sector-specific dynamic knowledge is not easily transferrable and can only be accumulated through continuous interaction with the market and the firms involved as well as through the aggregation of a large amount of information from policy actions implemented by other agencies. A key implication of this assumption is that, in the absence of this stock of context- and sector-specific knowledge, top-down actions "by decree," such as subsidies or local content requirements, will not be sufficient to succeed at developing an industry and may even be counterproductive in many circumstances.

More formally, in implementing its mandate, an important consideration in the decision-making process of agency G_k, deciding on a set of policy actions x_k, is knowledge and informational content of a set of policy actions and whether it conforms to what the targeted sector *i* requires in a given context (e.g., domestic, international, technological). Knowing the correct set of policy actions x_{ik} is a function of the stock of a sector-specific and context-specific knowledge K_i, or *metis*, combining information, institutional capacity, and capabilities of agents involved. These K_i as they apply to a specific sector in a specific context will require specialized knowledge of the industries, technologies involved, past and future trends, global and domestic supply chains, domestic firms involved, competitors, etc. They would also require constant experimentation and feedback from all the stakeholders, including the actions of *all the agencies and the private sector*.

Building knowledge K_i given the dispersion of policy actions $x_i(K_i)$ across agencies G_k would naturally require a leading agency in the presence of "frictions," including costs to resolve government and market failures. There are costs for gathering and sharing information as well as coordinating the implementation of policy experiments across multiple agencies. Indeed, experimentation and fine tuning of policies would require constant contacts with the private sector in line with what Evans (1995) called "embeddedness." Moreover,

[20] This type of market failures preventing structural transformation do not necessarily encompass well studied (sector-neutral) ones. It is generally accepted that state interventions are needed to tackle them (e.g., contract enforcement, intellectual rights, or pollution).

learning about the effectiveness of a trade policy, financing program, or the technology diffused by a public research institute to develop a targeted sector would require that all these agencies communicate with the private sector, that is, potentially many firms, and at the same time, they would need to communicate among themselves. Assuming a fixed cost per communication per period, the social cost of communication would be proportional to $n \cdot (n-1)$, where n is the total number of agents involved. In contrast, a structure with a leading agency in charge of accumulating this knowledge would lead to a cost proportional to n. In other words, the cost would be lower by the order of magnitude of n.[21]

Another way to infer the necessity of a leading agency is to assume that in the absence of a leading agency, each agency would have to replicate building K_i, or part of it, itself. One can assume that K_i is not transferrable, or even if transferrable, for example, through training, it is not optimal to do so provided there are learning externalities and knowledge agglomeration; that is, the whole is larger than the sum of its parts.[22] It may also imply that many agencies would have to duplicate this effort by dedicating sizable resources in an environment where usually technical and managerial capabilities are scarce.

As an illustration, suppose the focus is to develop renewable energy technologies. The development of this sector requires bringing together many scientists and experts who know energy technologies and industries. They will engage in innovation and R&D, design solutions to various energy needs of sectors and interact with firms by providing financial and business support and disseminating knowledge. Providing financial support requires not only financial expertise but also specialized knowledge K_i.[23] Building this knowledge requires continuous investment, experimentation, learning by doing, resources, and time.

Implementing policy actions x_i under a sector-specific mandate and building the extensive knowledge stock, especially for sophisticated industries, $K_i(S)$, transcends the mandate of each agency.[24] Moreover, it is not sufficient to build comprehensive sector-specific knowledge in one agency G_k that may require going beyond a specific mandate like creating and demonstrating nascent technology or supporting startups. Scaling up technologies, producing at scale, building clusters, and alleviating the bottlenecks for the growth of the whole industry would go beyond one agency's mandate. Then, a large and diverse stock of knowledge, $K_i(S)$, and policy actions, $x_i(K_i(S))$, are required to reap the full benefits of the industrial policy mandate, which is often cross-sectoral (e.g., software or artificial intelligence (AI) for the auto industry or synthetic materials for the electronics industry). Many industrial policy actions $x_i(K_i(S))$ would require policy actions dependent on knowledge generated in different areas, whether it is financial, regulatory, industry, or infrastructure expertise across various industries and fields, that would benefit further from agglomeration externalities and knowledge spillovers were the knowledge-building housed in a leading agency.

[21] This communication resembles transactions in the barter vs. monetary exchange, where the number of prices is $\frac{1}{2}n \cdot (n-1)$ in a barter trade vs. $(n-1)$ in monetary exchange.

[22] "Any vital industrial policy in developing countries—whether it is SME [small and medium enterprise] promotion, industrial human resource, quality and productivity improvement, or industrial cluster development—normally covers multi-sectoral issues managed by more than one ministry or agency. Thus, intra-government coordination becomes imperative if the policy is to be effectively designed and implemented. A lead ministry or agency must be designated and given a clear mandate to formulate the policy" Ohno (2011, page 7).

[23] For instance, the US Department of Energy has been transformed in the early 2020s to support not only energy research and demonstration projects but also deployment, manufacturing capacities, and financing to firms that the private sector may not provide (Loan Office Program).

[24] It is possible in theory that all policy actions $x_i(K_i)$ reside within the mandate of a single agency G_k. For instance, support for the development of energy technologies could be provided within one agency as mentioned above. Yet although the Loan Office Program of the US Department of Energy provides financial support to firms focused on the energy industry, it is not resolving all market failures to develop energy-related industries, including cross-disciplinary knowledge sharing and learning externalities.

Another possible but ineffective alternative to a leading agency is the setting up of dedicated committees and secretariats (Ohno 2012). By nature, the knowledge needed to identify the policy actions to develop a sector K_i must be continuously accumulated through painstaking experimentation and trial and error over extended periods of time, especially in interactions with the private sector. In contrast, committees often rely on "borrowed" (and usually insufficient) resources from other agencies and have limited lifespans, lacking the sustained effort, continuity (including staff), and pooling of capabilities that a leading agency would provide.

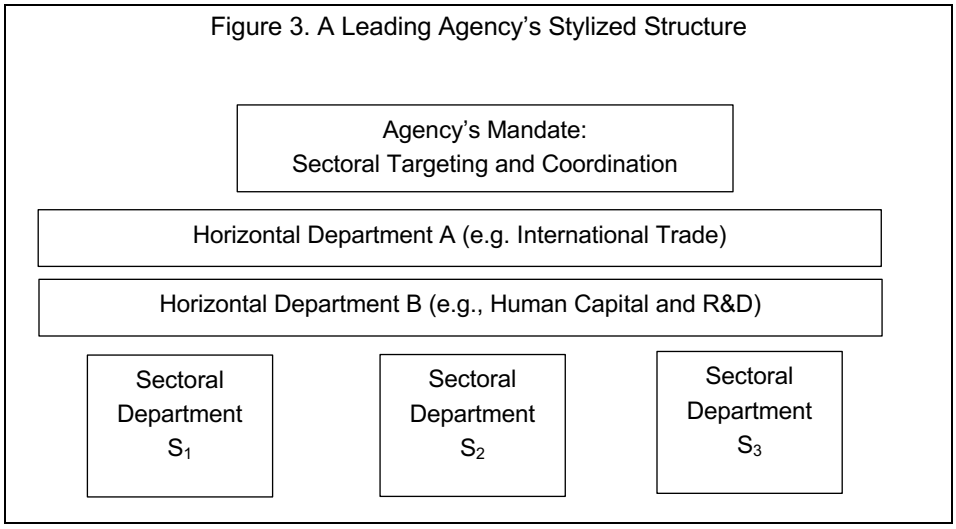
Perhaps the most important argument in favor of a leading agency is the tool-agnostic nature of building a sector- and context-specific knowledge stock. While a typical ministry or agency is constrained, if not defined, by the policy tools in its arsenal, building the *house of knowledge* requires analyzing all the tools available, and if necessary, creating new ones. A leading agency would not be constrained by specific tools and would have the freedom to design needed tools or change the parameters of existing ones.[25] The targeting of electronics in Taiwan Province of China illustrates this point (Wade 1991). The knowledge needed to implement the large array of policy actions, including infrastructure, training, and public research institute, was mostly accumulated at a leading agency (ITRI) tasked with the coordination of the efforts (see Case Studies section). It could dedicate sizable resources to understand the requirements of the electronics industry, market direction and trends, what specific domestic firms and multinational corporations (MNCs) would need, including communicating with firms in Silicon Valley, and other relevant features to grow an industry.

As the leading agency is in charge of accumulating specialized knowledge related to at least one sector (and often more in larger economies), building this stock of knowledge would naturally require employing a sizable team of long-term personnel. They would be highly capable technically with an extensive knowledge of the industry in question from all perspectives (e.g., technology, international markets, value chain). Processing the feedback from the private sector and coordinating with other agencies can only be credibly performed by specialists working in a division to pool all the resources together. In the presence of several sectors to target, the leading agency would ideally be organized in several dedicated sectoral divisions, mirroring the sectoral targeting.

In parallel to accumulating sector-specific knowledge, the leading agency would also require tackling trade-offs, setting priorities, and pooling resources, to make sure industrial policy is sustainable. Beyond targeting sectors and coordinating the policy action for the sectors targeted, or what we describe as "meso-targeting and coordination," the leading agency would also need to consider macro-sustainability and other cross-sectoral considerations such as fiscal sustainability, inflation, and financial stability, which we describe as a "holistic approach" (Ocampo 2013). Some functions would have to cut through several functions such as international trade or R&D. To be able to perform this set of actions, the setup of the leading agency requires, in addition to sectoral (or vertical) departments, a structure that would also entail cross-sectoral (or horizontal) departments (see Figure 3).

[25] There are also many documented instances of a leading agency even using moral suasion to achieve its goals. For example, TSMC, a chip manufacturer, was largely funded by the development bank, but it could not secure the remaining financing needs from the private sector without the leading agency's "arm twisting" or contacts.

Figure 3. A Leading Agency's Stylized Structure



The Political Economy of the Leading Agency

The accumulation of the context- and sector-specific knowledge about policy actions does not imply that it will be automatically implemented. In other words, can the leading agency translate its knowledge into action? Different parts of the government, businesses, and external actors are likely to have different objectives that may be inconsistent with the required policy actions (Acemoglu and Robinson 2013).[26] This inconsistency would stem from rent-seeking behavior, turf battles, different mandates, or simply from a different worldview (e.g., an agency could hold Washington Consensus views and resist tackling market failures or targeting specific sectors).[27] In addition to competing objectives of agencies, firms, and political and business actors, the extent of centralization and stability of the political system matters for policy continuity and implementation.

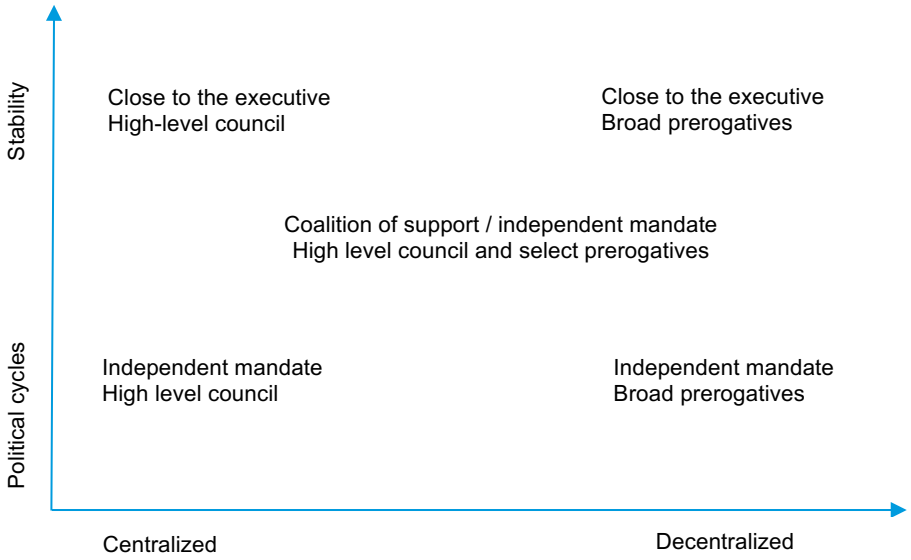
The degree of centralization of power would determine the organizational structure needed to coordinate and implement policies (Figure 4). At one end of the spectrum, in highly centralized states, a council and the leading agency, coordinating across the key stakeholders, under the auspices of the highest authorities could be adequate. For instance, a high-level council could consist of a chair (e.g., president, prime minister, deputy prime minister) and high-level agency/ministry officials to coordinate and execute the policies. The decentralized system of government requires a leading agency with a broad mandate to coordinate policy actions across various government agencies.

At the other end of the spectrum, in highly decentralized states, the leading agency would have to acquire directly the most important prerogatives under its umbrella as the only way to ensure the policies are implemented and feedback is received. Between these extreme cases, some policy actions could be addressed through a high-level council with some coordination and power functions. Other key prerogatives such as finance, trade or R&D could be put directly under the leading agency's responsibility, depending on the sectors targeted, to further support the work of the council. We describe this arrangement as hybrid, in which both the council and leading agency with key select prerogatives are important.

[26] "Since one ministry or agency is unable to direct or overrule other ministries and agencies, there should be a higher mechanism that supervises the whole process, gives full authority to the lead ministry or agency, and provides a forum in which multi-sectoral issues are deliberated and solved" (Ohno 2012).

[27] This concept builds on embeddedness (Evans 1995). It requires an extensive cooperation with the private sector, and this cooperation is built on the credibility to implement policies directly or through other agencies.

Figure 4. Leading Agency and the Power Structure: Political Cycles and Decentralized Power



The other dimension that matters for the autonomy and continuity of policy actions of the leading agency is the degree of stability of the political system. That is, can the leading agency pursue its work without undue interference or disruption? A political system with a stable or long-lasting executive implies that the agency would be ideally placed directly under the top echelon of the executive power, to ensure it is shielded from meddling or nepotism and benefits from the continuity of the political system. In contrast, in systems characterized by short political cycles and frequent political changes, the leading agency should not be attached to the executive to avoid a recurrent change of direction and staff and to give it a non-political nature, as is the case with central banks (or, to a large extent, NASA and the National Institutes of Health (NIH) in the US).

In many cases the political system is such that it is difficult to have a truly independent institution *de facto* although it can exist *de jure.* We argue that to achieve continuity in such cases, a coalition that is broad enough in support of industrial policy mandate is needed (Rithmire 2023, Dercon 2022, Tan 2021, Pritchett, Sen, and Werker 2017). How broad the coalition should be would depend on the power structure of the economy. Nonetheless, the relative independence of central banks in many developing countries indicates that independent institutions could function sufficiently well even in volatile political environments.

The Role of the Leading Agencies in the Asian Miracles

The Asian Miracles, during the period of their formidable growth, in the mid- to late-20th century, all set up the equivalent of the leading agency described above, which oversaw targeting and coordination while accumulating a deep understanding of the industries they targeted.[28] The setting up of these institutions corresponded to the inflexion point in their development trajectory.

[28] On the institutionalization of public-private relations, see Weiss (1998), Weiss and Hobson (1995), Kondo (2005) (in Ohno 2012).

