National Industrial Policy by Design Thinking

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Abstract

This study attempts to discuss the theory and practice of national industrial policy based on the rationale and methods of design thinking. The study examines the core of design thinking in industrial policy, specify the procedures and tasks of designers in developing the policy process model, discusses the rationale and options of industrial policy design practices, argue for and lists the characteristics of best design thinking industrial policy for least developed countries. There is a paucity of empirical evidence on how design thinking based industrial policy contributes to industrial growth. It is hoped that the argument, concepts and methods presented in this paper may stimulate sophisticated discussion on the theory, tools and procedures of design thinking in industrial policy performance assessment and improvement.

Design thinking is an alternative approach to solve problems of least developed countries which start industrialization from scratch under conditions of low level of input market and private sector development and rapid population growth effects. Spreading the awareness of design thinking skills and approach in national industrial policymaking and implementation helps to tackle the root causes of internal and international migration crisis.
Summary

Two conclusions have been drawn by all researchers of industrial policy. First, context matters to industrial policy research and decision. Context defines what an industrial policy is and what it should aim at. Context differs from country to country and from time to time and such is the nature of industrial policy. Second, there is an agreement on the need for stakeholders’ participation in the industrial policy process. There is, however, difference on what is exactly meant by policy process and what is included in the scope statement.

Context and policy process, no matter the differences in use and meaning, are the fundamental issues that matter to the understanding of industrial policy. However, identifying the mechanism that link these two dimensions in time and space poses a methodological problem. How are the various issues related to growth factors, economic activity linkages, stakeholders’ participation, policy direction, paths, location and their contexts, are all accounted for and discovered at national policy? The literature review indicates a knowledge gap on how to link the four Ws questions (what, how, why and where questions) of industrial policy theory, practice and methods.

This study attempts to discuss the theory and practice of national industrial policy based on the rationale and methods of design thinking. The study examines the core of design thinking in industrial policy, specify the procedures and tasks of designers in developing the policy process model, discusses the rationale and options of industrial policy design practice, argue for and lists the characteristics of best design thinking industrial policy for least developed countries.

The study tries to link the macro and local contexts and the policy process using the methods, rational and practice of design thinking. Design thinking based national industrial policy differ in its practical model both in time and in space. Based on the criteria of best design and non-design situation, the study identifies three design model options in practice: i) sector-based design thinking and instrumentalist approach (experiences of Western European countries), ii) system-based design thinking and long-term perspective (East Asian countries), and iii) top-down thinking and ad hoc approach (sub-Saharan African countries).

The sector-based design thinking reduces industrial policy to individual instrument parts and focuses on patching-up adopted policy instruments based on evidence-based knowledge and learning from previous experience. The cause and effect explanation is based on the rationale of market and/or state failures that lead to serious economic crisis (financial and economic crisis, green growth initiatives or fear of China as an industrial powerhouse). Self-
mobility of factors of production, role of private sector and good governance are assumed to be given or free from risks. The selection and proper mix of intervention instruments, per se, is important to break policy and behavior of path-dependency. Removing constraints and impediments which block optimal instrument use is the mode of change for the reductionist thinking.

The system-based design thinking consider industrial policy elements, principles and functions as sub-systems of larger economic system, institutional, demographic and local contexts. The policy focuses on the creation of critical mass of manufacturers and consumers (initiating industrialization from scratch) through public-private partnership (PPP), private sector development (expanding the share of manufacturing sector), infrastructure development and productivity growth (technology and innovation augmenting mechanism). Long-term thinking and implementation strategy is the most important characteristics that define system-based design thinking.

The top-down and ad hoc design is characterized by ideological motivated and politically driven industrialization, layering of policy instruments, state capture, corruption and clientelism. It produces a non- or poor design situation in which manufacturing remained at the same lower level of productivity growth despite number of policy initiatives and improvement suggestions.

The solution is balancing top-down and bottom up industrial policies. The following design tools and procedures are suggested: i) local government and private sector partnership in the establishment of manufacturing industries in every districts of the country; ii) local governments conduct feasibility studies to figure out which industries to support within the districts for the purpose of local economic transformation; iii) establishing industrial parks in the rural districts and formation of clusters for existing firms in urban districts; iv) the formation of association of local entrepreneurs, workers and youth to build relationships of trust and interdependence among stakeholders; v) specifying central government role in factor mobility, private sector development, diversifying the industrial structure, ensuring spatial balance; providing industrial park law and infrastructure, and coordination of sector policies and financial development; vi) establishment of National Industrial Policy Council which houses the designers of the industrial policy.

This paper is a theoretical framework section of a research work studying the performance of industrial policy in countries with rapid population growth. Even if the empirical work on the theory of industrial policy design thinking is at its initial phase, introducing the concept and approach may stimulate discussion on the role of design thinking in industrial policy.
performance assessment and improvement. Why industrial policy reforms fail or succeed to deliver expected results? Is the cause for the level of performance achieved related to policymaking process based on design-thinking approach? Alternatively, are the causes related to the choice of strategy and role of implementation factors pertaining to supply and demand side policy interventions? Can distortion problems be solved by techniques of layering, patching old or packaging new policy instrument mix? There is paucity of empirical evidence on how design thinking based industrial policy contributes to industrial growth.

Design thinking has particular relevance for least developed countries which start industrialization from scratch under conditions of low level of input market and private sector development and rapid population growth effects. The use of system-based design thinking of industrial policy for least developed countries has international significance. The debate on international migration crisis has led to policy formulation at curbing immigration at the destination end and using aid as a tool to stop migrants. Spreading and encouraging design thinking approach in national industrial policy helps to tackle the root causes of internal and international migration crisis.
1. Why Industrial Policy is Design Problem

At national level of analysis, industrial policy means spelling out exceedingly complex methodological design problems. It cannot be otherwise. Researchers, technical expertise and policy-makers agree that, ‘the whole life of policy is a chaos of purposes and accidents. It is not at all a matter of the rational implementation of so-called decisions through selected strategies.’ (Clay and Schaffer, eds., 1984). Industrial policy is no exception; it has no standard problems and established solutions.

There are various questions when formulating and implementing industrial policy. For instance, from where should one start (initial step and conditions) to form the industrial policy package and model? What should be taken into account when selecting intervention sectors and instruments? What are the objectives of industrial policy and aims of the policy instruments? Is it overcoming production scarcity, creation of productive employment, domestic market development, firm growth and expansion, commodity export and foreign exchange earnings, local economic transformation, etc.? How are the multiple industrial policy objectives prioritized and ranked? Is the choice based on a feasibility study conducted by professional economic bureaucracy, or is the choice motivated politically or ideologically? How is industrial policy aligned with the overall development strategy of the country?

There are also questions on strategic implementation of the policy: which party should be responsible for choice of policy objectives and selection of reform bundles: economic policy makers (central planners and managers), economists, private sector and/or local governments? Who should allocate resources and make decisions on which activities or sectors be accorded priority? Can stakeholder participation (who gets what and how much) change the design and combination of the various instruments (institutional support systems, trade, finance and price instruments) and strategies (which encourage existing comparative advantage, competitive advantages, cluster development, sector initiatives, etc.) and why? How long should the combination continue? If and when they change, what are the underlying reasons? Is there path dependency? How are industrial policy instruments and objectives administered?