Japan's Ministry of International Trade and Industry (MITI) was the cornerstone of the country's post-war economic miracle, with its golden age spanning the period from the 1950s to the 1980s. MITI's success lay in its ability to select and target strategic sectors such as steel, automobiles, and electronics, providing them with a wide range of support including, but not limited to, subsidies, tax breaks, and access to foreign technology. MITI's policies were not static. They evolved through a process of experimentation and feedback, accumulating practical context- and sector-specific knowledge, what worked and what did not. For example, MITI initially protected domestic industries but gradually shifted to promoting exports and competition as firms gained strength. This iterative approach allowed MITI to refine its strategies over time. Moreover, MITI acted as a central coordinator, aligning the efforts of various ministries, agencies, and private firms to ensure that industrial policies were implemented cohesively. By the 1980s, Japan had become a global leader in industries like automobiles and consumer electronics, with companies like Toyota and Sony dominating international markets. MITI's role was highlighted as a "pilot organization" that orchestrated Japan's industrial transformation through targeted policies and adaptive governance (Johnson, 1982, pp. 45–78; World Bank, 1993, pp. 112–130).

Korea's Economic Planning Board (EPB) was the driving force behind the country's rapid industrialization during its golden age from the 1960s to the 1990s.[29] The EPB's five-year plans set ambitious targets for GDP growth, exports, and industrial development, with a focus on sectors like shipbuilding, electronics, and automobiles. The EPB's approach was characterized by its ability to accumulate knowledge through continuous trial and error. For instance, early efforts to develop heavy industries faced challenges, but the EPB used feedback from these experiences to refine its policies such as linking government support to export performance. This performance-based accountability ensured that resources were used effectively. The EPB also played a critical role in coordinating the efforts of various ministries and agencies, ensuring that industrial policies were implemented in a unified manner. By the 1990s, Korea had transformed from a poor, agrarian economy into a high-income industrialized nation, with chaebols like Samsung and Hyundai becoming global leaders. The EPB played a significant role in creating a "disciplined state" that combined targeted interventions with rigorous accountability (Amsden, 1989, pp. 67–95; Kim, 1997, pp. 102–125).

Taiwan Province of China's Council for Economic Planning and Development (CEPD) played a vital role in the island's transition from an agrarian economy to a high-tech industrial powerhouse during its golden age from the 1950s to the 1990s. The CEPD's long-term economic plans focused on industrialization, export growth, and technological upgrading, with a particular emphasis on sectors like semiconductors and electronics. Similarly, the CEPD's policies were informed by what we describe as *metis*—practical knowledge gained through experimentation and feedback. For example, early efforts to develop light industries provided the foundation for the later moves into high-tech sectors. The CEPD also coordinated the efforts of various ministries and agencies, ensuring that industrial policies were implemented cohesively. By the 1990s, Taiwan Province of China had become a global leader in industries like semiconductors and computers, with companies like TSMC and Acer dominating international markets. The CEPD was instrumental in creating a "governed market" that combined state-led planning with market mechanisms (Wade, 1990, pp. 85–110; Gold, 1986, pp. 60–85).

Singapore's Economic Development Board (EDB) was key to the city-state's transformation from a trading port to a global financial and industrial hub during its golden age from the 1960s to the 1990s. The EDB's strategy focused on attracting MNCs by offering incentives such as tax breaks and infrastructure development. However, the EDB's success was not just about attracting investment but also involved accumulating *metis*

[29] See Chapter 3, "The Role of the EPB in Korea's Industrialization" in Kim, Byung-Kook (1991). *The Politics of Economic Reform in South Korea: A Fragile Miracle*. Stanford University Press.

through experimentation. For example, the EDB initially targeted labor-intensive industries but later shifted to high-tech and capital-intensive sectors as Singapore's economy matured (Yeo 2016). This adaptability was key to sustaining growth. The EDB also coordinated closely with other government agencies to ensure that policies were aligned and implemented effectively. By the 1990s, Singapore had become one of the world's most prosperous economies with a strong presence in industries like finance, petrochemicals, and electronics. The EDB made the creation of a "developmental state" possible, which combined strategic planning with flexibility and coordination (Huff, 1994, pp. 210–235; Lee, 2000, pp. 150–180).

While Hong Kong SAR was often characterized as a laissez-faire economy, the Industrial and Technology Development Council (ITDC) played a significant role in fostering industrial and technological advancement during its golden age from the 1970s to the 1990s (Cherif and Hasanov 2019b). The ITDC's approach was less interventionist than its counterparts in Japan, Korea, and Taiwan Province of China, but it still played a critical role in targeting high-value sectors like electronics, textiles, and financial services. The ITDC accumulated *metis* by experimenting with policies to create a favorable business environment in specific sectors by investing in public and quasi-public goods such as infrastructure, critical inputs and services, and education. It also facilitated partnerships between local firms and international corporations, enabling Hong Kong SAR to become a global hub for trade and finance. By the 1990s, Hong Kong SAR had established itself as a leading financial center with a robust industrial base and a reputation for innovation and efficiency. The ITDC trailblazed the creation of a "facilitative state" that supported industrial development through targeted interventions and coordination (Chen, 1997, pp. 45–60; Sung, 2005, pp. 75–90).

The leading agencies of the Asian Miracles differed in their historical background and explicitly stated goals (see Appendix). The literature noted that the state apparatus for industrial policy in Japan, Taiwan Province of China, and Korea had different structures and behavior (Auty 1994; Dollar and Sokoloff 1994; Kuznets 1988). These varied from Japan's hidden technocracy and strong links with the private sector, *zaibatsus* (conglomerates), to Taiwan Province of China's flexible developmental model with many ad hoc organizations focused on spinning off startups in electronics, and Korea's top-down model where the state largely micromanaged the daily operations of the big manufacturers, especially the *chaebols* (Biggart and Guillen 1999).

However, despite their differences, the leading agencies in the Asian Miracles shared similar mandates and organizational structures and occupied a special role in the institutional structure of the government. Their mandates adopted a long-term goal-oriented view. Their organizational structures were characterized by a combination of sector-specific departments and horizontal or cross-sectoral departments, which allowed for specialized focus on individual industries while ensuring coordination, prioritization, and tradeoff assessments across the economy. Their independence and the navigation of power structures allowed them to be effective in executing their functions and fulfilling their mandates.

Mandates

We argue that the leading agency as we define it, and as it functioned in the Asian Miracles, was far from being a "planning" agency as is generally understood. It was not largely staffed by bureaucrats seeking legibility in the sense of Scott (1998) although it was described as a planning agency staffed by planners in the literature (Wade 1992). Indeed, staff of these agencies must have thought of themselves as such as they often used planning jargon to describe their policies, e.g., Japan's administrative guidance or Korea's 5-year plans (even EPB had "planning" in its name). However, planning terminology at the time was used to differentiate the agencies and policies from those of a pure laissez-faire system.

The work of the leading agencies emphasized the contribution of the state to production as an active facilitator capable of experimenting, taking risks, and anticipating and resolving challenges (Wade 1992 and Evans 1995). These agencies were aware of the trends in domestic and foreign markets and stayed in constant contact with the private sector and firms (Johnson 1982, Wade 1992, Evans 1995). They showed a high level of innovation and flexibility as shown by the wide array of tools used (Cherif and Hasanov 2024). In Japan, the differentiation between the private sector and MITI was even more tenuous because of the *amakudari* system, in which the senior staff of MITI retired when they reached their 50s to join the same private firms they were working with in senior positions. In this sense, the leading agency's staff may be called "marketaucrats," literally market-governors, rather than bureaucrats.

This description of leading agencies is consistent with our assumption of a leading agency as the house of knowledge or *metis*, where a context-specific and sector-specific stock of knowledge is accumulated. It is precisely the type of knowledge that the state cannot "see" (Scott 1998) and must be acquired. That is, the leading agency, as practiced in the Asian Miracles, is far from being the planning institution that emerged in many developing economies in the 1960s and 1970s, leading to continuous debates about industrial policy's ineffectiveness or failures (Cherif and Hasanov 2024).

In fulfilling their mandates, the leading agencies focused on long-term targets, economy-wide goals transcending specific sectors, and an orientation toward structural transformation and technological upgrading. This approach was built on existing lower sophistication export-oriented sectors to free the resources required to invest in the higher sophistication export-oriented sectors while managing pressing macroeconomic and social issues.

The Long Run Focus

The leading agencies had mandates that encouraged long-term development instead of short-term expediencies. They were less concerned with the immediate economic outcomes of their policies but instead focused on their long-run objectives.

In Korea, the EPB set successive five-year plans that built upon each other to achieve long-term coordinated development. For example, the first five-year plan (1962–66) focused on creating a self-sustained and export-led economy. The second five-year plan (1967–71) focused on modern economic structure while the third (1972–76) and the fourth (1976–81) plans supported heavy industrial drive, higher living conditions, growth, and macroeconomic balance. These medium-term plans helped initiate long-term industrial development (Kuznets 1990).

Table 1. Overview of Korea's Five-Year Plans

Name	Years		Leaders
First Five-Year Plan	1962 – 1966	Creating a self-sustained and export-led economy through technology investment, education, and shift from agriculture to manufacturing	Park Chung Hee
Second Five-Year Plan	1967 – 1971	Creating a modern economic structure through building major highways and supporting steel and petrochemical industries	Park Chung Hee
Third Five-Year Plan	1972 – 1976	Heavy Industry Drive especially in five "strategic" fields: (1) electronics, (2) shipbuilding, (3) machinery, (4) petrochemicals and (5) non-ferrous metals	Park Chung Hee
Fourth Five-Year Plan	1977 – 1981	Continuation of Heavy Industry Drive	Park Chung Hee Choi Kyu Hah Chun Doo Hwan
Fifth Five-Year Plan	1982 – 1986	Shift from heavy industries to technology-driven products	Chun Doo Hwan
Sixth Five-Year Plan	1987 – 1991	Aiding structural transformation through acceleration of import liberalization and phasing out direct subsidies to industries	Chun Doo Hwan
Seventh Five-Year Plan	1991 – 1996	Development of high-tech industries in seven provincial cities to aid geographic distribution of industries throughout Korea	Chun Doo Hwan Kim Young Sam

Note: The Seventh Five-Year Plan was scrapped in 1993 after the election of Kim Young Sam with a new economic plan that matched his term length. After the election of Kim Dae-Jung, the practice of setting five-year plans was scrapped.

Economy-wide Goals

Leading agencies had economy-wide mandates instead of being overly attached to a specific industry that could increase the chance of being captured. Although agencies might have had to favor selected industries to drive development at various industrialization stages, these priorities were often evaluated with the entire economy in mind rather than being based on clientelism for a specific industry or on ownership, including public vs. private. For example, Singapore's EDB invested extensively in Government-Linked Corporations (GLCs).[30] However, these public corporations did not enjoy preferential treatment. Instead, EDB forced them to compete in the market on relatively equal terms with private companies. This approach helped support dynamism and competitiveness of all Singapore's companies.

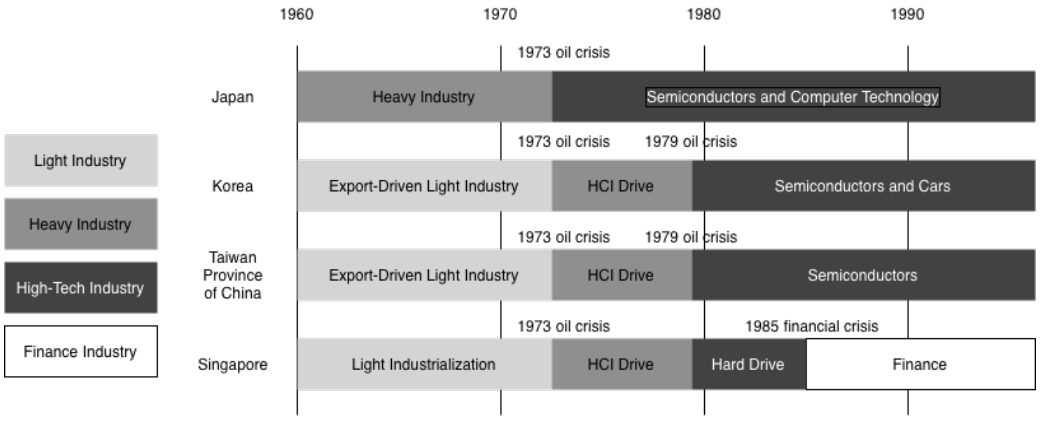
[30] Over time, the investment function was shifted to Temasek, which was founded in 1974.

In Taiwan Province of China, the CEPD initially supported labor-intensive light industries. However, the two oil crises in 1973 and 1979 caused major recessions around the world, and Taiwan Province of China's exports of light industry goods suffered amid slow global demand. Consequently, the government started investments in Heavy Industry Drive such as the Ten Major Projects of 1974 to upgrade its industrial structure. As a result, Taiwan Province of China's structure of export products experienced significant changes after the two oil crises. Between 1971 to 1986, the share of textiles, a labor-intensive good, in the export structure dropped from 30.6 percent to 18.9 percent while the share of electrical machinery and appliances, a capital- and technology-intensive good, increased from 15.8 percent to 21.8 percent (Wu and Wu 1987). Wu and Wu (1987) argue that as wages kept rising, continuous development required sustaining the rapid shift of the industrial structure from labor-intensive to technology-intensive industries.

Structural Transformation

The leading agencies went beyond fixing traditional market failures such as capital or skill shortage and had an implicit mandate to create new markets and push forward the technological frontier. This approach also corresponds to the model Mazzucato and Macfarlane (2018) proposed, which promotes structural changes across multiple sectors to achieve societal missions while bringing sustained growth in new markets. Figure 5 below shows the shifting targets for key production sectors in the four East Asian economies from the 1960s to the 1990s. All these economies, starting with light manufacturing or similar sectors, moved to heavy manufacturing and then to high-tech industries such as electronics and highly skilled services such as finance.

Figure 5. Shifting Sectoral Targets in East Asia



Note: The East Asian economies were effective in their "market shaping" strategies of moving up the value-chain. For example, Japan's move from Heavy Industry into Semiconductors and Computer Technology in 1973 created opportunities in this industry. Korea, Taiwan Province of China, and Singapore all moved into this area in which they had little previous exposure.

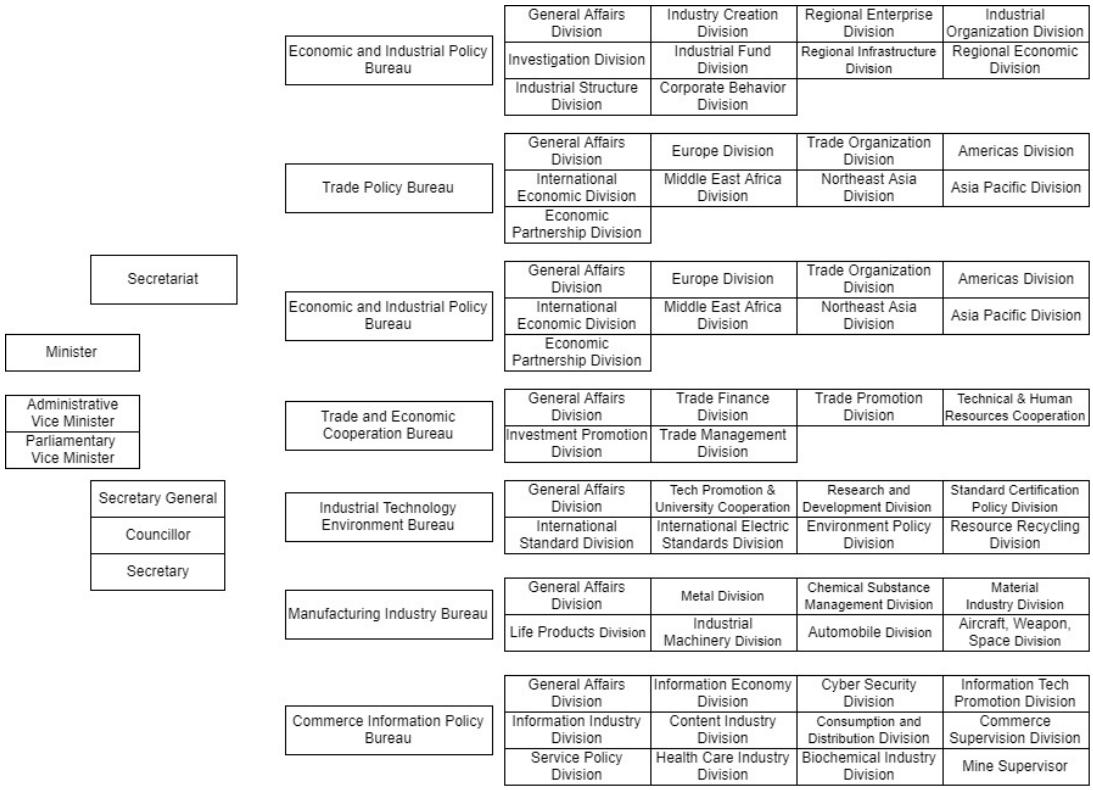
Source: Figure created by authors with information drawn from Soon & Tan (1997), Wade (1992), Okimoto (1989) and Greene (2009).

Internal Organizational Structure

Japan's MITI had both sector-specific and inter-sectoral divisions to help combine and evaluate interests across different industries for effective policy planning and implementation. As Okimoto (1989) observed, Japan's MITI had an integrated holistic approach that contrasted with the highly fragmented U.S. system. MITI's vertical units such as the Machinery and Information Industries Bureau (iai joho sangyo-kyoku)

represented the specific interests of their respective portfolio. The 1949 reorganization of MITI (then known as the Ministry of Commerce and Industry) marked a pivotal moment in the establishment of sector-specific divisions. This reorganization consolidated MITI's authority over industrial policy and created specialized bureaus (e.g., Machinery and Information Industries Bureau) to oversee the development of key sectors (Figure 6). This pioneering reform was described by Johnson (1982) as a pivotal moment in the development of Japan's industry. Meanwhile, horizontal units like the International Trade Policy Bureau (sangyo seisaku-kyoku) balanced the interests of all sectors within its functional jurisdiction. Sector-specific officials could argue for preferential policies benefiting the industry they represented in front of their colleagues in functional units. This model ensured that no specific unit could always dominate policy setting. MITI could thus take more of a holistic approach and consider each policy within the wider mandate and interests of economic development.

Figure 6. Japan's MITI Structure

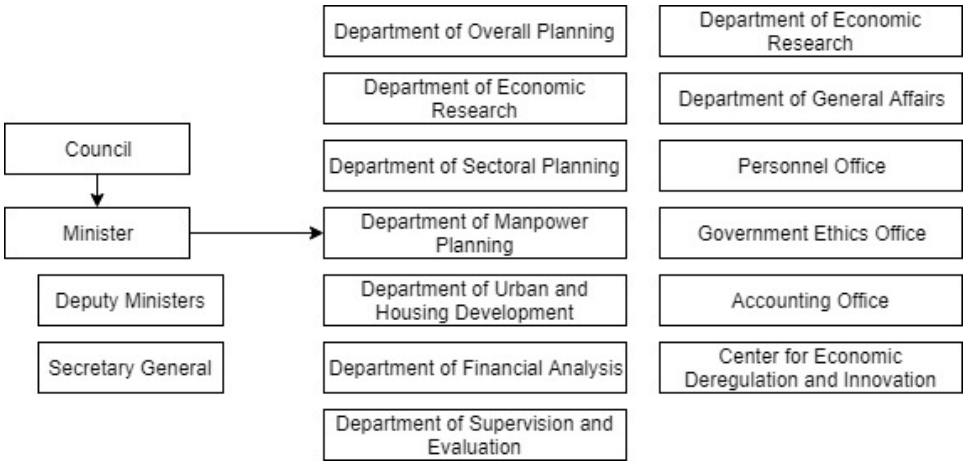


Source: Compiled based on the information on the MITI website.

Korea's leading agency, EPB, had a different structure than MITI, but its functioning was similar. Nominally, it did not house directly sectoral departments and all the cross-sectoral functions within it. However, the EPB sat at the top of the hierarchy within the Ministry of Commerce and Industry (MCI), which itself housed a network of agencies performing the functions of sectoral and cross-sectoral departments. It included the Industrial Policy Bureau which focused on individual sectors like manufacturing, the Social Development Bureau, which oversaw infrastructure and social welfare, and the Planning and Coordination Office, which oversaw cross-sectoral issues such as resource allocation and long-term economic strategy (Kim 1991).

Taiwan Province of China's CEPD was organized around sector-specific and functional divisions. Its sectoral units were housed in the Department for Sectoral Planning (Figure 7). These divisions focused on individual sectors, dividing responsibilities to increase efficiency. Although the structure was less elaborate in its cross-sectoral coordination compared to Japan's MITI, it was inspired by it to a large extent (Wade 1990).

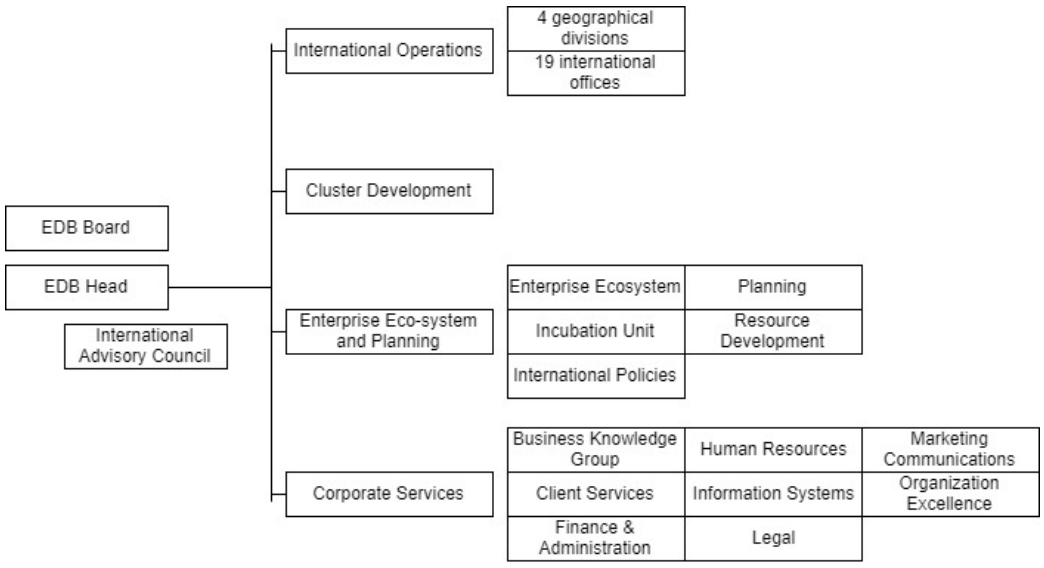
Figure 7. Taiwan Province of China's CEPD Structure



Source: Compiled based on CEPD (2012).

Singapore's leading agency, EDB, had divisions in both vertical and horizontal treatments of the sectors. It had a vertically focused Cluster Development Division that concentrated on each industrial cluster. These types of divisions were supplemented by horizontally focused bureaus in Enterprise Ecosystem and Planning Division, which oversaw economy-wide issues like Intellectual Property and International Policies. This structure of vertical and horizontal units was an effective way to aggregate different considerations both within sectors and across industries, allowing for cross-checks and supporting internal accountability.

Figure 8. Singapore's EDB Structure

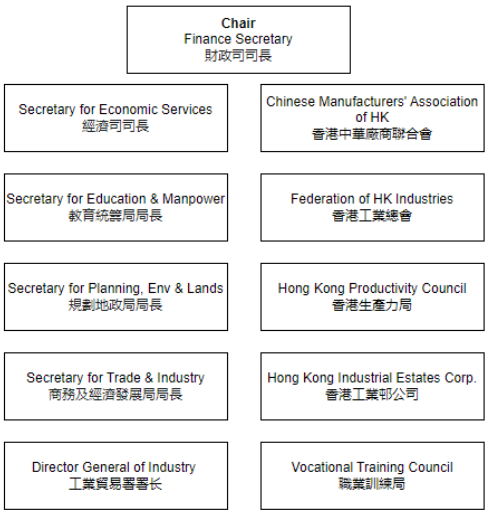


Source: Compiled based on the information on the EDB website.

Hong Kong SAR's ITDC can be seen as both a high-level council and a crucial node of a wider network of complementary agencies and committees. In this regard, it is not an outlier of the leading agencies discussed although it did not have the same structure combining sector-specific and cross-sectoral units. ITDC's organization was shaped by the power structure prevailing at the time.[31]

ITDC played a much greater *de facto* role, akin to a leading agency, despite having narrower mandate *de jure*. It had the least policy-making authority and the narrowest role as defined by law, i.e., trade promotion and facilitation. Despite a certain level of autonomy, it, however, operated at arms' length from the executive. The ITDC compensated for these limitations by drawing its influence from an informational advantage about markets and trade trends (a.k.a. *metis*) and a convening power to coordinate. It developed a sophisticated network of committees, review boards, and councils that collaborated with each other in a network of information sharing and joint responsibility. This network allowed for collaboration with both vertically integrated institutions that focused on a specific industry as well as horizontal institutions that took a cross-sectoral viewpoint. In addition, ITDC was chaired by the Financial Secretary, joined by ten representatives, five within government and five nongovernmental representatives (Figure 9).

Figure 9. Hong Kong SAR's ITDC



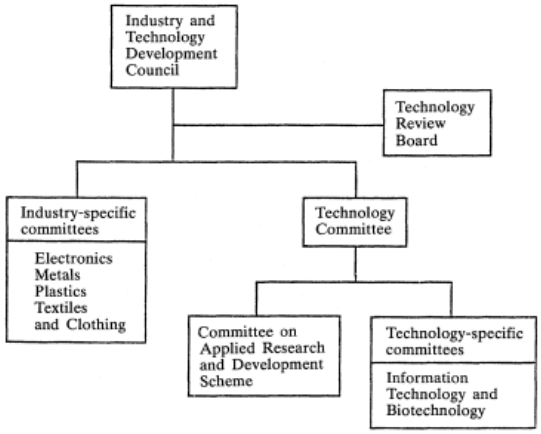
Source: Based on Yeh and Ng (1994).

The network built around ITDC functioned relatively effectively. It included other agencies such as the Technology Review Board, Technology Committee, and industry-specific committees (Figure 10). The units of this network complemented each other and helped in maintaining each other accountable and avoiding interest capture by private actors. The structure also allowed for significant information sharing and transparency. ITDC collaborated closely with industry-specific committees set up by the Hong Kong SAR government, made of experts in the field to look at priority manufacturing industries such as electronics, metals, plastics, textiles, and clothing. Those committees engaged with industry leaders to identify specific technological challenges faced by

[31] It evolved under the British colonial "laissez-faire" rule. The colonial administration, while not democratic, developed a reputation for efficiency, contributing to a stable and predictable environment. ITDC's functioning resembled that of how MITI operated during the rule of the Supreme Commander for the Allied Powers (SCAP), which oversaw the demilitarization and democratization of Japan after WWII (Johnson 1982).

specific sectors, thereby helping complement the economy-wide approach taken by the ITDC. For instance, the Technology Review Board was set up to speed up vetting of companies for funding purposes, including for the disbursement of the Innovation and Technology Fund. It simplified the vetting process to streamline bureaucratic review and reduce time for companies to receive funding from the government (Fuller, 2006). The Technology Committee was made up of the Committee on Applied Research and Development Scheme and technology specific committees, providing advice both within a technological field and from a holistic perspective. This network structure of technology and industry committees and review boards (vertical and horizontal units) and ITDC's leading role within this network allowed for significant information sharing and transparency across agencies, giving credence to the work of ITDC and its network.

Figure 10. Hong Kong SAR's ITDC and its Network



Source: Yeh and Ng (1994).

Political Economy Challenges

Japan's MITI operated in a relatively decentralized power system, prone to a high turnover of politicians. MITI had to compete with the Ministry of Finance and Bank of Japan for policy preferences. Furthermore, the Ministry of Finance had budgetary power and set strict guidelines on how MITI could use them. To circumvent this dynamic, MITI relied on external institutions, large companies, industrial associations, banks, securities houses, and other private-sector institutions. At the same time, MITI was given broad prerogatives by the government to direct specific resources to key sectors. Among others, it controlled foreign exchange, particularly important in the early post-war period when foreign currency was scarce, import licenses to protect domestic industries and facilitate technology acquisition, and more important, credit through its extensive "administrative guidance" (Johnson 1982).

Despite the absence of a formal independent mandate, MITI was in charge of key mandates and tools and its policy continuity did not come from being directly attached to the executive. MITI's true power lied with career technocrats who advanced based on merit and seniority; there was consensus within the leading party, the Liberal Democratic Party (LDP), about the importance of its objectives while the LDP dominated Japanese politics for decades; and MITI developed a web of personal relations with the business community, especially through its revolving door system (*amakudari*), where top administrators of MITI retired early to lead the private firms they had been working with closely. By having direct impact on the private sector, instead of relying on the formal political framework, MITI could circumvent the political and legal process, obtaining more power and freedom to pursue its economic policy (Okimoto 1989). Until the 1990s when the Japanese government

restructured its system after the financial crisis, MITI had virtually no need to include other ministries in industrial policy making (Ahman 2006). Instead, it operated on a system of consensus with private sector actors.

In Korea, EPB evolved in a stable and relatively centralized system and was given substantial prerogatives to conduct industrial policy. It was directly attached to the President's office, drawing from that position political protection and ensuring its continuity of action. It was, however, engaged in policy competition with the Ministry of Commerce and Industry and the Ministry of Finance, both of which played an important role in economic policymaking. EPB was able to dominate economic decision-making related to industrial policy through a combination of "councils and committees" and broad prerogatives given. Under Park Chung-Hee, EPB was responsible for the Monthly Economic Briefing to the President. This responsibility gave EPB significant policy initiative to influence the Blue House, the Presidential Palace, and control macroeconomic planning (Minns 2001).

EPB could set the economic agenda through chairing inter-ministerial policy conferences like the Economic Ministers Conference, Economic Vice-Ministers Conference, and Industrial Policy Deliberation Council (Jung 2011). These meetings helped EPB to take a leadership position and set the agenda for policy proposals subsequently presented to the State Council. EPB had also been given broad prerogatives as it controlled the economic budget and other Ministers were usually obliged to consult the EPB Minister on policy initiatives, especially if it involved budget expenditures (Choi 1987). This function gave EPB an upper hand in negotiating with other ministries. Lastly, EPB oversaw formulating the Five-Year Plans, allowing it to lead the government in its economic policymaking. These advantages helped enhance the power of EPB to coordinate with other ministries to support policymaking.

Taiwan Province of China's CEPD evolved in a relatively centralized system, controlled by the Kuomintang, albeit relatively less centralized compared to Korea. It was an agency that was part of the Executive Yuan, thus placing it close to the executive branch. Its head usually outranked its main competitor, the Minister of Economic Affairs. The head of CEPD had close relationship with the head of the executive and chaired economic meetings, which gave him power to determine economic agenda. Taiwan Province of China's leading agency oversaw formulating long-term economic plans and coordinating policies, giving it strong policy initiative to guide economic policy (Arnold 1989). However, compared to EPB, there was more emphasis on coordination and less on control.