Industrial policy formulation and implementation varies depending on macro and local contextual factors which affect quantity supply, access and availability of resources. For instance agro-ecological settings and population growth pressures influence the type of industrial crops grown, the distribution and cluster of urban centers. The level of domestic market development, type of property ownership and spatial differences in the rates of
entrepreneurship and surplus labor influences the process of the self-development and self-transformation of the manufacturing sector.

Deciding on what and how to industrialize the country, who to involve in the formulation and implementation of the policy, when and where to industrialize, how to finance it, whom to serve, choice and mix of instruments, etc. are all methodological design problems. The path to problem solving is not clear, and there are no standard problems that have established solutions. Particularly in countries with fastest population growth, there is a need for rapid industrialization by all means, everywhere and through big push. Industrialization problems and solutions are not fixed, they modify according to the changing situation. Given the intricate and complex fluid circumstances, what should be an industrial policy? Which industrial policy practices and methods are appropriate in a given condition? What is the “the right way of thinking (and doing) of industrial policy”, (Rodrik, 2004, bracket is added).

Purpose and scope of the study

This study attempts to discuss the theory and practice of national industrial policy based on the methods and rationale of design thinking. Design thinking is a nonlinear process and a normative analysis about the appropriateness of industrial policy rationale and practice in a dynamic context. It aims to systematically solve the methodological problems around the making and implementation of national industrial policy through an iterative local practice and loop approach.

The study examines the core of design thinking in industrial policy, specify the procedures and tasks of designers in developing the policy process model, discusses the rationale and options of industrial policy design practices, argue for and lists the characteristics of best design thinking industrial policy for least developed countries. It is beyond the scope this study to empirically develop the theory of design thinking in industrial policy. The attempt is not to impress with literature review and empirical evidences, but share the idea and relevance of design thinking. It is not common to discuss industrial policy through the application of design method and thinking.

Design thinking, a problem-solving approach and concept, is important particularly for least developed countries facing a mirage of economic growth and transformation problems. In a collaborative way, international agencies (UNIDO, 2017; ECA, 2014; Bigsten and Söderbom 2005; ADB, 2017) and others have undertaken various research and support programs to enhance industrialization in least developed countries. However, with the exception of few countries, the various reform interventions could not translate into
appreciable manufacturing outcomes. Why do repeated industrial policy capacity building programs and advices not meet their declared objectives? Why is that least developed countries continued to fail in their industrialization efforts while they are presented with alternative ways of success stories and best suggestions? Where do bad industrial policies come from? How do we explain this enigmatic situation and predict about the future?

The premise of this study is that in least developed countries national industrial policy has an inherent design-thinking problem. Design theory “relies on abduction and expects to cycle through multiple experiments that test a variety of solutions in an iterative way that actively works a variety of tensions between possibilities and constraints, and is best suited to decision contexts in which uncertainty and ambiguity are high”. (Liedtka, 2013)

The paper is organized as follows. Section 2 makes a literature survey on the diverse conceptual and practical approaches in industrial policy as a theoretical justification for studying design thinking. Section 3 introduces the core of national industrial policy design thinking. Section 4 specify the procedures and tasks of designers in developing the policy process model. Section 5 discusses the various options in national industrial policy practice and methods. Sections 6 argue for and lists the characteristics of best design thinking industrial policy for least developed countries. Finally, the study concludes by highlighting the state of design based industrial policy knowledge and the need for and significance of design thinking for least developed countries.

2. Investigative Questions on Industrial Policy: A Survey of the Field from Design Thinking Perspective

There is a massive literature on industrial policy dealing with different themes (such as innovation, technology use and diffusion), different level and unit of analysis (sector, subsectors, firms organization), different spatial scales, (regions, towns), debates (state vs. market), intervention instruments (vertical and horizontal), alignment with other macro-economic sectors (such as trade and finance), stakeholders participation and public private partnerships, value chains and global production network, environmental pollution, and different stages of development.

Comprehensive review of them is beyond the scope of this paper. I have chosen the four Ws questions (why, what, how and where questions) of design thinking process to organize the literature and get a clear view on conceptual challenges of industrial policy. The following
sections take the four points in turn and discuss industrial policy thinking challenges and the lessons learnt.

2.1. Definition of Industrial Policy: Asking What Question

There is no standard, formal and generally accepted definition of industrial policy. Large and burgeoning literature defines industrial policy in variety ways depending on authors’ interest of analysis and debate (for the scope of industrial policy see Ambroziak, ed. 2017). The varied alternative meaning of “industrial policy” is related to the context it is used.

a) Industrial policy defined by looking at particular industries and champions of specific industries

"Industrial policy … means government policy aimed at or motivated by problems within specific sectors", (Tyson and Zysman, 1983)

"Industrial policy is an attempt by a government to encourage resources to move into particular sectors that the government views as important to future economic growth." Krugman and Obstfeld, 1991).

UNCTAD defines industrial policy as a “concerted, focused, conscious effort on the part of government to encourage and promote a specific industry or sector with an array of policy tools”. (UNCTAD, 2009).

Industrial policy as “any type of selective intervention or government policy that attempts to alter the structure of production toward sectors that are expected to offer better prospects for economic growth than would occur in the absence of such intervention, i.e., in the market equilibrium.” (Pack and Saggi, 2006).

Industrial policy is defined “as any policy that affects a subset of industries differentially from the remaining group of industries… an industry is a set of firms competing in a specific and identifiable market. A specific and identifiable market is characterized by the types of goods and services that are offered for sale by the firms in that industry. Firms may participate in more than one market and thus may be in more than one industry. (Hart, 2004).

b) Industrial policy is defined as inputs to firm growth and in the sense of enabling environment

The second meaning of industrial policy refers to horizontal policies (i.e. not sector specific) that afford an enabling environment for industry or for business more generally, “everything that affects a company”. "Industrial policy means the initiation and co-ordination of governmental initiatives to leverage upward the productivity and competitiveness of the whole economy and of particular industries in it." (Darmer and Kuyper, eds., 2000)
In the context of developing economies, industrial policies imply “targeted government actions aimed at supporting production transformation that increases productivity … improves domestic capabilities and creates more and better jobs”. A broad definition includes both innovation, infrastructure and skills policies, as well as targeted interventions boosting a specific sector, activity or cluster of firms (OECD, 2013).

Industrial policy is “strategic effort to encourage the development and growth of part or all of the manufacturing sector as well as other sectors of the economy. The government takes measures "aimed at improving the competitiveness and capabilities of domestic firms and promoting structural transformation." A country's infrastructure (transportation, telecommunications and energy industry) is a major part of the manufacturing sector that often has a key role in IP. (Graham, 1994; Bingham, 1998).

c) Industrial policy defined in the sense of government picking winners and losers

Industrial policy “refers to a set of policies designed to promote promising industries while propping up or easing the fall of declining industries. Defined that way, industrial policy is often described as the government picking winners and losers.” (Krugman, 1983).