Singapore's EDB evolved in an even more stable and centralized system, dominated by Prime Minister Lee Kuan Yew and his party. It was also an exception as it did not engage in the same level of policy competition with other parts of the government. Unlike the other leading agencies, it was not directly attached to the highest level of the executive. In fact, EDB was a statutory body under the direction of the Ministry of Trade and Industry. While not directly under the Prime Minister's office, EDB maintained extremely close ties to the top leadership, including the Prime Minister and key cabinet members. The Singaporean cabinet set broad goals and EDB had to find ways to execute the predetermined policy goals. Nonetheless, EDB was working closely with other agencies, especially the Ministry of Trade and Industry and the science and technology agency A*STAR (Agency for Science, Technology and Research) to accumulate context-specific and sector-specific knowledge and implement relevant policies. Their relationship was less competitive and more cooperative than that of the leading agencies in other Asian Miracles (Edquist and Hoffman 2009).

ITDC, as a leading agency in a decentralized environment, followed the pattern of ruling through a council. It was represented by both top bureaucrats from the Hong Kong SAR authorities as well as appointments from industry leaders. This structure and its high-level nature allowed ITDC to have close coordination with the executive while still maintaining an arms' length approach through a strong representation of the industry leaders. It also had sufficient power to coordinate across the network of agencies for effective policymaking. In addition, the staff on the ITDC was recruited mainly from academia, banking, and the private industry, bringing crucial expertise and the flow of ideas between the government and private industries (Yeh and Ng 1994).

Software: The 4As Model of Institutional Features for Effective Action

Beyond the organizational setup, institutions differ in their operational design determining action. We argue that for the institution to be effective in implementing industrial policy, the proper operational design, consisting of key institutional features, is needed to support the institutions' actions. In other words, given the proper institutional *hardware*, what would the adequate institutional *software* be? Essentially, what institutional features are paramount to operate effectively, especially in the context of political economy constraints and coordination costs? Without such a software, the risk of falling into isomorphic mimicry is high, that is, having all the outer features of the institution without the real capabilities for effective action (Pritchett 2013).

We propose the 4As model of operational design for effective action. This model is guided by the theory presented in the previous section, the existing literature[32], and a systematic study of the institutions that conducted industrial policies in the Asian Miracles. To implement the set of policy actions *x* leading to the successful targeting and coordination of industrial policy, we argue that the institution needs to have the four key features. These 4As are as follows: (i) *Ambition-Agency* in the policy (or mandates), that is, ambitious goals and the ability to work towards achieving them; (ii) *Autonomy* in implementing mandates and coordinating among the stakeholders while being shielded from undue political and business influence; (iii) *Accountability* in achieving the objectives for external and internal stakeholders; and (iv) *Adaptability* to shifting economic and political conditions with continuous feedback from the market and various stakeholders.

In addition to defining the 4As, we provide a rationale for each "A" based on the experience of the Asian Miracles and how they achieved them in practice. It is straightforward to say that an institution (or institutions) should be autonomous or accountable, but it is a more arduous task to show a path to achieve it. In other words, our own ambition is to go beyond the abstract concepts, which many would agree on, by offering a possible blueprint for the leading agencies to follow in the footsteps of the Asian Miracles.

Ambition-Agency

We contend that the degree of ambition of the leading agency, or its *mindset*, is directly related to the extent of success of industrial policy. Chang (1994), Ohno (2012), Wade (1990, 2012), and Woo-Cumings (1999) among others, have emphasized the role of the "developmental mindset" in explaining the success of the Asian Miracles. We apply this argument specifically to the leading agency, giving it a concrete definition and linking it directly to the growth outcome of industrial policy. We also argue that *Ambition* to be translated into a reality must come with *Agency*. In other words, ambitious goals must be matched with the capability to conduct bold policies and take risks.

[32] See Ohno (2012).

Setting Ambitious Goals

We assess the extent of ambition of a leading agency along three dimensions of its medium to long-term goals: (i) the degree of sophistication of the sectors it targets; (ii) the extent to which domestic firms are involved in the ownership, management, production, and innovation; and (iii) the international competitiveness of the sectors targeted. Indeed, in the institutional setup we propose, a leading agency is primarily in charge of analyzing and targeting sectors as well as identifying and coordinating the required policies.

The growth outcome of industrial policy largely depends on the sectors a leading agency targets. Sophisticated sectors such as electronics, chemicals, automotive, biotechnology, and IT, which could be proxied by R&D intensity, are more conducive to productivity gains, spillovers, linkages, and positive externalities. These sectors support catching up with richer economies (Cherif and Hasanov 2019a) and result in better predistribution outcomes (Aghion, Cherif and Hasanov 2023), i.e., lower market income inequality, than commodity sectors such as metals (Prebisch 1950 and Singer 1949) and low sophistication sectors such as tourism. If a leading agency is not ambitious enough and focuses most resources on sectors with low sophistication and productivity gains, the resulting growth model may produce decent growth outcomes in the short- to medium-run, but growth would eventually run out of steam.

Growth models solely based on low-sophisticated or commodity sectors are more prone to large shocks and potential political instability. For example, developing economies, typically depending on the exports of few mineral resources, agricultural products, or on tourism, regularly see their revenues fluctuate substantially or worse, plummet for a relatively long time, that is their revenues have a large permanent volatility component (Cherif and Hasanov 2018). In contrast, economies with more sophisticated sectors tend to recover faster from crises (Zhu 2018) and have the technological and knowledge basis to pivot to new industries if they are faced with disruptive events.

As pointed out by Prebisch (1950) and Singer (1949) in the context of Latin America, the concentration of exports in primary goods leads eventually to a secular deterioration of the terms of trade and relative welfare. As these countries export inferior goods such as agricultural products and import superior goods such as pharmaceutical products, electronics, and transportation goods, and as the global economy grows, their purchasing power is doomed to deteriorate. For instance, the relative demand for a product like Ozempic would grow much faster than the demand for products such as cashews as global income grows (as seen in the relative prices of these products on the global markets). The resulting consequences are that cashew exporters would see their income erode relative to that of Ozempic exporters (Denmark).

Beyond the level of sophistication of the sector targeted, the extent of involvement of domestic firms in the production and innovation process would determine the extent of spillovers in the economy and whether high growth can be sustained. Moreover, a growth model focused on wage competition to attract FDI is vulnerable to competition from poorer economies as they start offering an attractive business environment with much cheaper wages, or other economies with a depreciated domestic currency. The experience of relatively successful middle-income economies such as Malaysia compared to the Asian Miracles, suggests that domestic technology creation and innovation are key to reaching the high-income status. Malaysia's focus on attracting FDI in electronics, without sufficiently effective policies to create an ecosystem of domestic firms fully engaged in supply chains and innovation, has led eventually to a drastic slowdown in their catching up with high-income economies, that is, substantially extending its journey through the middle-income trap (Cherif and Hasanov 2019c).

The drive to export and compete on international markets, or export discipline (Studwell 2013), is a key element explaining the success of the Asian Miracles (Cherif and Hasanov 2019a). Competing on international markets gives incentives for firms to catch up technologically and invest in R&D as well as reach sufficient economies of scale. In contrast, an import-substitution approach, which was in vogue in the 1960s and 1970s, is likely to be unsustainable in the medium- to long-run as firms remain dependent on imported critical inputs and technology. As the experience of those times shows, a domestic macroeconomic or external shock, for example, forces the government to reduce the explicit (or implicit) barriers to entry and cut subsidies, leading to the sudden exposure of the protected industry to international competition (Cherif and Hasanov 2024).

In addition, policymakers may lack ambition or confidence to enter sophisticated sectors to produce for global markets. Policymakers often believe that producing and exporting sophisticated products such as microchips or machinery tools are beyond the capabilities of domestic producers even if these firms exist. In contrast, Taiwan Province of China decided to enter the semiconductor industry in the 1970s when its GDP per capita was equivalent to that of Tunisia in the late 2010s. This push for chips occurred even though at that time there was not much local demand for chips, and the global market was completely dominated by vertically integrated multinationals.

A leading agency's global or export mindset was a necessary and crucial ingredient in its policy goals. Although exporting was done by private firms, often exporting would not have been attempted without a host of public policies (e.g., export promotion agencies, finance, standard setting, market intelligence, infrastructure, trade agreements) and incentives (including export quotas in Korea, see Chang 2002). In most developing economies the risk-adjusted returns for firms are usually tilted toward non-tradable industries, or at best, low-tech or non-sophisticated exports, and exporters face substantial hurdles, market failures (e.g. coordination and information), and barriers to entry, necessitating an active industrial policy geared toward exports (Cherif, Hasanov, and Zhu 2016).

The Asian Miracles achieved a high level of ambition along these three dimensions in practice through setting medium-term goals that helped signal the direction for policies and markets. Goal setting was an important way for the leading agencies to show their commitment to developing sophisticated export sectors in which domestic firms were in the lead, thereby mobilizing the resources necessary to tackle the sector-specific (and economy-wide) bottlenecks. Medium-term goals helped alleviate challenges posed by learning externalities and coordination failures. These goals often provided incentives for entry into new sectors, encouraging private firms to pivot to innovative sectors and adapt and develop new technologies, supporting learning spillovers and agglomeration effects. These goals also acted as an important signal for private firms that these sectors were a priority, reducing coordination failures in mobilizing simultaneous investment into these sectors. The medium-term goals addressed market failures by signaling the state's ambition, improving coordination efforts, and mobilizing private market forces in developing the targeted sectors.

While the leading agencies of the Asian Miracles set medium-term goals to guide their industrialization, the type of goals depended on their level of development. At earlier stages of development, given big constraints on resources, they tended to specify more centralized plans that directed resources into a specific sector. At later stages of development, they were more flexible with their plans and focused on building the supportive framework for growth.

In early stages of development, medium-term goals focused on specific products, which were not highly sophisticated but were far beyond the Asian Miracles' initial capabilities, later becoming building blocks for more sophisticated products. For example, Korea, in its Third Five-Year Plan (1972-1976) initiated the Heavy

Chemical Industrialization (HCI) Plan while the government borrowed heavily from foreign sources to fund this economic strategy (Han 2014). In Japan's earlier days, the First and Second Rationalization Plans for the Iron and Steel Industry (1951-1956 and 1957-1961) focused on subsidies and policies concentrating on the iron and steel industries, seen as important for modern economy. Japan borrowed heavily and focused its resources on select few sectors, mobilizing the rest of the economy to serve these industries (Okazaki 1997).

Heavy industries, such as steel, were still relatively highly sophisticated for these economies at that level of development, and the goals set were extremely ambitious with export markets in sight given the production scale targeted to bring costs down relatively fast. For example, POSCO, the freshly established Korean public steel company, entered the sector by building one of the largest and most modern steel mills in the world while Hyundai entered shipbuilding by building the largest shipyard.

Industrial upgrading was another strategy used to compete against low-cost producers. In the early stages of Hong Kong SAR's industrialization, the government realized that to compete with the low-cost labor-abundant economies in Southeast Asia, there was a need to upgrade industries to high value-added manufacturing (Yeh and Ng, 1994). A major impediment was the lack of private technological research for industrial upgrading. Since Hong Kong SAR's manufacturing industry was predominated by small and medium enterprises with less than 50 workers, most were too small to have the funds for their own R&D (Li, 1991). Only a very small percentage of firms spent more than 1-2 percent of their sales for applied research and product improvement (Yeh and Ng, 1994). The government set up an Applied Research Fund in 1993 to provide up to $750 million for the development of new technologies and promote application of R&D in industry (ITC, 2024). Further, the Applied Research and Development Scheme provided matching funds to companies for their R&D work in return for the government sharing the benefits of commercially successful projects it supported (Yeh and Ng, 1994).

In contrast, at higher levels of development, leading agencies often downplayed the role of production targets while supporting innovation. They focused on a more holistic approach and were more flexible with their plans. In Korea, the Sixth Five-Year Economic and Social Development Plan (1987-1991) aimed to improve trade liberalization while decreasing direct assistance to specific industries. Furthermore, the government pledged to enhance human capital and encourage research and development, aiming to increase the ratio of research investment from 2.4 percent of GNP to 3 percent between 1987 and 1991 (Kuznets 1990). In Japan, the Rationalization Plan was discontinued after 1961, so, MITI started encouraging capital liberalization in 1967, allowing FDI into Japan and encouraging technology transfer in the process (METI 2019). In both cases, the goals switched from large scale production and exports of basic inputs to encouraging domestic technology creation and innovation.

In a similar fashion, beyond stimulating private research spending, the Hong Kong SAR government directed public expenditure to improve the science and technology research infrastructure in the city. In 1988, the Hong Kong SAR government established the Hong Kong University of Science and Technology (HKUST) with a focus on science, engineering, and business and management (Postiglione, 2011). The university became a major hub of research and helped stimulate technological transfers to the private sector (Sharif and Baark, 2008). The government established Hong Kong Research Grants Council to fund research in universities and polytechnic institutions (Yeh and Ng, 1994).

Although the leading agencies' focus tended to be more sector-specific and centralized at the earlier stages of development and became more "hands off," encouraging innovation, at later stages, the goals set were ambitious at each level of development. As economies became more complex and the private sector grew with

more access to finance, the leading agencies needed to play less of a mobilizing force, gradually letting market forces help channel the resources to different sectors. As Ang (2016) observes, weaker economic frameworks could foster growth, but a strong framework is necessary to sustain growth. Similarly, the leading agencies adapted their ambitions and goals based on their economies' stages of development.

Aligning Interests

To help lend credibility to their ambitions in the medium-term goals, the senior staff of the leading agencies had to manage their political relationships in the existing power structure. By nature, ambitious goals required a deep transformation of the economic structure, which in turn was usually faced with formidable resistance and skepticism, especially from foreign advisors (Woo 1999). Overcoming this resistance in practice stemmed from the nature of the relationship between the leading agency's staff and politicians.

We argue, based on the experience of the Asian Miracles, that leading agencies achieved *Agency* to work toward their ambitious goals through an alignment with national goals and by managing the closeness of personal relationships of senior staff with the center(s) of power. At the onset of development, the national goals articulated by politicians had to be ambitious in the first place, that is, with the intent to develop internationally competitive export-oriented and innovative domestic firms and industries. These were the strategic goals of the Asian Miracles, which had deep roots in nationalism (Woo-Cumings 1999). These "capitalist development states" tended to have a division of labor where the politicians "reigned" and the bureaucrats "ruled" (Johnson 1982). This relationship between the politicians who "reign" and the *marketaucrats* who "rule" has varied over time, depending on the economic and political conditions (see also Figure 4).

Managing Power Relations

In the early stages of development, when power tended to be both centralized and relatively stable, the leading agencies' staff nurtured close personal relationships with the center of power (Johnson 1982).The EPB's leadership in Korea was close personally to Park Chung Hee, and it took a partisan stance, defending explicitly his policies against his detractors. In Taiwan Province of China, most of the leading agency's staff were members of Kuomintang, and Singapore's EDB also had a strong relationship with the Prime Minister, a position that has changed only three times since independence in 1965. Similarly, Japan's MITI had strong relationships with the political leadership in the early 1900s to the end of WWII (Johnson 1982). In these economies, at the time, forging a close relationship with the executive power served to reduce political friction.