Using Swedish data Anders Gustafsson studied “some aspects of industrial policy, namely public supports to firms that are intended to support innovation and growth at the firm level”. These policies aim to solve market failures in capital markets, failures that prevent firms from accessing to enough funding to invest in physical or human capital. If governments can identify these firms and help them with funding, the firms can use this money to innovate and invest, which in turn raises economic growth. (Gustafsson, 2018)

d) Industrial policy defined as process of public and private sector participation and partnership

Industrial policy is viewed as a process of stakeholder participation in the making of industrial policy and strategy. “Entrepreneurs, governments and other relevant stakeholders get together to learn from each other about costs and opportunities and to engage in strategic coordination to select best options for industrial diversification”. The consultation may include wider issues such as private sector development, capacity building, public sector reform etc. (Rodrik, 2007; UNIDO 1991; Lin and Monga, 2010).

e) Industrial policy is defined in the sense of structural transformation

In their review of industrial policy in Europe, Foreman-Peck and Federico adopt a very broad perspective. They define industrial policy as “every form of state intervention that affects industry as a distinct part of the economy” (Foreman-Peck and Federico, 1999).
Industrial policy defined as a set of “structural policies designed to strengthen the efficiency, scale and international competitiveness of domestic industrial sectors, typically contains an element of national champions, of self-reliance in bringing about growth and development’ (Soete, 2007). Similarly, Chang identifies industrial policy as being “aimed at particular industries (and firms as their components) to achieve the outcomes that are perceived by the state to be efficient for the economy as a whole” (Chang, 1994).

“Industrial Policy is any type of intervention or government policy that attempts to improve the business environment or to alter the structure of economic activity toward sectors, technologies or tasks that are expected to offer better prospects for economic growth or societal welfare than would occur in the absence of such intervention.” (Pack and Saggi, 2006).

“Industrial policy is any type of intervention or government policy that attempts to improve the business environment or to alter the structure of economic activity towards sectors, technologies or tasks that are expected to offer better prospects for economic growth or societal welfare than would occur in the absence of any such intervention ...” (Warwick, 2013).

Industrial policy is less about market restrictions, focusing more on the facilitation of R&D, technological innovation, productivity gaps, and competitiveness, as well as system-building and coordination-enhancing policies that promote interlinked activities with a horizontal impact. Its objectives can also include addressing larger goals reflecting global concerns (Singh 2016).

f) Industrial policy defined in the sense of economic development and sustainability

“Industrial Policy means the initiation and coordination of governmental activities to leverage upward the productivity and competitiveness of the whole economy and of particular industries in it. Above all, positive industrial policy means the infusion of goal-oriented, strategic thinking into public economic policy…In more abstract terms, industrial policy is the logical outgrowth of the changing concept of comparative advantage.” (Johnson, 1984).

As one key element within a developmental state, industrial policy generally focuses on promoting research and development, moving the technical innovations emerging from R&D investments into commercial use, and raising productivity and competitiveness by bringing the newly-developed technologies into commercial use. It is through this combination of initiatives that industrial policy in this sense of the term connects with broad developmental
goals, including increasing employment opportunities, both within a particular region or state, and for the country as a whole. (Pollin, 2010).

Industrial policy has a broader meaning, associated closely with the concept of a “developmental state.” With industrial policy as a tool of a developmental state, a range of policy instruments and targets are put into play. “These could include R&D subsidies for government, university or private business research centers. It could also include preferential tax treatment, credit opportunities, or direct subsidies for specific sectors of the economy, different regions or even individual businesses. Some types of business regulations, such as auto fuel efficiency standards or financial regulations aimed at channeling credit to preferred sectors or activities at subsidized rates, could also be seen as industrial policy interventions. These various forms of support or regulations could be applied narrowly within a particular region or state or industry, such as a statewide renewable energy tax credit; or they could be available throughout a country”. (Maio, 2014).

Industrial policy refers to government actions to alter the structure of an economy, encouraging resources to move into particular sectors that are perceived as desirable for future development. In practice, industrial policy agencies undertake measures to influence structural change such that regional disparities, labor-intensive industries or small enterprises are encouraged and/or the economy becomes environmentally more sustainable (Altenburg and Lütkenhorst, 2015).

g) Industrial Policy defined as ‘industrial strategy’

Industrial strategy is “about coordinating a wide range of economic policies to achieve particular objectives, which need not be purely economic. Industrial Strategy should be seen as a framework rather than as a collection of specific industrial policies…. The purpose of industrial strategy should be to identify what is societally necessary and beneficial, and thus to align with other key national strategies (for example on economic growth, wellbeing or environmental sustainability), (Rhodes and Brown 2018).

UNIDO’s approach to industrial policy is strategic. Strategy generally refers to the fundamental long-term positioning of a country within its context, which in an increasingly globalized context is the world economy. UNIDO’s Strategic Industrial Policy (SIP) Approach is defined as government interventions aimed at steering economic activity, particularly the intra- and inter-sectoral structure of production, towards areas that are expected to offer better prospects for economic growth than would be the case in the absence of such interventions (UNIDO, 2011).
2.2. Industrial Policy Rationale: Asking Why Question

What is the underlying reasons for the use of industrial policy? The answer to this question depends on one's view on the role of the state and market in resource allocation and economic development. There are pro and con arguments on industrial policy use and necessity (contending paradigms of industrial policy use).

The first paradigm emphasizes the significance of state intervention in promoting industrialization and use of industrial policy. The argument in favor of government policy intervention is based on the notion of market failures, whereby “a competitive market system does not yield the socially efficient outcome” (Pack and Saggi, 2006). Market failure is discussed in relation to economies of scale (firm’s entry strategy in productivity levels and growth rates; or the possibility of increasing market for the goods produced in the country), externalities (benefits or costs experienced by a firm), and market imperfections (informational asymmetries in capital markets). Individuals’ pursuit for self-interest and firms for profit leads to results that are not efficient, often leading to a net social welfare loss (for an overview of the literature see Rodrik, 2004; Rodrik, 2008).

This is particularly utmost important for African countries where there is a historical condition of inter-sectoral imbalance or disequilibrium. There is an immediate gain from reallocating resources from low productivity sector such as subsistence agriculture to high productivity industrial sector. Industrialization in such economies cannot take place autonomously; it requires state intervention and support. Justification for government intervention is based not only on the critique of equilibrium theory (existence of equality between supply and demand quantities in a given market), but also on the use of welfare and public policy choice theories.

The second paradigm advocates free market roles in industrialization. The pro-market model is based on neoliberal theories, which advocates the intensification and expansion of the market, “by increasing the number, frequency, repeatability, and formalization of transactions”. Market transaction is conducted in competition and any transactions is taking place in a framework which maximizes the effect of each transaction. Market is the mechanism for the perfect mobility and accumulation of factors of production irrespective of the given historical condition.

The free market theory assumes that marginal productivities are equal everywhere, and there is no need for conscious and deliberate reallocation of resources among sectors. According to conventional wisdom, the industrial successes of Western economies,
particularly Britain in 18th century, is attributed to laissez-faire (free trade) and free market policies.

Since industrial policy is about “picking winners”, the free market-center approach claims that government is ill-placed to assess chances of commercial success more effectively than the market. Government intervention in “picking winners and saving losers” involves not only risks of misjudgment (distorting competition); it also expose the state to be captured by the interests that benefit from its intervention. Instead, the market can select industries and firms and ensure efficient allocation of resources. Government should not do more than ‘incentivizing’ the market to be more efficient through price stability, money supply, interest rate policies and provision of public goods. Industrial policy is best designed and performs well if it is based on system of free market and free trade.

The third paradigm is based on the rationale of New Structural Economics that tries to synthesis the state and market approach to structural change and economic development. “New Structural Economics” (NSE) framework combines a market-friendly economic system with proactive industrial policy centered on a country’s comparative advantages. The basic premises of this economic development theory is that “the market should govern prices, and the state should make intelligent policies and investments that encourage the "right kind" of innovation in economic activity (Lin, 2012).

The starting point of the analysis is an economy’s endowments (of capital, labor and natural resources) and the structural evolution of these factor endowments from one level of development to another. At early stages of development, factor endowments are typically characterized by a relative scarcity of capital and relative abundance of labor and/or natural resources. Developing industry follows this comparative advantage, but for a country’s comparative advantage to be revealed to the private sector, the main agent in industrial upgrading, relative factor prices must fully reflect scarcities. This necessitates ‘effective’ competition in factor markets. The role of government is to play a ‘facilitating’ role in assisting the private sector in structuring productive activity according to comparative advantage.

In addition to securing effective market mechanism (secure the conditions for well-functioning markets), the government should also play an active role in facilitating structural changes. There is a need for establishing an industrial strategy that is guided by a careful empirical analysis of the country's comparative advantage in the global economic environment.
My critical assessment on the arguments on the need for industrial policy is based on the perspective that emphasis place-based and network-centered intervention to transform the local economy. Based on the ideas of economic geography this perspective tries to synthesis state and market approaches at local and national levels (not at global levels). The starting point of this approach is that the causes of industrial non-development lie at the regional and/or local level. Industrialization unfolds in space and produces space (Murdoch, 2006), and it can take place both in urban and rural areas in parallel.

The context and role of different places should therefore be taken into account in industrial policy design and modeling. There is uneven spatial distribution of economic shortages, surplus labor and concentration of economic activities. State and market centered approach are blind to these spatial heterogeneity, dependency and uneven distribution.

The paradigm of state intervention is blind to the great deal of heterogeneity existing among firms within a sector. It does not tackle important endogenous issues related to the spatial heterogeneity, which if ignored, result in inefficient macroeconomic policies. The outcome of state selected sector policies, which allows governments to pick winners in a discretionary fashion, depend on behavioral responses of actors; their knowledge acquisition, spillovers, and dissemination, most of which are geographical in nature. It is not the sector but firms which trade.

2.3. Industrial Policy Intervention Instruments: Asking How Question

There are various forms of government intervention in the fundamentals of economy, but which measures have industrial policy nature? The literature identifies mainly two forms of industrial policy instruments: vertical and horizontal (for details see Pelkmans, 2006). Vertical policy refers to interventions that favors specific sectors, industries or firms. Examples of vertical policy are sector-specific subsidies and giving certain firms or sectors preferential access to capital. In contrast with vertical policy, horizontal policy is geared towards promoting specific activities across sectors. For example, the provision of support for research and development or finance for innovative activities is a horizontal policy, as are measures which in a coordinated way seek to promote manufacturing exports. The relative importance of these different types of measures may also change over time as governance capabilities develop.

A matrix approach (Aiginger and Sieber, 2006) added sophistication to the horizontal and vertical perspectives. This approach is supposed to solve the long prevailing dichotomy between the vertical and horizontal approach (See Table 1).
Table 1: Industrial policy measures: A matrix approach

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<th>POLICY MEASURES</th>
<th>ICT &amp; Organic food processing</th>
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<th>Energy</th>
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Source: Aiginger and Sieber, 2006; Vuksanović, 2016.

There are also a range of policy measures and instruments which offer physical infrastructure—such as industrial parks, business incubators and individual factory buildings. Mission-based policies which focus on a particular policy challenge may not neatly fit into the horizontal vs sectoral categories. For a further discussion on the instruments, see Section 5.1. below.

2.4. Industrial Policy Process Analysis: Asking How and Who Questions

The interest in studying industrial policy process came after researches became tired of waging a debate over market versus state failures. A consensus was reached not to focus on either market or state failures as reason for changes in policies. Researchers saw a need for a collaboration of both the market and government actors to correct failures caused by both of them. “We need to worry about how we design a setting in which private and public actors come together to solve problems in the productive sphere, each side learning about the opportunities and constraints faced by the other, and not about …the right tool for industrial policy” (Rodrik, 2004).

The choice of industrial policy relies on the quality of the cooperation and alliance between government and entrepreneurs. The government has to consult the private sector when it plans to allocate resources and makes decisions on which activities or sectors should be accorded priority. Stakeholder participation is considered important on how to select a mix of promotional, market and functional measures.
The idea of collaboration focuses mainly on stakeholder participation methods, procedures and techniques. Beyond the idea of effective stakeholder participation, it does not address long-term and strategic issues related to the mechanisms of economic growth and transformation. For instance, what is the assumption when selecting intervention of instruments? Is it on the basis of endowment factors, market demand for consumption products, or identification and promotion of selected value chains. The collaboration between the agents is supposed to address constraints related to the engines of manufacturing growth and expansion.

The idea of policy design “involves the effort to more or less systematically develop efficient and effective policies through the application of knowledge about policy means gained from experience, and reason, to the development and adoption of courses of action that are likely to succeed in attaining their desired goals or aims within specific policy contexts.” (Howlett and Mukherjee, 2014).

To realize the idea of policy design, there is a need for practical methods of analysis. Policy analysis is a sequence of logical steps in which messy data and conflicting information are used to structure alternative in order to provide a semblance of rational choice. (Guess and Farnham, 2011). Since recent time a method is developed for policy analysis and six basic steps have been identified to analyze policy as an interrelated process. The steps include: i) understanding the policy history, ii) identifying political and governance contexts, iii) identify key debatable policy issues, iv) study of stakeholders in the process, v) output and outcome evaluations, vi) identify future challenges and opportunities. These methods shift the focus from policy analysis to policy process.

It seems that there is a paucity of research to understand industrial policy using the dynamic methods and models of policy process. The existing literature focus on either on policy formulation or implementation stages as a separate process, or as linear process. Countries have expert groups studying monitoring and evaluation to improve policy implementation.

2.5. Industrial Policy Direction, Path and Location: Asking Where to Question

Industrial policy is not only about efficiency and effectiveness; it is also about direction and linkages among the various economic activities in the process of industrialization. Where the industrial policy is heading and how it thinks to link the economic strategies. Direction includes discussion about path of industrialization (for instance start out with labor-intensive manufacturing then move to capital intensive, accumulation and deployment of capabilities
created through investment in science, technology, heavy investment in human and physical capital accumulation, etc.); pathway to growth (specialization vs diversification). The orientation (inward/outward looking) of industrialization is discussed in terms of trade regimes – import substitution (ISI) and export orientation (EOI). Industrial policy direction can work with existing comparative advantage (resource-based industrialization) or explore new areas (attracting foreign direct investment).

There are multiple pathways to industrialization (Gereffi and Wyman, 1991; Weiss, 2003; Szirmai, et al. eds 2013; Berhanu 2018). The question is in what fashion do countries achieve success in industrialization? This requires policy process analysis (see section above).

The path of economic agglomeration and dispersion forces has spatial consequences in the form of regional imbalance. Market-force oriented intervention may cause geographic concentration and industrial specialization. Intervention in the form of government fiscal policy may lead to local protectionism and specialization in regions. Direction and path bring about specialization between rural and urban areas.

There are multiple pathways to industrialization and imbalance development depending on the initial condition, political ideology and role of the government. This shows that contextual factors matter for industrial policy direction and location.

To conclude the theoretical discussion, two things emerge from the literature review. First context matters; it defines what an industrial policy is and aimed at. Researchers have their respective context when they define and discuss about the nature of industrial policy and its direction. Context differ from country to country and from time to time. It is not surprising that we have no standard definition of industrial policy. The problem is how to define and categorize the contextual factors affecting or influencing industrial policy?