As economies developed, however, leading agencies tended to have less explicit partisan attachment to the executive, regardless of the power structure. Since these economies were usually open to foreign trade and were based on innovation, the agencies wanted to avoid appearing politicalized to strengthen the existing economic institutions to attract foreign capital and encourage domestic competition and innovation. For example, Singapore's EDB did not openly endorse the government's political positions since doing so might have threatened EDB's reputation as an objective agency (Soon and Tan 1997). Furthermore, the leading agencies in more developed economies often wanted to maintain their credibility as effective economic institutions instead of being seen as a political arm of the government.

The level of political stability also affects the political relationship of the leading agencies. In states with low political stability, the agencies had a little need to align with political figures with high turnover rates. For example, in Japan where the Prime Minister was sometimes replaced every couple of years, MITI did not need to maintain a close relationship with the Prime Minister of the day to enact policy. Instead, MITI forged an

alliance with businesses and made their decisions based on consensus, instead of Diet legislation or government budgets (Okimoto 1989). This arrangement helped MITI decrease friction from political turnovers and better signal its ambitions despite political cycles.

Recruiting Elite Personnel

A leading agency can only be credibly ambitious in its support to create internationally competitive domestic firms in sophisticated industries if the quality of its staff reflects this ambition. The leading agencies of the Asian Miracles were similar in this respect as they shared a sort of *elitism* in their recruitment strategy since the inception, hiring talents from the most prestigious institutions in the country and basing promotions on meritocracy.

This human resource strategy enhances the internal capability of the leading agency and its ability to accumulate specialized knowledge, or *metis*. Deyo (1987) observes that the Asian leading institutions were run by an economic elite, small by international standards. This recruitment process created cohesion and a strong sense of purpose within the leading agency staff, enhancing their commitment to economic policies. The elite recruitment also enhanced overall staff capabilities, facilitating the leading agencies' faculty to absorb the latest knowledge and adapt to changing environments. For instance, Japan recruited almost exclusively from the University of Tokyo based on a competitive exam, known as *Todai*, especially those from its Economics and Law Departments. In Korea, at one point close to 90 percent of those at the managerial level at EPB came from Seoul National University, the most prestigious in the country (Choi 1987).

In addition to recruiting from domestic elite universities, a few leading agencies relied heavily on attracting foreign talent, either expatriates or foreigners with extensive industry experience. They helped formulate economic policy best adapted to the global conditions and in many cases applied their knowledge and foresight of trends in technologies and industries of the future. In Singapore, expats or foreign educated bureaucrats played an important role in the early years of EDB. E.J. Mayer, the first Managing Director of EDB was an Israeli national while I. F. Tang, EDB's second Chairman, was a graduate of Harvard Business School. Tang was instrumental in making the agency adapt to Singapore's need for foreign investment, changing the EDB from a bureaucratic institution to a more business-oriented organization, facilitating Singapore's emergence as the precision engineering shop of Asia (Edquist and Hoffman 2009). Taiwan Province of China's ITRI relied heavily on expatriates working in the Silicon Valley, including in the creation of TSMC, who brought with them deep technical knowledge and personal connections. It was the result of an earlier policy to send thousands of students to study electronics there for decades with no conditions to return, which eventually paid off (Cherif and Hasanov 2019c). ITRI also relied on a high-level council of experts, which was constituted exclusively of external experts, to set ambitious goals in its first projects in electronics (STAG).

Elite recruitment both from domestic universities and abroad may help explain how the Asian Miracles absorbed knowledge rapidly, especially in the early stages of their technological development, and adapted so well to international trends. The *marketaucrats* tended to stay in the leading agencies for the great majority of their career, commonly more than 20 years. The meritocratic elite system and the prestige assigned to working in these agencies helped them retain staff and maintain a high level of continuity, critical to accumulating specialized knowledge, *metis*.

Autonomy

Autonomy is a critical element for the successful working of the leading agency (Evans 1995). The leading agencies of the Asian Miracles had a high degree of autonomy from the political system and other non-state

actors.[33] This autonomy empowered them to accumulate knowledge and act upon it without undue interventions, e.g., nepotism or rent-seeking behavior, and was another key feature in managing power relations (see the discussion in the previous subsection). While many studies emphasized the importance of the autonomy of institutions in explaining the success of industrial policies, we explore how to practically achieve a sufficient degree of autonomy based on the experience of the leading agencies of the Asian Miracles. We argue that the *independence* endowed to many central banks in the 1990s and 2010s around the world already offers a blueprint to create autonomous leading agencies in many developing countries.

This parallel is valid as *independence* in the context of central banks does not mean total insulation from the political process or an ivory tower operation; rather, it is akin to the concept of *autonomy* of a leading agency. There is a rich literature suggesting that central banks are natural extensions of the politicized government (Balls, Howat, and Stansbury 2016), which have certain policy autonomy but cannot have absolute operational independence since they are a part of the government's fiscal and monetary system (e.g., Wray 2014, Steelman 2011, and Buiter 2024).

In practice, a central bank draws its relative independence from a legal framework allowing three key autonomies: personnel independence; financial independence; and policy independence (Eijffinger et al. 1996). We explain these features below and argue that the leading agencies of the Asian Miracles followed this recipe, even before the spread of independent central banks in the late 20th century. In this sense, these agencies pioneered the concept of independent or autonomous institutions while maintaining alignment with ambitious goals set by national governments (which in the case of central banks meant macroeconomic stability, namely, price stability and full employment).

Legal Framework

The legal frameworks establishing the leading agencies of the Asian Miracles did not grant them *autonomy* explicitly. In other words, they were not outside of the government, but their legal frameworks and the context in which they evolved enabled them to operate autonomously while remaining accountable to the executive branch. There were variations in the formal legal frameworks under which they were established, reflecting different political and economic contexts, but they were all endowed with authority over a broad range of key industrial policy levers and, above all, the control of access to credit and foreign exchange (Woo 1991 and Studwell 2013).

Japan's MITI was established under the Ministry of International Trade and Industry Establishment Act of 1949, which granted it a broad authority over industrial policy. In particular, MITI was granted two powerful prerogatives, i.e., control of access to foreign exchange, in a context of exchange controls, and credit. This legal foundation allowed MITI to operate with a high degree of autonomy as it shielded it from turf battles with other ministries and agencies, in particular the Ministry of Finance and the Central Bank (Johnson 1982). MITI controlled directly the national development bank, and indirectly the whole banking system through the practice of "administrative guidance" (Johnson 1982 and Studwell 2013). The latter was a form of moral suasion used by MITI to make investments in its preferred industries the only game in town (Fallows 1994 and Studwell 2013).

Korea's Economic Planning Board was created in 1961, as a super-ministry with overarching authority over economic planning and budgeting. Its legal mandate allowed it to coordinate policies across ministries,

[33] Evans (1995) studies Korea (and Taiwan Province of China), emphasizing the concept of "embedded autonomy."

reducing bureaucratic fragmentation and enhancing its autonomy (Amsden 1989). It included access to foreign exchange, credit, and the entire budget. Other ministries were required to create special offices to coordinate with EPB. The EPB was placed directly under the authority of the President and was headed by a Deputy-Prime Minister-level Minister, which minimized the chances of political interference. In this sense, the EPB was the most powerful agency.

Singapore's EDB was established as a statutory board under the Economic Development Board Act, which gave it operational flexibility and independence from the civil service. This allowed the EDB to act swiftly and decisively in attracting foreign investment and promoting industrialization (Huff 1995).

Taiwan Province of China's CEPD was established under the Executive Yuan (Taiwan Province of China's executive branch) and given a broad authority over economic planning and coordination. Its legal mandate ensured that it could operate autonomously while aligning with national priorities (Wade 1990).

Hong Kong SAR's ITDC was established as an advisory body within the Hong Kong SAR government's structure. Its mandate focused on providing recommendations and guidance on industrial and technology development policies (Sung 1991).

Personnel Independence

Political cycles and the need to attract the best talent to build a critical mass of technocratic elite illustrate the importance of personnel management. An independent personnel policy helps prevent the government from interfering with the agency's policies, for example, through replacing technocrats with cronies or interfering with the action of the institution for the benefit of special interests (e.g., private corporations, banks, etc.). For instance, in the case of central banks, typically, the executive appoints the top positions for some fixed term, but the institution retains full autonomy of internal promotions and compensation. This independence aligns relevant incentives and provides policy credibility since central bank decisions must be credible to anchor inflation expectations. Yet the initial impact of the independent personnel policy can have short-run implications that may not necessarily be favorable to the sitting government while the full effect may stretch beyond the government's lifespan (Keefer and Stasavage 2003). This is even more important for leading agencies as they aim at affecting medium- to long-term investment decisions. Setting a competitive compensation schedule, comparable to that of well-paid private sector jobs, helps explain why central banks attract the best talent. In contrast, the rest of the government is usually constrained by rigid rules and regulations, keeping wages relatively low even when there is an obvious need to attract the best candidates.

In the leading agencies of the Asian Miracles, internal promotions were based on meritocratic and a seniority-based system while compensation did not typically follow the general government schedule.[34] It allowed staff to focus on medium- to long-term economic goals. While political appointees usually occupied the top posts, the bureaucratic system had the autonomy to set policies without worrying whether a decision might offend the executive, or private interests close to it, and consequently face political retribution. This personnel management independence creates policy autonomy without jeopardizing career prospects of agency staff that implement long-term policies of the agency.

Japan's MITI is a stark illustration of an autonomous leading agency based on personnel independence hiding in plain sight. The top two posts in MITI, nominally the Minister and Vice Minister, were both political

[34] This is a critical prerogative to attract talent in selected institutions, especially in a context of brain drain.

appointees. However, these posts remained quasi-ceremonial while real power to conduct policy usually was in the hands of a third post, the Administrative Vice Minister, who was promoted through the ranks within MITI according to meritocratic and seniority rules (Johnson 1982 and Brown 1991). For example, Kodama Koji, who served as MITI's Administrative Vice Minister during 1989-1991, entered MITI after graduating from the University of Tokyo's Faculty of Law in 1957 and served as Sector Chief (課長), Deputy Director (局次長), Chief Counsellor (総務審議官), Chief Secretary (官房長), and Director (局長) before serving as the Administrative Vice Minister (事務次官). Koji's career path illustrates how MITI's internal promotion system insulated it from the political process. In his 34 years of service, Koji out-served 12 Japanese Prime Ministers, two Emperors, and many more MITI Ministers.

In the case of Korea, EPB had personnel independence since its inception, even surviving the democratization of the 1990s. In 1994, the democratically elected Korean President Kim Young-Sam decided to abolish the EPB and merge it with the Ministry of Finance to create a new super-ministry. The new Minister of Finance, Hong Jae-hyung, was the outgoing EPB Minister. The Deputy EPB Minister at the time, Kang Bong-gyun, served as Minister of Finance in 1999-2000. In other words, the new executive chose to use the same technocrats in the new ministry, opting for policy continuity hidden within a radical reform.

Leading agencies had a high degree of personnel independence, and they attracted an elite, thanks not only to providing higher wages but also to establishing themselves as prestigious institutions (e.g., Wade 1990). Internally, they had a promotion process largely autonomous from the political system, insulating them from political interference. Externally, the same technocrats continued from one administration to the next, even with political shocks such as democratization. This personnel stability helped create an autonomous agency that could focus on medium to long-term economic goals and provide policy continuity.

Financial Independence

Independent personnel management, however, requires financial independence as well. For instance, central banks have financial independence since they have their own budget. Central bankers do not need to seek budget approval from the national parliaments, a privilege that helps them maintain their autonomy from the political system. Similarly, the leading agencies in the Asian Miracles also maintained financial independence by not relying on the legislature to approve their budgets.

In Japan and Singapore, the leading agencies were "lean," with relatively small budgets that minimized their reliance on the legislature or allowed them to circumvent it altogether. For example, in Japan, MITI's power of policy enforcement came mostly from its administrative guidance, that is, its ability to make the targeted sector "the only game in town" (Fallows 1994 and Studwell 2013), and its ability to coordinate among public agencies and private firms. It did not need to request a large budget, which could have created more scrutiny and interference. Brown (1991) observes that MITI's budget was a lot smaller than that of other leading agency counterparts, and the smallest among all Japanese ministries. For instance, in 1991, MITI had a budget of only one trillion yen when the government budget was more than 70 trillion yen. This arrangement helped make sure MITI was relatively autonomous from the legislature and could pursue its agenda without political interference. In Singapore, the EDB aimed to streamline the bureaucratic process for investors but spent less in direct subsidies. Consequently, the agency maintained a high degree of autonomy as it did not need large financial resources.

Another way to acquire budget independence was through a close relationship with a strong executive. In Korea and Taiwan Province of China, the leading agencies had much larger budgets to provide financial

incentives such as export credits, preferential loans, and research investment subsidies. However, their budgets came from executive orders instead of votes on the legislature floor. During the early stages of development, both Korea and Taiwan Province of China had a strong center of power while legislative authority was weak (Arnold 1989).

Policy Independence

Lastly, policy independence is a crucial feature of autonomous agencies. For instance, central banks have strong policy independence since they have the legal framework to enforce their decisions without the need of legislature to ratify their decisions. A modern central bank can set interest rates that move the market to their desired outcome. Through bypassing the political process, central banks could ensure that their policy is not changed through political interference and they can act swiftly without long delays of the bureaucratic process. The leading agencies of the Asian Miracles were similar as they did not largely rely on the legislature to provide policy initiatives. Instead, they were empowered with the legal tools to pursue their policy agenda.

In Japan, industrial legislation originated almost exclusively from MITI instead of coming from the parliamentary office of legislators. An absolute majority of bills related to industrial policy originated from MITI and were almost always ratified by the Japanese Parliament, giving MITI extraordinary autonomy to have their own legislative preferences (Johnson 1982 and Brown 1991). Furthermore, Japan's MITI, similar to Singapore's EDB, relied on their relationship with the business community instead of a legal document to carry out their policy preferences. The leading agencies in Japan and Singapore could thus bypass the legislature altogether without the need to pass bills to coordinate with the private sector and exercise industrial policy. Nonetheless, the agencies were still accountable vis-à-vis the executive (see the next subsection).

In Taiwan Province of China and Korea, the leading agencies had strong relationships with the executives, which allowed them to make policies without the legislature's approval. For example, Taiwan Province of China's CEPD could directly issue executive orders to conduct their desired economic policies, completely bypassing the Legislative Yuan (Arnold 1989). Korea's EPB could solicit the President's support through their monthly economic meetings, thereby gaining presidential approval on their policy goals.

In Hong Kong SAR, the organizational structure of ITDC helped it ensure a strong sense of autonomy. It cut across different government institutions, allowing for horizontal coordination across different government bodies. The strong representation of the private sector also allowed it to have constant communication with the industry, including information sharing between the industry and the government. Overall, the decentralized organizational structure minimized the risk of the leading agency being captured by any given interest and helped build a broad coalition of different actors and perspectives to coordinate industrial upgrading in Hong Kong SAR.

Accountability

Another feature of the 4A model is accountability, which is acknowledged as paramount in many studies of the role of institutions in development (e.g., Rodrik 2008). We distinguish between three types of accountabilities, i.e., vertical, internal, and external accountability. Vertical accountability refers to the agency's responsibility to the executive branch in fulfilling its mandate; internal accountability refers to systems within the agency to ensure transparency, efficiency, and adherence to goals; and external accountability refers to its ability to hold firms (and other parts of the government) accountable for results.

Vertical Accountability

One of the key challenges of setting up an effective leading agency is uncertainty and informational asymmetry that give rise to the principal-agent problem. The incentive structure of the agency could deviate from that of the "developmental state," as the agency pursues its own interests or falls prey to governance problems such as cronyism and corruption. Even without governance problems, in the classical principal-agent model, a risk-averse agent creates an efficiency loss by selecting a suboptimal policy decision based on fear of mistakes and bureaucratic inertia (Shavell, 1979). For example, the agency can choose a policy decision that helps advance the private interest of the agency rather than fulfil its key mandate. Since the agency can always blame external factors such as global economic conditions or domestic political situation for many failures, it is difficult to assess the decision-making or actions of the agency (Spence and Zeckhauser, 1971).

Aligning interests could be done through granting more power and prestige to the agency while at the same time monitoring its performance. Sweeping powers for the agency would help align the state's objective with policy implementation (Holmstrom, 1979). Increasing prestige and elite recruitment of the agency by providing an "efficiency wage" higher than the market wage to attract qualified staff, would further align the incentives (Akerlof and Yellen, 1986). In addition, creating monitoring channels is important, especially if the agency has sufficient powers, to keep the agency in check and avoid both internal and external interest capture (Strausz, 1997). In the case of central banks, monitoring assessment is manifested in the chair's periodic reporting of central bank actions, goals, and outcomes to the parliamentary committee.

The agencies of the Asian Miracles achieved vertical accountability, overcoming the pitfalls of moral hazard through strategic political oversight combined with performance-based assessment. While these agencies enjoyed significant autonomy, they were not entirely free from political oversight. However, this oversight was limited and strategic, focusing on high-level goals and outcomes rather than micromanagement.[35] This performance-based accountability ensured that their autonomy was balanced by a focus on achieving measurable outcomes.

Japan's MITI reported to the prime minister (usually a MITI alumni), who provided high-level oversight without interfering in day-to-day operations. Johnson (1982) notes that this balance allowed MITI to maintain its autonomy while remaining accountable to the executive. MITI's success in driving industrial growth and export competitiveness was closely monitored by the prime minister's office. Essentially, MITI's autonomy was contingent on its ability to deliver results, which ensured accountability to the executive (Johnson, 1982).

Korea's EPB reported directly to the president, who provided strategic direction without undermining its operational autonomy. Kim (1997) highlights that this arrangement allowed the EPB to focus on long-term goals and outcomes. The EPB was responsible for meeting national economic targets such as GDP growth and export performance. Similar to MITI, EPB's autonomy was tied to its ability to achieve these targets, closely monitored by the president and his office (Kim, 1997).

Singapore's EDB reported to the Ministry of Trade and Industry, providing oversight while allowing EDB to operate independently. Schein (1996) notes that this arrangement ensured accountability without compromising autonomy. The EDB's performance was evaluated based on its success in attracting foreign

[35] "An effective developmental leader must be able to mobilize various state and non-state developmental actors….To put it differently, prime ministers and presidents who stay aloof of key developmental issues, make sporadic top-down decisions without deep thinking or consultation, or micromanage everything without trusting their ministers and advisors, are unlikely to go down in history as great leaders" Ohno (2012).

investment and creating jobs. Delivering results was crucial, which were regularly reviewed by the prime minister's office (Schein, 1996).

Taiwan Province of China's CEPD reported to the Executive Yuan, which provided high-level oversight while allowing the CEPD to design and implement economic plans. Wade (1990) emphasizes that this balance was critical for the CEPD's success. The CEPD's performance was measured by its ability to implement economic plans and achieve growth targets, ensuring monitoring and accountability to the Executive Yuan.

Vertical accountability of Hong Kong SAR's ITDC in the 1960s–1970s was primarily ensured through its institutional positioning and governance structure. The council was chaired by the Financial Secretary, one of the most senior officials in the colonial administration, which gave ITDC direct access to the executive and aligned its decisions with high-level policy priorities. Its membership included representatives from key government departments and industry leaders, creating a formal reporting channel to the top echelon of government. In addition, ITDC operated within a network of advisory and review bodies—such as the Technology Review Board and technology-specific committees—that reinforced oversight and transparency while facilitating coordination across agencies (Yeh and Ng, 1994; Fuller, 2006).

Internal Accountability

During their peak periods of influence in the mid- to late-20th century, the leading agencies of the Asian Miracles ensured internal accountability in similar fashion. To ensure internal accountability, the institutional structure of the agency was supported by vertical and horizontal units, or internal oversight, to minimize a narrow focus on a certain sector. This feature was already highlighted as part of the institutional hardware in the first part of the paper. Below, we describe the commonalities among the Asian Miracles in terms of the systems and mechanisms these agencies implemented within their organizations to ensure transparency, efficiency, and adherence to their goals.

The leading agencies prioritized hiring highly skilled professionals and promoting them based on performance, ensuring that internal accountability was rooted in a culture of competence and results. Japan's MITI recruited top graduates from elite universities through competitive exams and promoted them based on merit as discussed in the section on *Ambition* (Johnson 1982). Korea's EPB was portrayed as an elite bureaucratic institution characterized by rigorous recruitment practices (Amsden 1989). It prioritized meritocracy, selecting top talent from prestigious universities, focusing on analytical and policy-making skills. Singapore's EDB recruited top talent from local and international pools, emphasizing technical expertise and leadership potential (Huff 1995 and Schein 1996). In the same vein, Taiwan Province of China's CEPD and Hong Kong SAR's ITDC recruited technocrats with strong academic and professional backgrounds, promoting them based on performance and expertise (Wade 1990, Yeh and Ng 1994).

The agencies established clear performance metrics and monitoring systems to track progress and ensure adherence to goals. Japan's MITI set specific targets for industrial growth, export performance, and technological advancement (Johnson 1982). Korea's EPB's Five-Year Economic Plans included detailed targets for GDP growth, exports, and industrial development (Kim 1997). Singapore's EDB established clear metrics for attracting foreign investment, creating jobs, and developing high-value industries (Huff 1995 and Schein 1996). Taiwan Province of China's CEPD and Hong Kong SAR's ITDC set targets for productivity growth, export competitiveness, and industrial upgrading (Wade 1990, Yeh and Ng 1994).

Internal accountability was reinforced through hierarchical structures and regular reporting mechanisms. Japan's MITI's hierarchical structure ensured that senior officials monitored the performance of subordinates (Johnson 1982). Korea's EPB's hierarchical structure allowed senior officials to oversee the implementation of economic plans, with a clear chain of command (Kim 1997). Singapore's EDB's structure ensured that senior managers monitored the performance of their teams (Schein 1996). In Taiwan Province of China's CEPD's and Hong Kong SAR's ITDC, senior officials oversaw the implementation of economic policies (Wade 1990, Yeh and Ng 1994). Moreover, all the agencies conducted regular internal audits and reviews to ensure transparency and efficiency.[36] The leading agencies cultivated a strong organizational culture of discipline, professionalism, and commitment to national development (Johnson 1982, Kim 1997, Schein 1996, and Wade 1990).

External Accountability: Firms

External accountability refers to the ability of the leading agencies to ensure that firms and other entities receiving support (e.g., subsidies, loans, technical assistance) delivered measurable results aligned with national economic goals. The agencies enforced external accountability through their strategic alignment with national goals (see earlier subsections) and a combination of performance-based conditions and monitoring and evaluation systems.

Japan's MITI provided subsidies and loans to key industries (e.g., automobiles, electronics) but required firms to meet export and productivity targets. For example, MITI supported Toyota's expansion into global markets but demanded that the company achieve specific export goals. MITI regularly reviewed the performance of firms receiving subsidies and loans, conducting audits and assessments to ensure compliance with targets and withdrew support from those that failed to perform (Johnson 1982).

Similarly, Korea's EPB provided financial support to chaebols (e.g., Samsung, Hyundai) but required them to meet export and production targets. The EPB tracked the performance of chaebols through regular reporting and evaluations and imposed sanctions on those that failed to deliver (Chang 2002, Kim 1997).

Singapore's EDB offered incentives (e.g., tax breaks, infrastructure development) to attract MNCs but required them to create jobs and transfer technology. For instance, when Shell invested in Singapore's petrochemical industry, the EDB ensured that the investment led to job creation and technology transfer. EDB monitored the performance of MNCs through regular progress reports and site visits and adjusted the benefits of those that failed to meet its expectations (Schein 1996, p. 129).

Taiwan Province of China's CEPD provided support to small and medium-sized enterprises (SMEs) but required them to increase productivity and export competitiveness. The CEPD used detailed planning and monitoring systems to track the implementation of economic plans and the performance of supported firms and withdrew assistance from those that failed to perform (Wade 1990).

Hong Kong SAR's industrial policy entailed mainly support on the industry level and it did not entail heavy-handed conditionalities as in Japan or Korea. Instead, the schemes used by the ITDC were designed with built-in incentives and accountability mechanisms. In fact, industry-university links, technology and business parks, and various measures to improve productivity in Hong Kong SAR's firms (mostly by the Hong Kong Productivity Council) were supported and funded. Promoting exports and productivity and improving company managerial

[36] See Johnson (1982, pp. 145–147) for Japan; Kim (1997, pp. 98–100) for Korea; Schein (1996, pp. 110–112) for Singapore; Wade (1990, pp. 165–167) for Taiwan Province of China.

and operational practices were achieved through various mechanisms such as matching grants, competitive or project-based funding, and milestone reporting, audits, and post-project evaluations (Yeh and Ng 1994).

Adaptability

As the economic, political, and industry conditions are not static and change substantially over time, the leading agency needs to be proactive in monitoring and understanding these changes, adapt to them, and pivot if needed. In a world of unpredictable challenges and fledgling opportunities, adaptability is key to capturing new markets and letting go of the old ones to generate sustained growth (Woo-Cumings 1999).

The leading agencies of the Asian Miracles showed a great ability to adapt to changing conditions and constantly "upgrade" their growth model. In Taiwan Province of China, for example, the sixth four-year plan (1973-1976) focused on developing capital-intensive industries such as shipbuilding, chemicals, and petrochemicals (similar to Korea's HCI). However, affected by the global recession caused by the 1973 energy crisis, CEPD halted the plan prematurely in 1975, replacing it with a new six-year plan (1976-1981) focusing on infrastructure and nuclear energy, among others. The plan was revised again in 1978 to include more infrastructure projects, including a round-the-island railroad and an expansion of the T'aichung port harbor (Wu and Wu 1987). These shifts in policies helped Taiwan Province of China to weather the two oil crises of the 1970s, avoiding high external debt and escaping a failed HCI drive at a time when international conditions were not favorable to energy- and capital-intensive industries (Cheng et. al 1998).[37] The power of the leading agency to halt national plans and revise it as needed was crucial for sustained economic growth.

In Singapore, EDB similarly adapted its plans as the international conditions changed. In the 1980s, Singapore was focused on high value-added manufacturing such as hard drives. However, the 1985 financial crisis caused Singapore to suffer one of its largest economic recessions since its independence. EDB, seeing an opportunity with China's Reform and Opening Up, formulated policies to facilitate Singapore's move into the finance sector, helping further transform Singapore into a finance hub, connecting the world to China's markets.[38] EDB's power to shift the national plan (done together with other agencies and led by the Economic Committee) away from the sole focus of manufacturing, an important sector until that point, to a service sector such as finance, an entirely new area, helped Singapore adapt to changing international developments, capitalizing on new potential opportunities.

The adaptability of the Asian Miracles' leading agencies stemmed from (1) their autonomy and access to the executive power, illustrating the interrelation between the 4As traits; (2) a holistic approach to policy formulation steeped in a broad and flexible mandate; (3) monitoring channels to evaluate compliance, receive feedback, and adapt their tools and goals accordingly; and (4) an evolving institutional structure. These elements allowed the agencies to evolve and adapt as the economy developed and became more complex. Surprisingly, these arrangements are remarkably similar across the Asian Miracles' agencies, regardless of the differences in their levels of development and their political economy structure.

[37] While a logical step in industrial upgrading at the time, the HCI drive in the sixth four-year plan became difficult to implement by the two oil crises in the 1970s, which substantially increased energy prices and at the same time, slowed global growth, reducing international consumption heavy industry growth.

[38] Singapore's international financial sector started developing in 1968 with the establishment of the Asian Dollar Market.

The Agency for Change: Autonomy and Access to the Executive Power

As discussed in the previous sections, the autonomy of the agency allows for swift policy adjustment while its privileged position gives it an access to the executive power for the overall policy formulation and implementation. While elite recruitment of the agency increases its internal capability to set and adjust policies, the agency's privileged position and prestige among government institutions enhances its external faculty to institute change. The Asian Miracles shared the trait of assigning a preeminent position and prestige to their leading agencies within the government structure. These agencies were often seen as a necessary stepping stone to access the highest levels of the executive, ensuring that, over time, visions of change developed within the agency would eventually be distilled from the top.

For example, as late as the 1980s, Japanese prime ministers were expected to serve as a minister of MITI before taking over the reins of the country (Okimoto 1989). Korea's EPB head was made a deputy prime minister with formal powers to "control and coordinate ministries concerning economic planning and administration" (Jung 2011). Taiwan Province of China's CEPD was led by the vice president, the prime minister, or other senior members of the administration. In Singapore, while EDB was not a ministerial portfolio, it held a crucial position in the government, and its head maintained close relationship with the prime minister. Many EDB heads went on to become ministers (e.g., Hon Sui Sen became Minister of Finance). In Hong Kong SAR, strong relations with the industry and other state agencies allowed ITDC to be effective in its mandate.

The Agency for Agility: Holistic Approach to Policy Formulation

The leading agencies of the Asian Miracles had ambitious and holistic mandates. They were typically given a broad and flexible mandate to balance economy-wide interests such as wages, employment, and macroeconomic stability, e.g., deficit and external debt sustainability, as they pursued growth and productivity gains. This approach helped avoid catering to specific interest groups or being fixated on a specific sector or growth model without assessing implications on the aggregate economy in the medium to long run. This feature is strikingly akin to the central banks' flexible mandate, including inflation, unemployment, external balance, and financial stability.

An important component of this holistic approach was that the agencies lacked any political base to satisfy. For example, the most influential players in policy formulation in Japan's MITI, the deputy division directors, left public relations to their senior directors and focused on formulating policy. In Korea, EPB did not need to feel beholden to a business or party and could switch between supporting exporters through subsidies to protecting consumers by combating inflation. The stated ambitions of the agency were based on a holistic or comprehensive aggregate economic perspective, which enhanced the effectiveness of the policies to promote sustained economic gains best suited for the whole economy at a particular time.

For instance, Korea's EPB, had a flexible mandate with a view and approach to benefit the entire society. In the 1960s to the 1970s, EPB tended to adopt policies that benefited big businesses. It suppressed labor costs and provided loans with negative interest rates for big exporters (Woo 1991). In effect, this policy transferred domestic savings to subsidize export companies. However, in the 1970s to the 1980s, EPB took the side of consumers and saw inflation as the biggest economic threat. The agency constantly clashed with the Ministry of Finance over policies that could enhance economic growth but at the risk of overheating the economy and causing further inflation (Amsden 1989). While the Ministry of Finance often had vested interests in higher expenditures and higher economic growth, EPB had no political base and therefore focused on the economy-wide threat of higher inflation. In this case, EPB did not need to feel beholden to any specific side of this economic debate and could defend its position for the public interest.

The Agency for Metis: Monitoring Channels to Evaluate and Adjust

Leading agencies use both formal and informal channels to monitor policy compliance of other parts of the bureaucracy, receive feedback, and adapt accordingly. In terms of formal monitoring channels, leading agencies set up frameworks within the bureaucracy. For example, in Korea, EPB set up Planning and Management Offices (PMOs) in other ministries to monitor performance and policy compliance. PMO officers were selected and paid by EPB but were attached to their assigned ministries and recorded statistics on how ministries performed based on EPB's industrial policies. PMOs also served as a policy liaison between EPB and the ministry (Jung 2011).