The second common core issue that comes out from the review is the understanding of and need for studying policy process. The state and market debate has gone beyond the dichotomy and underlined the importance of collaboration and partnership among agents of the industrial policy. What is in the name of a policy process? Stakeholders’ participation for what. Process is not only learning and sharing knowledge about the efficiency and effectiveness of instrument use. A study of industrial policy process should also include mechanisms of economic growth, question of direction, path and spatial implications.

For the purpose of this study, the literature review indicates a knowledge gap on how to link the what, how, why and where questions of industrial policy theory, practice and methods discussed above. How are the various dimensions and issues of growth factors, economic
activity linkages, stakeholders’ participation, direction, paths, location and their contexts are all linked and discovered in national industrial policy? There is a need for design thinking.

3. The Core of National Industrial Policy Design Thinking

Before proceeding to the core concept of design thinking, it seems necessary to discuss how the idea of design thinking occurred to me. It is not only because there is a methodological knowledge gap about industrial policy. At first, I assessed the gains of state-led industrialization in Ethiopia using a number of statistical indicators reflecting the level, growth and structure of industrial activities. The performance assessment shows that the manufacturing sector of Ethiopia remained at its infant stage of structural condition and productivity growth for the last six decades due to myriad of constraints (Tsegaye, forthcoming).

The key challenges can be summarized in terms of factors related to entry barriers, operational constraints, productivity, competitiveness and backward and forward linkage problems. Entry barriers include investment climate (access to finance, infrastructure and corruption) and regulatory burden (bureaucratic hurdles). Operational constraints include limiting factors that determine the quantity and nature of manufacturing output. The operational constraints that affect productivity include supply of raw materials, skill labor force, reliability of electricity, etc. The determinants of competitiveness include access to raw materials, finance, land, and low cost of production such as energy and transport. Linkages are direct physical relations of inter-sectoral supply and demand. Due to the fragmented nature of smallholder agriculture and lack of cluster development inter sectoral linkages and spill-over effects have fared less well over the past decades.

The question is why industrialization remained at the same lower level of productivity growth despite number of policy initiatives and improvement suggestions. It may be so that the propounded improvement suggestions were standard and technical in nature, the majority of which focus mainly at the level of sector and firm growth. The government response to structural economic problems at different phases of the period of industrialization was poor for different reasons. The government strategic plan (focus areas and instrument choices) was not systematic in response to the changing contextual conditions. Industrial policy practices changed mainly as a result political consideration or ideological motivation, very much less as a result of evaluating the appropriateness of the methods and practices in a given complex macro context. Despite best policy suggestions, there was no varied efforts for self-
improvement, if any, they were inconsistent, abrupt and ill-assorted collection of micro-based improvement suggestion superimposed when a government changes.

I find the traditional approach of promoting industrial development just like an airplane without wings: it moved like a car but did not fly. 35 years ago, one expert of the field characterized the period of industrialization in Ethiopia as “Running to Keep in the same Place” (Eshetu, 2004). Currently the national debt of Ethiopia amounted to around 30 billion U.S. dollars, equivalent to 33.50 percent of the country's Gross Domestic Product in 2017. Despite huge debt, we still find industrialization at the same lower level.

In a country where industrialization starts from scratch and in a context where population growth doubles every twenty-five years, the use of linear analytical approach and standard solutions leads to costly intervention exercise. National industrial policy rationale, practice and methods have to go beyond more of the same approach, assumption and implementation style. Design thinking is the alternative theory and practical approach to solve the problems of manufacturing growth and expansion in Ethiopia.

What is in the name of Design Thinking and Reasoning (micro level concept)

The term design thinking is used in so many different contexts and fields that any attempt to make a generic definition is not easy. In the fields of fashion, engineering and architecture, the term design thinking is used broadly in the creation of a product or service. In software engineering research, the idea of design, a thorny question, is defined in general as “a set of decisions to satisfy requirements and constraints. Designing means making decisions to achieve goals and satisfy requirements and constraints” (Cervantes and Kazman, 2016). In the field of engineering the use of the word design involves, the concepts of goal articulation, knowledge about the means, requirements, and constraints.

Design thinking has gained popularity in the fields of IT, business, education and medicine. The term design thinking is used to refer to the study of the practices of working designers (Georgiev, 2012), the methods and processes for investigating challenges, acquiring information, analyzing knowledge, and positioning solutions in the design and planning fields, by combining “empathy, creativity, and rationality” (Plattner, et al. eds. (2011). Design is a “mix of different kind of solution focused thinking which includes both problem solving (analysis) and reframing of the problem situation” (Dorst, 2010; Dorst, 2011).

Designers consider and combine three fundamental units when analyzing and solving problems: element, principles and functions. Best designers cannot disregard these units of the
process. In this paper the definition of design thinking is based on the logical process and equation that specifies (Figure 1):

What (input element)+How and Why (principles and functions)= leading to Product/Results

In this study design thinking is seen as a process of aligning what (input element), how (process), result and context issues. Design thinking, though centered on problem solving, is also characterized by conditions of high uncertainty. Design thinking is nonlinear due to the presence of uncertainty and ambiguity conditions that calls for the very use of the approach.

**Linking Design Thinking and Industrial policy (macro level concept)**

To provide a basis for understanding how design thinking is linked to the theory and practice of national industrial policy, a basic model is sketched in Figure 2. The shaded part deals with the policy factors discussed in terms of three interrelated strategic dimensions: policy input or element (factors related to mechanism of growth and diversification), policy principles (such as job creation and balance in regional development) and policy functions (such as upgrading and diversifying the industrial structure).\(^1\)

The policy principles and functions are the decision-making tools and they can be referred as the policy process. While the shaded part constitute the blocks of policy input and policy process, the macro and local context part shows the non-policy factors that influence the rationale for the adoption of a particular strategy block. The non-policy factors can be

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\(^1\) The term policy refers to the broad framework defining fundamental assumptions, principles, objectives and priorities. (Stewart, ed., 2014).
explained using different categories (geographical, social, political, demographic, commercial, legal, institutional, technological, and global, etc.) and they are the reasons for adopting a particular policy input and process.

Figure 2: The Core of National Industrial Policy Design Thinking: Policy and Non-policy Dimensions

Understanding the policy design input (element)

Policy inputs are the materials of the policy design. The inputs/elements reflect and address the major constraints of industrialization specific to growth factors. Industrial policy input are analyzed and measured in terms of the conceptual tools of economies of scale and technological change. There can be different ways of diagnosing constraints related to productivity and technical changes, but growth factors are the fundamentals. There cannot be industrialization without growth mechanisms (quantities/market and qualities of land, labor, capital and technology). The industrial policy inputs of the design are the things that make up the design and they should not be taken as given.

Understanding the policy design process:

Policy design process is composed of principles and functions. The principles are rule of interaction between the policy design elements (i.e., what we do to those inputs). The principles deal with the multiple objectives of industrial policy: job creation, productivity, environmental sustainability, balanced regional development, etc. Policy design principles are
a set of considerations that form the basis of any good policy; they help the policy team to make appropriate decisions. The principles and rules reflect how the government think about design. They provide a way to look at the work the government plans to create and how it creates: building the right thing; building the thing right.