Formal monitoring channels also took the form of specialized offices that cut across ministry portfolios. For example, Japan's MITI had special offices monitoring industrial policies across ministries in a specific area. Its office on technology imports monitored all foreign technologies, whether FDI, joint ventures, or licensing agreements, which needed to receive the office's approval before being allowed to operate in Japan (Lynn 1994). MITI thus had a channel to monitor and receive information from other ministries based on specific themes, using that information to modify its policies.

Alternatively, formal monitoring channels were based on parallel bureaucratic structures. In the case of Taiwan Province of China, the head of the leading agency before 1984 usually held concurrent positions within the economic policymaking circle. For example, Yu Kuo-Hwa, Head of CEPD in 1977-1984 was simultaneously Governor of the Central Bank in 1969-1984. Chiang Ching-Kuo, head of CIECD in 1969-1973 was also the Premier after 1972. Chiang's predecessor Yen Chia-kan, head of CIECD in 1963-1969 was Vice President after 1966. These concurrent appointments helped enhance the information flow between ministries and the leading agencies, thereby enhancing the way these agencies could monitor other stakeholders in the economic policy realm (Greene 2009).

The key informal monitoring channel was through interactions with the private sector. For example, Japan's MITI relied heavily on industry leaders to set policy and provide monitoring (Haley 1987). MITI received information directly from industries and could bypass the bureaucratic structure to monitor how other ministries executed its plans. It helped greatly that often the firms' top executives were MITI alumni themselves (Johnson 1982).[39] In Singapore, since EDB's main goal was to help foreign companies to navigate the bureaucratic system, EDB also fostered a close relationship with foreign companies. They receive feedback directly from foreign companies on their experiences (Carter 2003).

In Hong Kong SAR, ITDC had a strong feedback mechanism by keeping ties with local trade and industrial organizations. These included the Federation of Hong Kong Industries and the Chinese Manufacturers' Association. It had strong collaboration networks with local firms such as the Hong Kong General Chamber of Commerce (Yeh and Ng 1994). In addition, the Hong Kong SAR government conducted commissions and regular studies on Hong Kong SAR's main manufacturing industries to identify the key constraints on improving manufacturing efficiency and assess Hong Kong SAR's industrial infrastructure and investment climate (Yeh and Ng 1994).

[39] Johnson (1982) describes the *amakudari* system where the cohort of (mostly Todai graduates) elite MITI civil servants retires *en masse* at age 55 to lead the very same private firm they have been in charge of monitoring, resulting in an invisible tightly knit network covering the bureaucracy and business (see also Woo-Cumings 1999).

The Agency for Dynamism: Evolving Goals and Structures

The agencies' goals and structures evolved over time adapting to changing economic and political developments. The internal organization of the agencies became less centralized as the economies grew in complexity and integration with the global value chains. For example, Korea's EPB was initially a very top-down organization, with the President personally awarding car prizes and cheap credits to reward top exporters. However, as Korea's export sector became more mature, EPB's focus became less about rewarding specific exporters and shifted to a more holistic model, using complex policy levers like research grants and macroeconomic stability tools to provide a strong economic environment to spur sophisticated exports.

At lower stages of development, the agencies focused on clearly quantifiable targets, but as countries developed, the agencies become more bottom up and more focused on innovation. For example, in the early period of Japan's development, MITI (in its early incarnation) formulated explicit export targets for the textile industry, which were adopted by the Supreme Export Council (Amsden 1989). Korea followed Japan's model, with similar export targets and closely monitored in monthly meetings with the president. At later stages of development, the targets became more sophisticated, including raising productivity, technology adoption, and innovation.

This ability to evolve was the result of all the features highlighted above—Ambition-Agency, Autonomy, and Accountability. As an illustration, the Hong Kong Productivity Council (HKPC) and its successor the Industry and Technology Development Council (ITDC) helped "govern" the market. Hong Kong SAR's agencies recognized early on that the predominance of small to medium enterprises led to low private R&D development and set ambitious targets to upgrade Hong Kong SAR's industries to high value-added manufacturing by helping promote private research investments. Hong Kong SAR's ITDC maintained a strong degree of autonomy by having representations from both top bureaucrats within the Hong Kong SAR executive as well as appointment from leading private organizations, thereby having strong coordination with the executive apparatus while maintaining an arms-length relationship. ITDC worked within a network of vertically integrated and horizontally integrated committees and structures, maintaining high degree of accountability, which reduced the chance of interest capture by private actors. Its decentralized structure with strong private involvement helped keep a strong sensitivity to market signals while allowing the agencies to adapt to shifts in the technological frontier and consumer preferences in the competitive international market.

Case Studies

Building a Silicon Dragon: Taiwan Province of China's Semiconductor Industry

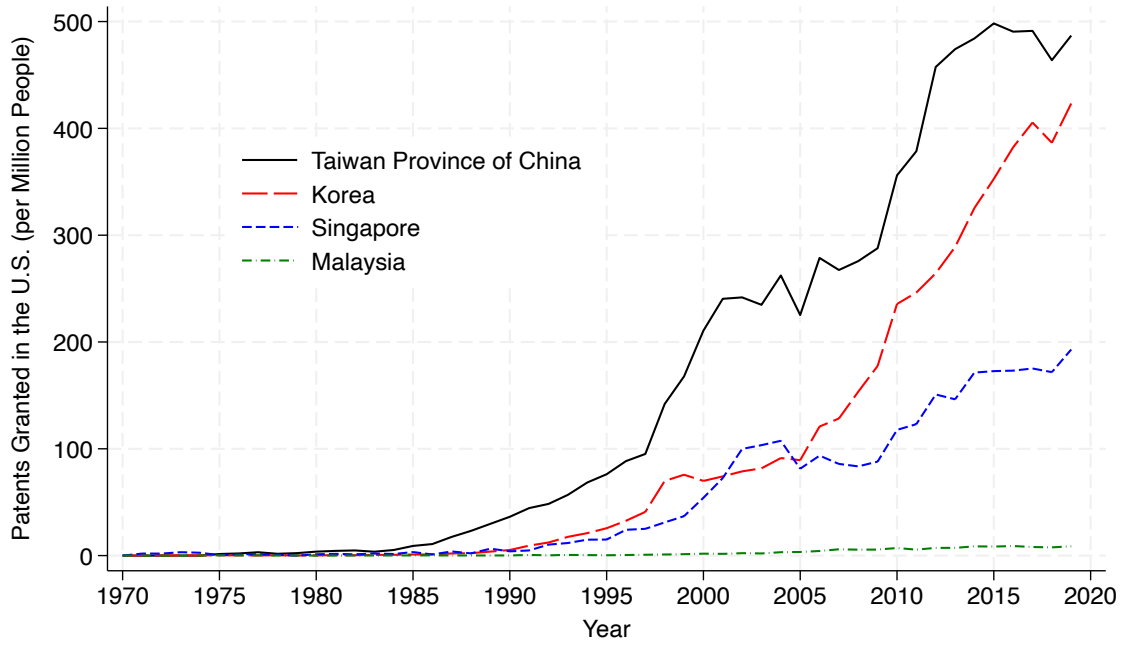
In the 1960s, Taiwan Province of China faced incredibly low odds to succeed at the development of the semiconductor industry, one of the sophisticated industries of the time. Domestically, private firms were unwilling to assume the risks of investing in the new field, at the limit of the global technological frontier. Taiwan Province of China, which was barely a middle-income economy (Cherif and Hasanov 2019b), also lacked the human capital to support an indigenous sophisticated technology-based manufacturing. It only had about 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 economies with established companies. Internationally, the semiconductor industry was already well-established in other industrialized economies, 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 Province of China emerged as one of the world's largest exporters of semiconductors. Newly created small firms, which grew rapidly, sprung to the forefront of the technological frontier, leading the world in innovation and production (Mathews 2006). For example, in 2013, Taiwan Province of China'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 Province of China'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 Province of China become a major manufacturing hub, but it also leapfrogged to the technological frontier within a generation. Its firms created a dynamic environment that encouraged competition and R&D spending. As Saxenian and Hsu (2001) observed, Taiwan Province of China ranked above all G7 economies except the U.S. and Japan in per capita patent grants by the late 1990s (Figure 12).

Taiwan Province of China "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 its 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, emphasizing the actions rather than the policies.

Figure 12. Annual US Patent and Trade Office Utility Patents Granted (1970–2019)



Source: USPTO

Ambition-Agency

Taiwan Province of China's industrial development was spearheaded by CEPD, but it was not alone it its efforts to build the chip industry. The CEPD fulfilled the roles of the leading agency in terms of both sector-specific, including electronics, and cross-sectoral coordination. However, the CEPD worked in coordination with other institutions to develop semiconductors. We highlight two institutions, which played complementary roles to the CEPD, specializing in manufacturing and technology, and which were not involved in economy-wide tradeoffs. If one thinks of the 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. 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.[40] 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 specialized knowledge, metis, and, as it turned out, with substantial returns in the future.

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

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 mobilizing resources to achieve its aims. The sixth four-year plan, promulgated in 1974, encouraged technological research (Gold 1986) 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 Province of China'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 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 Province of China's semiconductor research efforts kickstarted after a change of leadership to one that was more sympathetic to technological upgrading. Greene (2009) observes that the political regime was not interested in technological industrial policy in the 1960s. Discussions about technological upgrading were 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 Province of China's Silicon Valley and a powerhouse for its technological upgrade. These agencies and projects led by the Economic Planning Council (1973-1977) and its successor, CEPD (1977-2014), played a major role in leading the economy's research and technological efforts.

Taiwan Province of China 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.[41] Taiwan Province of China also sponsored thousands of students to pursue their graduate studies in engineering and sciences, with a particular emphasis on electronics, abroad, especially in the United States. Sometimes the entire graduating class of most elite universities (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." [42] [43] For two decades, the vast majority of these

[41] He was appointed as Minister without portfolio in 1979 in charge of technology promotion (Yu 2007). He became known later as "Godfather of Technology."

[42] See Cohen and DeLong (2016) on Hamiltonian economics and U.S. economic history and DeLong's podcast in https://www.ft.com/content/dfa63e95-58b0-3478-a855-6174d1c88850.

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

students did not return, settling in the U.S. 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 U.S.

Taiwan Province of China's willingness to consult foreign experts and recruit elites, regardless of their backgrounds, helped it push forth on its ambition to build sophisticated industries. It 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 recognized experts in the industry and almost entirely of foreigners of non-Chinese descent (Greene 2009).[44] STAG was a shortcut to import specialized knowledge in the early stages, and it played a critical role in shaping Taiwan Province of China's ambition by promoting technological leapfrogging and clustering early on (Fuller 2002 and Greene 2009).

Autonomy

Taiwan Province of China's CEPD and ITRI had autonomy from the political process, which helped them develop needed 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 2025).

In terms of personnel independence, the establishment of STAG illustrates well the flexibility in recruitment, including foreign talent. ITRI also appointed many technocrats who had previous experience in the technology field. Taiwan Province of China 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 but also in 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 subsidizing firm research and giving away its technological research for free, relative financial independence was important as it minimized the possibility of directing benefits from new research to reward political supporters. Instead, ITRI was effective in providing 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 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 centralized 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 decentralized. ITRI had both vertical and horizontal units to keep it accountable from outside interests and maintained strong relationship with the ministry in charge of science development.

[44] 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).

In the 1980s, the biggest threat came from political disagreement about the ambitious industrial policy undertaken. As Fuller (2002) observes, the use 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 centralized 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 local 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 Province of China's semiconductor industry was based on startups, each specializing in a specific sub-sector of semiconductors, there was a minimum interaction between the different vertical sector-specific units within ITRI. However, as the semiconductor industry became more developed, ITRI became less hierarchical and had more vertical and horizontal units. That is, its accountability structure became more decentralized within the different units within the agency. As Callon (1995) remarks, by the 1990s, ITRI became more concerned with firms' flexibility, speed, and ability to innovate and compete with outside firms. Instead of setting centralized targets, it gave medium-level officials more flexibility to institute change, decentralizing 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 centers 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 that coordinated efforts between the National Science Council and ITRI and made 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 Province of China's semiconductor technology.

Adaptability

Lastly, the adaptability of the leading agency to changing economic and political conditions has supported sustained growth of the industry. As described earlier, the Taiwan Province of China's leading agency (understood as a network at the center of which was the CEPD and spearheaded by ITRI at the sectoral level) was able to adapt to changes while implementing its ambitious program, thanks to the following: (i) its access to the 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 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 the 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 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 support. Fuller (2002) remarks that the 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 local firms received government help to jumpstart their companies but still needed 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 2019c). ITRI's holistic approach helped Taiwan Province of China 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 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 emphasizing its service organization. Indeed, UMC and TSMC, two dominant companies in the semiconductor global market, were spun off from ITRI's lab ERSO (Cherif and Hasanov 2019c). In the 1990s, and as a result of lobbying from the same companies it spun off, the program was discontinued, potentially reducing the startup pipeline ITRI managed to create in its earlier days.

Competing in Sophisticated Sectors on a Global Stage: 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-90s, 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 meager 50,000 annual production to over 1 million by the end of the decade. Korean cars started to be favored by consumers for their price and quality. In 1987, during Hyundai's second year of presence in the U.S. market, while overall car sales in the U.S. 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 HCI 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 industrialization of the 1970s, the 1974 Long-Term Automotive Production Plan helped plan 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 liberalizing 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-centered industrialization, 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 industrialization (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, fiscal outlays, higher prices, and lower quality.[45]

The change of the executive after President Park's death in 1979 and the 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 achieve economies of scale and compete in 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 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 Rationalization 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 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 2019c, 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 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, foretelling how modern central banks acquired their independence. The EPB had a policy of independence, thanks to its proximity to the center of power and its goal alignment with the executive, which in the case of the automotive industry became fully aligned after

[45] The related literature largely concludes that protectionism was a necessary stepping stone, and a successful industrial policy cannot be conceived without it. In contrast, we do not necessarily rely on its necessity as other tools were as important. Moreover, the EPB's internal report itself confirmed the limits of this strategy (EPB 1980).

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, in the Industrial Development Bureau's Heavy Industry Division, ensured that the EPB relied on experts who were accumulating specialized industry knowledge (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.[46] The EPB had a strong internal hierarchy, i.e. internal accountability, to insulate itself from outside interests but initially had little vertical and horizontal units. 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 with 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 stabilization policies initiated by the EPB in 1980, the growth rate dropped to 8 percent by 1984 (EPB 1988). Due to its strong internal hierarchy, 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 organized. The Korean Auto Industries Cooperative Association (KAICA), founded in 1962, had a powerful business voice (Lee 2002). Yet the EPB's strong internal hierarchy helped shield it from lobbying. As the decision-making process was centralized within the top executives in the EPB, who had political standing to resist business interests, the EPB was essentially accountable to the executive for implementing its mandate.

[46] Kim Joo-young, the father of Daewoo's founder Kim Woo-jung (one of the major chaebols 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 favorable 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 oil shock that necessitated a more export-oriented industrial policy and a relative liberalization of trade to capture larger export markets, and the 1981 Voluntary Restraint Agreement (VRA) between Japan and the U.S. to restrict Japanese automotive exports to the U.S., which opened up new opportunities for Korea.