Policy function deals with a set of activities which the industrial policy is supposed to do, namely upgrading, balancing and diversifying of the industrial structure. Given the objectives and principles, what is the industrial policy supposed to do. Policy function deals with a set of activities which the industrial policy is supposed to do. The establishment of heavy industry (capital intensive industries which typically takes raw materials to a finished material ready for other firms to incorporate into a finished product); establishment of light industry (which uses standard machine tools and process equipment to shape and assemble purchased parts into finished product for use), or high tech industry (such as making semiconductors, fiber optics, specially chemicals, super alloys used in jet engines, producing biotech drugs, and other complex processes).

Understanding the Macro Contextual Parameters (Non-policy Factors)

The three strategic dimensions or building blocks of the industrial policy factors (elements, principles and functions) do not exist in vacuum; they are nested and reasoned in a given economic space, institutional setting and demographic process. National industrial policy operate in varied non-policy factors (contexts) that influence the policy input and process. Considering the challenges of industrialization in least developed countries, one can mention at least three contextual parameters that affect the nature and performance of the policy dimensions.

The first contextual factor is the rate of population growth, demographic transition and age structure of the country. In some countries, for instance in developing countries, the population can grow 3% annually, its doubling time can be 25 years and the age structure may be dominated by child and young adults. The sectoral and spatial effects of the population growth can determine the principles of industrial policy. Due to rapid labor force growth, the objective of industrial policy should be the creation of jobs for the surplus labor and security of consumer goods for the growing urban population.

The second contextual factor that affects the building blocks of the industrial policy is the stage of economic development of the country. There are three successive stages and process of economic development, each with different set of economic characteristics (Porter 1990).
The first is the factor-driven stage, in which competitive advantage is based exclusively on endowments of labor and natural resources. The second is efficiency-driven stage, in which efficiency in producing standard products and services becomes the dominant source of competitive advantage. Economies at this stage concentrate on manufacturing and on outsourced service exports. The third is innovation-driven stage, in which the ability to produce innovative products and services at the global technology frontier using the most advanced methods becomes the dominant source of competitive advantage. Different growth factors play different roles at different stages of development. Appropriate industrial policy design follows the stages of private sector and market development.

The third contextual factor is regime types and the nature of state intervention in the economy. The state is not a “black box” and not all states are effective in their intervention in the economy. There are three ways of conceptualizing the capacity, relative autonomy and role of the state in the national economy. The regulatory state “is a state that applies and extends rule-making, monitoring and enforcement via bureaucratic organs of the state.” The second is developmental state in which the state has more independent, or autonomous, political power and control over macroeconomic planning. The third is predatory clientelist state, in which the political power controlling the government plunder the state resources for their own growth and their political clients. The predatory clientelist state is marked by an absence of rules-based bureaucratic structure and accountability and transparency governance. (David, 2012; Ong, 2012; Niklasson, 2012).

4. Procedures and Tasks of Designers: Construction of Design Thinking based Industrial Policy

Industrial policy design thinking can be described as the ability and reasoning to understand the intersection between policy inputs and processes and their complex, volatile and uncertain non-policy contextual factors (see Figure 3).

Understanding the input factors of manufacturing growth and expansion depends on the stages of economic development. At the initial stage, growth factors have important contribution to industrialization. The policy focus on what to produce, and on market and private sector development as engines growth, both for the manufacturing firms and industrial crops. At the efficiency driven stage (how to produce), the policy focus on ability to harness the benefits of existing technologies. At innovation driven stage (compete in new and unique
products), the policy focus on innovation which can emerge from new technological and non-technological knowledge.

![Design Thinking in National Industrial Policy Practice: Macro and Local Context, Design Inputs and Process Model](image)

Policy process analysis works towards a systematic understanding of how the policy process functions in practice. There are extensive literature in the methods of policy process analysis and mainstream policymaking effort (Sabatier, ed. 2007). Traditionally policy process is explained as a linear process (agenda setting, formulation, decision making, implementation and evaluation). The linear model received critic for its failure to capture the more complex, contested and iterative process (Godin, 2006). The model ignores feedbacks and loops that occur between different stages of the process. Shortcomings at any stages of the process may lead to a reconsideration of earlier steps and this may result in an innovation.

Design thinking is nonlinear and this approaches is used to policy making recently (Mintrom and Luetsjens, 2016; Kimbell, 2015). The studies on policy process analysis recommend different steps, strategies and tools in policy development. Some of the basic steps includes: i) understanding the policy history, ii) identifying the policy context, iii) identifying policy objectives, iv) developing the policy objectives and instruments through stakeholder participation, v) implementing organizations, vi) monitoring and evaluation. Following these steps and other design thinking strategies empirical works have been conducted across a range of sectors (Wolmer, et al. 2006). There is also a study on the impact of the policy making process on the development of firms and industries in China (Ahrens, 2013).
Constructing industrial policy based on design thinking requires some distinct stages. The first stage is to clarify the object of inquiry: the concept industrialization and industrial policy. There can be different definitions and interpretations of industrialization. For the purpose of this study I find the following statement help clarify the meaning of industrialization used in this work. Industrialization is commonly defined and understood in pure economic terms related to the physical presence of industrial plants processing raw materials into finished goods either for further industrial use or general commercial use (Todaro, 1989). It is a cumulative changes in economic and social processes related to the discovery of more efficient ways for the creation of value.

Quantitatively, industrialization is said to exist and becomes self-sustained when reaching at a critical mass of users and complementary products necessary for emergence of new industries. An opening of industrial park in an agrarian economy cannot be labeled as industrialization. Industrialization is not a singular event or a collection of such events. Industrialization is a qualitative economic change or leap occurring when there is an interaction between various elements of industrial formation: technology, markets, business models, entrepreneurship, industry dynamics, government investment, production and supply networks.

In this study industrial policy is defined as “any type of intervention or government policy that attempts to improve the business environment or to alter the structure of economic activity toward sectors, technologies or tasks that are expected to offer better prospects for economic growth or societal welfare than would occur in the absence of such intervention.” (Altenburg, Rosendahl, Stamm, and von Drachenfels, 2008)

The second step in the search for a framework of analysis should be the construction of the non-policy context factors that influence the policy process and affect its performance. Industrial policy operates in varied contexts that condition both its nature and performance. Depending on the case study, contextual factors can be grouped into a number of major categories. In the case of least developed countries, the specific macro and national contextual factors unique to industrial policy include: i) rapid population growth, ii) factor mobility and input market development, and iii) the regulatory nature of the state and private sector development. These contextual factors should not be assumed as fixed or given. They change overtime. Given the dynamics of the contextual factors, what should be industrial policy? Which industrial policy practices and methods are appropriate in the changing conditions? (For further discussion, see Annex)
The third step relates to the identification of instruments of intervention and policy formulation analytical tools. This includes consultation with stakeholders, knowledge utilization (collection of evidences, evaluation, academic research and feedback about past performance) and knowledge about institutional capacity of the agencies (difficulties mobilizing resources, recruiting and retaining competent staff, coordinating stakeholders and projects, and efficient project management).

The fourth step includes identifying the preference for centralized or decentralized government control. What is the appropriate level of government intervention? Is the policy primarily driven by organized groups with hierarchical structures, which engage in the preparation and execution of projects, from the mobilization of entrepreneurs to the planning of programs. Is industrialization primarily a movement of local governments actively seeking and engaging with group of entrepreneurs facilitated by networks. The fourth step deals with the question of balancing top-down and bottom up approaches when implementing strategic objectives.