The EPB's super-ministry status (within MCI) allowed it to coordinate Korea's trade liberalization from the 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).[47] 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' subsidization 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 centralize 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 specialized knowledge, *metis*, accumulated in the leading agency. As the U.S. 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.

Table 2. 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).

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

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 chaebols had an automotive subsidiary but only Hyundai-Kia "survived," itself a "forced" marriage by the EPB) and (ii) pushing for export orientation and maximum competition while (iii) limiting the number of domestic competitors if the EPB thought competition for resources jeopardized the whole industry.[48]

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 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 emphasized 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 3. The Composition of R&D Investments in Korea's Automotive Industry (1976–80)

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.

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

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 made sure that the EPB, and by extension the President, had a clear grasp on the bureaucracy and the best way to help their targeted industry.

For informal channels, Park Chung-Hee had strong relationship with the major conglomerate heads, the 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.

Conclusion

We argue in this paper, using a stylized theory based on a limited number of assumptions, that the effective conduct of industrial policy, like in the Asian Miracles, requires a specific institutional architecture. At its core, there is a leading agency responsible for targeting specific sectors and accumulating *metis*, i.e., context- and sector-specific knowledge. This knowledge, and the ability to act on it, is used to formulate a wide range of sector-specific policies, especially those tackling market failures, and to coordinate their implementation across the whole government and the private sector. This *metis*, which encompasses the ability to analyze sectors, markets, and formulate policies, is mostly accumulated through experimentation and feedback from markets and other agencies. These agencies by nature do *not* "see like a state" and are not planning agencies. They are "plan-rational" rather than "plan-irrational" (Johnson 1999). These agencies could be described as leading or pilot agencies, accumulating knowledge, experimenting, coordinating, and pivoting if needed.

We sketch the implications of this theory in terms of the internal structure of the leading agencies and their relations with other parts of the government in different power systems. We then illustrate our findings in the context of the Asian Miracles' leading agencies. Our main finding is that a combination of sector-specific departments and cross-sectoral ones within the same agency is key to both focused and broad perspectives in the conduct of industrial policy. We also argue that there is scope for an agency to implement policy in different political economy setups, ranging from a centralized (or authoritarian), in which the agency could be close to the executive and could act through a council, to a "laissez-faire" and prone to electoral cycles, in which the agency could have an independent mandate and extensive or broad prerogatives.

Beyond the institutional setup, or "hardware," to complete the institutional architecture, we propose a set of necessary features of the actions of this leading agency—the 4A model, or the "software" of the institutions. These 4As are *Ambition-Agency* in the goals and the ability to implement policies; *Autonomy* in the action; *Accountability* along three dimensions, which are internal (within the agency), vertical (vis-à-vis the executive), and external (vis-à-vis the firms receiving support); and *Adaptability* to changing economic and political conditions. Indeed, the Asian Miracles' institutions have evolved over time. Moving from low-income to high-income economies makes the policy challenge less about inducing catch-up in industrial capabilities and more about supporting innovation. By studying the genesis of these institutions, we distill concrete steps the Asian Miracles took to achieve the 4As in practice and show how they evolved in a low-capacity environment.

In discussions about the Asian Miracles, the replicability of their model often arises. We argue that most economies can replicate the institutional architecture we describe, walking in the footsteps of the Asian Miracles. Indeed, the specialized agency for industrial policy proposed is an entity that has resemblance in structure to another well-known institution known as the central bank, tasked with managing short-run economic (e.g., output and prices) fluctuations or financial crises.[49] In fact, many institutional features of modern central banks fit into the architecture of the Asian Miracles' leading agencies. We can describe the central bank as a specialized agency that has key mandates or objectives, is granted agency and autonomy to act on these objectives, is accountable to the government for its actions while maintaining close relations with the financial sector and attempts to respond to changing economic and social conditions. However, there are some important differences too. The central bank's mandate, knowledge stock, and policy tools are narrower in scope; it does not need to coordinate much across other agencies or the private sector; the actions it needs to take to fulfil its mandate are more certain; and the impact of its actions is clearer in the short run.

[49] As also alluded to in the title of Honohan's (2024) book, *The Central Bank as Crisis Manager*.

To illustrate how the features of the 4A model for the central bank, we use the example of the U.S. Federal Reserve (the Fed), but the model applies to central banks in other economies. The Fed has a dual mandate of full employment and price stability (in addition to other objectives like financial stability) and is given control of certain tools (e.g., money creation, control of short-term interest rates, etc.) to implement its mandate. It has been granted independence from political interference by Congress in its operations, but at the same time, is accountable to Congress for what it does.[50] In the wake of the 2008 financial crisis as economic activity was spiraling down, the Fed was instrumental in staving off the collapse of the financial system by providing liquidity to financial institutions, reducing interest rates drastically, and acting as a lender of last resort. It acted fast as its autonomy allowed it to do so without a long bureaucratic process or the needed approval from the government to implement unorthodox policy tools such as quantitative easing. Its technical staff had built the knowledge and expertise and had access to information and markets to take the policy actions needed. Staying true to its mandate to support full employment while adapting to changing economic conditions and acting fast, it helped avert the Great Depression of the 1930s (Friedman and Schwartz 1963). The Fed's institutional structure, including its technical expertise, control of relevant tools, and operational independence, allowed it to perform its job as originally prescribed by Congress.

Between the 1990s and late-2000s, most economies around the world have given their central bank a relatively independent mandate to control inflation, and to act as a manager of crises and recessions or expansions. However, a specialized agency for long-run growth as a manager of industrial policy is lacking. Lucas (1988) famously remarked about the importance of economic growth and its implications: "The consequences for human welfare involved in questions like these are simply staggering: Once one starts to think about them, it is hard to think about anything else." Many countries have various ministries, including ministries of trade, industry, or economy, that supposedly are designed to deal with these questions while various economic councils at presidential or cabinet levels are supposed to drive a growth policy. In other words, these institutions do not play the role of a leading agency as we define it in this paper. Fragmented mandates and political economy and informational frictions and costs make the implementation of industrial or growth policy relatively difficult. Moreover, implementing policies consistently over time—policy continuity—is important in creating and growing industries, especially sophisticated ones (Cherif and Hasanov 2024).

There is a need for a specialized leading agency to manage industrial policy for long-run growth. Its proper functioning, based on the 4A principles, is as important, if not more, as that of the central bank. This agency would coordinate across many functions of the state and interact with the private sector, build specialized knowledge, and execute complex functions to achieve its mandate. The experience of the Asian Miracles, illustrating the 4A model in action, shows that it is possible to design successful institutions for industrial policy in contexts of low capabilities and poor governance. This is further supported by the global success in creating relatively independent and competent central banks in many countries, suggesting that replicating the institutional architecture for the conduct of industrial policy is feasible not only in emerging but also low-income countries. While a large part of the literature focuses on studying the effects of specific policies followed by the Asian Miracles such as subsidies or tariffs, we argue that the secret weapon of their success was their institutional setup. The specific policies of the past may not necessarily be the most efficient or effective today, but it is the role of a leading agency to discover what works to drive change for success.

[50] The standard justification of independence is the criticality of expectation formation of prices and minimum pressure during electoral cycles for easy monetary policy. For the leading agency, autonomy can be justified by the need for policy continuity to build *metis* and anchor expectations to spur investment, among others, while minimizing capture and political vested interests.

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Appendix. Historical Background of the Leading Agencies

Korea

In Korea, EPB (Economic Planning Bureau) was created in 1961 in the aftermath of the Park Chung Hee military coup to promote industrialization. EPB was vested with the goals of (1) promoting exports to accumulate capital and (2) regulating prices to aid the initial industrialization process (Cheng et al 1998). Park established EPB through merging parts of the Ministry of Construction (Bureau of Planning and Foreign Cooperation), Ministry of Finance (Bureau of Budget) and Ministry of Homeland Affairs (Bureau of Statistics). The result was a super-ministry with controls on planning, foreign relations, budget and statistics research (Choi 1987).

EPB helped address strong internal and external pressures for industrialization. Internally, the military government needed strong economic growth and industrialization to support its legitimacy. Externally, Korea in 1961 was still strongly reliant on American foreign aid. Park needed to booster its industrial strength to compete with its northern socialist counterpart in an ideological struggle that was at least partly based on economic performance.

Taiwan Province of China

Similar to EPB, Taiwan Province of China's successive agencies were created to coordinate long-term economic development through industrialization and rural development.

While both Taiwan Province of China and Korea were similar in that they relied on American aid and lacked strong domestic industrial bases, Taiwan Province of China's Kuomintang had an added challenge since it also lacked strong links to the domestic island population. The Kuomintang party was superimposed on the island's indigenous population after Japan's surrender in WWII and the Kuomintang faced strong local dissent after massacring thousands of protesters in 1947, known as the 227 Incident. When the Kuomintang retreated to Taiwan Province of China in 1949, this division continued to threaten its legitimacy. In particular, this political issue was exacerbated by the geographical divide between the urban centers, dominated by Kuomintang elites from the Chinese mainland, and the rural areas, largely inhabited by local population.

Taiwan Province of China had an impetus for not only economic development but also allocative equity to benefit both urban and rural areas. The government created successive planning agencies at an ad hoc basis to bypass its bureaucratic system and serve the political purpose of the day. The Kuomintang created CUSA (Council for US Aid) for 1948-1963, CIECD (Council for International Economic Cooperation) for 1963-1973, EPC (Economic Planning Council) for 1973-1977, and CEPD (Council for Economic Planning and Development) for 1977-2014. This incredible fluidity of the institutional setup allowed for more flexible policy and higher pay for these agencies than what they could receive in the bureaucratic system, thereby attracting the best talent.

Singapore

EDB (Economic Development Board) in Singapore was created with the specific goal of attracting investors in the aftermath of the political economy changes surrounding Singapore's independence in the 1960s.

In 1960, shortly before Singapore's independence from Britain in 1963 and its ejection from Malaysia in 1965 to become a sovereign city-state, the UN conducted an economic review of Colonial Singapore. The report identified unemployment as the biggest challenge and urged the government to attract investors to boost job creation (Winsemius 1963). In 1961, Senior Minister Lee Kuan Yew and his finance minister Goh Keng Swee created EDB to facilitate investment for labor-intensive manufacturing sectors. From 1961 to 1965, EDB focused mostly on import-substitution strategies by tapping into the surrounding domestic Malaysia market for capital and market access. However, when Singapore was forcibly ejected from Malaysia in 1965, the city-state lost access to the Malaysian market and had to focus on export-oriented policies to expand its foreign networks and attract capital from wider geographic reaches (Lee 1973).

EDB was tasked with attracting potential investors by providing what they needed: land, building, labor, tax breaks, a sympathetic bureaucracy, and Singapore's existing stable political climate. EDB branded itself as an "one-stop" agency for investors that would negotiate with government bureaucracies on behalf of these investors (Callon 1995). In this sense, EDB was less of a government agency that regulated investors but instead a representative of investors that helped them navigate the political system.

Japan

Japan's MITI (Ministry of International Trade and Industry) was created in 1949 to help coordinate government policies for economic reconstruction and development. After the postwar Economic Stabilization Board (*Keizai Antei Honbu*) was abolished in 1952, MITI became the primary agency in charge of economic planning.

Among other roles, MITI was tasked with setting development priorities. Japan was concerned that without explicit allocative objectives, scarce post-war resources would be invested into low-priority consumption such as coffee houses and real estate instead of industrial development. MITI also had strong connections with Japanese corporations. Many of its policies were implemented not through the highly unstable political executive but through consensus with large corporations (Okimoto 1989).

Hong Kong SAR

Up until the end of WWII, Hong Kong SAR was a trading and finance center connecting China with the international market. Despite its abundant capital and access to labor, Hong Kong SAR had very little industrial activity itself (Szczepanik, 1958) and restricted itself to be a "trading and banking entrepot" (Yeh and Ng, 1994). However, with the outbreak of the Korean War in 1951, the US started imposing a trade embargo on China (Chen, 2006). This embargo led to a sharp decline in trade activities in Hong Kong SAR and forced entrepreneurs to transition to an export-led industrialization due to not only existing banking infrastructure and cheap labor (Lui and Chiu, 1993) but also its status as a British Colony, giving the city a duty-free access to the UK market through the System of Commonwealth Preference (Yeh and Ng, 1994).

Hong Kong SAR experienced high growth in manufacturing activities in the 1950s-1990s, starting with textile and plastics in the 1950s, electronics and electrical industries in the 1960s, and more technology-intensive products such as watches, consumer electronics and even television games by the 1970s (Yeh and Ng, 1994). Manufacturing became a major driver of economic growth. For example, in 1961, the share of manufacturing sector to GDP was about 24 percent. By 1970, this share increased to 31 percent. Moreover, the manufacturing sector was dominated by a robust network of small to medium firms. In 1988, small and medium firms with less than 50 workers accounted for 44 percent of the total manufacturing workforce and 35 percent of the gross output value (Yeh and Ng, 1994). While by the 1990s, manufacturing activity in Hong Kong SAR slowed down and gave way to tertiary sector such as finance, insurance, and real estate, partly due to rising land and labor costs, rising protectionism, and competition from other industrializing countries.

Traditionally, existing literature viewed Hong Kong SAR government as not playing an active role in industrial development (Henderson, 1989). While this literature recognizes that Hong Kong SAR government was involved in lowering labor costs through administering commodity prices and provision of cheap public health and housing facilities (Schiffer, 1985), it generally still sees the Hong Kong SAR government as adopting a "positive nonintervention" laissez faire approach (Yeh and Ng, 1994). While it may be true that the government did not intervene directly in markets in the same way as its East Asian neighbors in Korea, Taiwan Province of China, or Singapore might have done, Hong Kong SAR did nevertheless employ elements of industrial policy, overseen by its agencies, such as the Hong Kong Productivity Council (HKPC) and its successor, the Industry and Technology Development Council (ITDC).

The HKPC was established in 1967 to offer training programs, management consultancies, and technological support to increase productivity of industries in Hong Kong SAR. Financed by the government, it provided services to industries in computers, electronics, engineering, chemicals and metallurgy, and textile and apparel (Yeh and Ng, 1994). In 1992, the Hong Kong SAR government created the ITDC to enhance the competitiveness of Hong Kong SAR's industry through technology upgrades, especially in the areas of technology transfer and applied research and development (Yeh and Ng, 1994).

Appendix Table 1. A Brief Summary of Leading Agencies

	Agency	Year Created	Reason for Creation	Main Responsibilities
Korea	Economic Planning Bureau (EPB)	1961	To address internal and external pressures for industrialization faced by the military government after the 1961 coup	- Promote exports to accumulate capital - Regulate prices to aid industrialization - Control budget - Set economic plans
Taiwan Province of China	Various	1948	Kuomintang's need for economic development to benefit both urban and rural areas	- Coordinate government policies across ministries - Set economic plans
Singapore	Economic Development Board (EDB)	1961	To facilitate investment for labor-intensive manufacturing sectors to reduce unemployment	- Attract investment - Facilitate joint foreign ventures
Japan	Ministry of International Trade and Industry (MITI)	1949	To help coordinate government policies for economic reconstruction and development after WWII	- Setting development priorities through consensus with businesses
Hong Kong SAR	Hong Kong Productivity Council (HKPC) and its successor ITDC	1967	To increase productivity of local firms	- Provide training programs and management consultancies - Support technology transfers and upgrades

PUBLICATIONS

Institutions for Industrial Policy: The Foundation of Economic Development

Working Paper No. WP/2026/063