The fifth step is related to the preparation of national industrial policy document. Some countries have a national document describing a framework or action plan for accelerated industrial development for at least seven to ten years. National industrial policy document consist of large set of measures that aim at providing the appropriate framework for industrial development to take place, via both the creation of firms and sectors (creation of comparative advantages) and the structural change of existing firms (structural change). The policy addresses the constraints as well as priorities regarded as key to industrial development in the country. The national industrialization policy is a product of extensive and prolonged consultations involving government ministries and institutions, private sector, and academia. The consultative process provided an in-depth understanding of the country’s challenges in the field of industrialization and the necessary strategies for public private sector partnership.

5. Classifying design-based Policy Process Model in Practice

The way in which the national industrial policy design thinking is practiced in time and space lead to different types of designs. Based on experiences drawn from developed countries, East Asian countries and least developed countries, one can distinguish three possible types of national industrial policy design thinking that have different datasets, compositions and trends: sector-based design thinking and instrumentalist approach (Western Europe); system-based design thinking and long-term perspective (East Asian countries), and top-down
thinking and ad hoc approach (Sub-Saharan African countries). Similar policy instruments can produce different content and quality depending on the design thinking. In what follows I will describe the properties and dynamics of these design thinking.

5.1. Sector-based Design Thinking and Instrumentalist Approach

Sector approach reduces the national industrial policy database into input-output activities (line of relationship) that share common operating characteristics and challenges. Reducing the industrial policy database into different sectors (delimited area) allows for more in-depth analysis of intervention instruments and implementation measures (various strategies, programs and resources). For instance, national industrial policy may focus on the following manufacturing sub-sectors as priority drivers of industrialization: processed foods; textiles and garments; engineering products; wood and wood products; leather and leather products; mineral (metallic and non-metallic) processing and products (beneficiation); pharmaceuticals; and others.

Sector based design thinking reduces industrial policy to individual sub-sector parts and focus on reforming (restructuring) adopted policy instrument based on evidence-based knowledge and learning from previous experience. The sector-based thinking emphasizes on measuring quality (how instruments nature are made), quantity (number and mix of instruments for optimality), efficiency (maximizing results of an action in relation to resource use) and effectiveness (doing right things).

According to this expectation policy instruments are important in so far as they yield significant returns (cost-effectiveness analysis). Measuring and understanding these tools is critical to the study of industrial policy. The instrumental approach of construing industrial policy stress the pragmatic, situational aspects and technical nature of instrument use. The contextual dynamics (level of economic activity, governance types and rate of population growth) is assumed to be given or fixed. The selection and proper mix of intervention instruments, per se, is important to break policy and behavior of path-dependency.

The instrumentalist approach is applied in countries where industrialization has reached into critical mass of firms and consumers as in the case of Western European countries. The instrumentalist approach assumes the existence of growth mechanisms and entrepreneurship and what may be lacking is knowledge about interchangeable instruments specific to the given problem and objective such as process of learning and acquisition of skills that are not locally available. The sector-based reasoning have faith (accept the reality) in the regulatory state and stationary state of population growth. While it is possible to predict behavior of
bureaus and bureaucrats, the choice of policy instrument should be derived from actions and practices, and collaborative endeavors of public and private sectors.

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Industrial policy is believed to be applied through variety of policy instruments (see Table 2). Industrial policy is considered as a technical issue that can be solved by the knowledge
are vertical, horizontal and combination of instruments and what is required is finding the best possible ones to meet the objectives. The approach emphasizes the effectiveness and efficiency of the instruments and search for best evidence.

5.2. Systems-based Design Thinking of Industrial Policy

Systems-based design thinking consider industrial policy inputs and policy process as subsystems of macroeconomic, institutional governance and demographic contexts. It aims to change not only the instruments but also the contexts that condition both the activities and objectives of industrialization. The macro environment of industrial policy can be grouped in a number of major categories: the initial conditions of industrialization (level of market and private sector development); the nature of the state and mode of its governance; and the demographic process and rate of population growth in the country. Apparently industrial policy is more than the choice of instrument mix based on the criteria of optimality.

Systems-based industrial policy design is the intersection between policy input (elements) and policy process (principles and function) and contextual factors (see Figure 4). Systems-based industrial policy design thinking synthesis the building blocks of industrial policy as products of the environment. It also tries to combine and leverage all three dimensions.

The essence of systems-based thinking is encapsulated in the concept of systemic wholeness, which is grasped by looking at the whole instead of the parts. One of the
consequences of systems-based thinking is the willingness to sacrifice the performance of the part for the performance of the whole. This is in opposition to maximizing the performance of any one given part at the risk of sub-optimizing the performance of the whole. With systems thinking, designers learn how the parts of the industrial policy interact, not how they perform independently.

Systems-based thinking tries to fulfill the requirements and remove the constraints of industrialization depending on the stage of product diversification. At the stage of input growth, the policy focuses on the creation of critical mass of manufacturers and consumers (initiating industrialization from scratch) through market and private sector development (factor mobility and centralization of fragmented inputs for the purpose of accumulation; and linking production and exchange activities for scale economies), infrastructure development and productivity growth (technology and innovation augmenting mechanism). At the stage of efficiency it focus on technological absorption and innovation. At this point, competitiveness is increasingly driven by higher education and training, efficient product markets, well-functioning labor and financial markets, the ability to innovate and use sophisticated production processes.

Systems-based design thinking aims to solve the multiplicity of industrial policy objectives, i.e., effects or impacts it is expected to have. Industrial policy may be expected to create jobs, secure consumer and industrial goods, lead structural transformation, correcting market failures, market-ensuring (e.g. via antitrust or enforcement of property rights) and market-conforming (non-distorting), lift-up backward regions, etc. A satisfactory achievements of these objectives requires huge resources. Given such difficulty, on which of the objectives should the emphasis be placed?

In reductionist and instrumentalist approach industrial policy is considered mainly as an input to firm growth (see section 2 above). In a system based thinking, the design principles takes into account the effects of demographic process. For instance, it takes into account of spatial heterogeneity, dependency and uneven distribution of economic activities. Industrial policy focuses not only on hierarchies of firms, but also on people and places. Long-term thinking and implementation strategy is the most important characteristics that define systems-based design thinking. Strategy is define here as planned allocation of resources for achieving the vision and goals of industrial policy.
5.3. Top-down Thinking and Ad hoc Approach: Non-Design Process and Situation

Under top-down thinking and macroeconomic policy models, the government is assumed to have full understanding of the transformation and growth problems of the country. Top-down thinking reasons at the aggregate level much to the neglect of micro-economic foundations (rationality of households and firms). The government decides the industrial policy package on behalf of the private sector and the communities. It underestimates the microeconomics and spatial qualities of the industrial policy.

Top-down approach is based on ad hoc reasoning\(^2\), which manifests itself in the shift of ideological and political intervention of industrialization. Industrial policy instruments and types of government intervention are specified and urgently searched as solution based on shifts in ideological and political thinking of the power elite. The rational is not addressing market failure for the purpose of resource creation. It comes mainly as a general concern related to the distribution and use of existing resources. Programs of industrialization are created to implement specific political motivation of the power elite and ideological thinking of their advisors (question of who gets what).

In a top-down thinking, there is no systematic analysis and problem solving technique starting from policy formulation to implementation. While there is policy action and government intervention, one cannot dismiss out the argument on the proper way of designing national industrial policy. The top-down and ad hoc thinking uses each of the three design processes and skills in different proportions, leading to a poor or no design situation.

The industrial policy is besieged by myriads of approach and process inconsistencies and irregularities due to lack of clarity in industrial objectives. These policies inconsistencies and irregularities include the followings policy packages: import substitution policy, export-led industrialization, agricultural-demand-led-industrialization strategy, industrial incubator tools (foreign direct investment, cluster initiatives), innovation policy (horizontal), sectoral industrial policy (textile or leather), establishment of agro-poles for agricultural value chains, policy that target narrowly defined industries, supporting sunset (large mature industries).

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\(^2\) Ad hoc reasoning is an auxiliary assumption added to a theory that does not accord with empirical reality or with what was predicted. According to science, the resort to ad hoc reasoning is illegitimate; it does not increase the explanation capacity of the original theory. Not only that it is illegitimate, the auxiliary assumption itself cannot be independently testable from the main hypothesis. Ad hoc reasoning added for redemption does not lead to scientific progress. The frequent use of ad hoc reasoning is regarded as degenerating the research program and finally it ends up in the dustbin of scientific history. See, https://sites.google.com/site/maartenboudry/teksten-1/ad-hoc
versus sunrise industries (new firms and technologies), physical infrastructure (such as industrial parks, business incubators and individual factory buildings), etc.

The continuous layering of policy packages without reflecting as to what has happened to the effectiveness of earlier measures, is an indication of a short-term trial-and-error approach. Each time when an ideological or political anomaly emerged, it is dealt with by an ad hoc design action. No important policy design decisions have been based on design elements, principles and functions.

The change in the level of government intervention and methods of organizing services is a contributing factor to layering type of policy design. At one extreme there is nationalization and highly top-down organization and administration and at the other extreme there are governments which allows market competitions. Adjusting government intervention is not based on the idea to make industries more efficient (achieving more by spending less), and more effective (by increasing the percentage of added values, etc.). Modification of government intervention depends on the ground of ideological and political vicissitudes. Change in the degree of government intervention results in choice of implementing packages. Political bargaining comes when trying to decentralize an area of economic policy previously dominated by central government.

The idea of catching up developed countries contributes to existing inconsistencies and irregularities in industrial policies. Developed countries, not contextual factors, are being used as benchmark for industrialization strategies. The idea is that for late industrializing countries it is expensive and time consuming to independently develop new technologies, products and industrial management organization. Late comers can save time and capital by adopting the necessary technology and know-how from countries that have already industrialized (Suehiro, 2008)

The challenge of developing countries is then how to go about importing, adopting, and improving foreign technologies and systems. This can be achieved through attracting foreign direct investment or importing most industrial products. In the case of the latter the countries have to export primary products such as minerals or agricultural products in order to pay imports. Or, in order to reduce imports they may follow import substitution policies, which may also necessitate the production of intermediate goods. Through the cycle of import-export of products and technologies, the countries can enter into a catch-up industrialization path.

In practice the idea of catch-up does not assume a specific order and steps in adopting production technology, manufacturing know-how, institutional systems and management that
promote industrialization. There is no formalistic order and relationship between the variety of policy domains/instruments (horizontal and vertical) and institutional requirements (such as factor market mobility and property nature) in the process of adaptation. The idea emphasizes instruments for the accumulation of new capabilities and assumes the existence well developed market, capable regulatory and learning institutions. In the catch-up and instrumentalist thinking, the growth mechanism of industrialization (input growth, productivity, infrastructure and institutions) are not treated separately as building blocks of the industrial policy. They are assumed to exist (taken as given), and mentioned in connection with the classification of policy instruments.

Ad hoc reasoning and top down approach is characterized by inconsistencies, irregularities, political bargaining, layering of instruments, imbalance between top-down and bottom-up interventions, institutional influx and clientelism. It is possible that situations like economic hardship and cases of emergency might cause policy inconsistencies both in the reductionist and system-based design thinking. But measuring and explaining the performance by single phenomenon is different from taking into consideration of all characteristics. In ad hoc reasoning and top down approach all the characteristics happen together or overlaps in time and space and when all of them do we have a situation of non-design. Under conditions of non or poor design situation, industrialization remains at the same lower level for decades without producing the necessary economic structural change.

6. Procedures and Tools of Design Thinking for Least Developed Countries

The starting point of this study is that the key question of industrial policy of least developed countries is design problem. The task and the responsibility of administrating and implementing industrial policy is formally allocated to the central government. In most studies on industrial policy or economic structural transformation, the central government is assumed as the owner and driver of the policy for various reasons. The motivation for centralized management and administration is related to the idea of providing uniform policy, to compensate lack of skill capability at lower levels, and to minimize corruption problems. Many years of centrally managed industrial policy did not bear fruit as expected. Industrial policy is used, along with other development projects, as a means for the growth of the state economy controlled by the political power elite.
There are excellent performance evaluation studies at micro levels (policy on firm growth), sectoral interventions, public-private partnership (PPP), structural transformation, etc. Policy recommendation and improvement suggestion of these studies matter; but it does not if it is more of the same reasoning and implementation approach. Centrally managed industrial policy is not appropriate for least developed countries where “creative destruction” of the traditional economy is on the agenda. According to design thinking, creative destruction requires a prototyping model that focus on nodes in the network that have large multiplier effects, should be iterative, fluid and loop approach, people centered and place based. In least developed countries, creative destruction comes as a result of balancing top-down and bottom-up approaches to industrial policy.

6.1. Beyond more of same: Bottom-up Industrial Policy

Bottom-up industrialization means the establishment, operation and agglomeration of light and small-scale manufacturing industries by market forces with the aggressive support of local governments at district level. For instance in Ethiopia there are 769 district governments responsible for education, health, agriculture extension, water supply and social sectors. Of these district governments, 671 are labeled as rural districts and 98 as urban districts or administration. The districts vary in their local endowment structure, namely labor supply, natural resources (farm land, agricultural products and minerals), capital resources (both finance and human capital), types of economic shortages and activities. The idea of bottom-up industrial policy is to make districts rely on domestic economic growth factors (entrepreneurial talent, independent technology and free capital accumulation) to derive industrialization. Domestic economic driving forces are cultivated by market oriented reforms and local institutional innovations.

Surplus labor cannot be absorbed without endogenous technical change and agglomeration. District governments do not wait for technology to progress through the acquisition of equipment and machines from abroad. Instead, they help firms and enterprises explore existing local comparative advantageous and identify key local competencies. District governments focus on building industrial and technological capacities and take the responsibility to upgrade the local endowment structure to endogenize industrialization.

Bottom-up is not only hierarchical. It is a concept which refers to place (the question of where to industrialize and why there). The rationale for industrialization is not based on “one size fit all” places as in the case of central government-led industrialization. The analytical
case and model for industrial policy differ from district to district. The bottom-up policy stresses local specific interventions that are necessary for exploiting the full potential of the local endowment structure. To upgrade the local endowment structure, to uncover opportunities and risks, the local government conducts feasibility studies. This study helps the local government to figures out which industries to support within the districts for the purpose of local economic transformation. Bottom-up industrial policy targets not sectors but firms, which do the trading.

In addition to feasibility studies, the bottom up policy focuses on ways and means of establishing industrial parks in the so-called rural districts and formation of clusters for existing firms in urban districts. An industrial park is a delimited territory with technical and production infrastructure, where manufacturing production, service provision and technological development takes place for the purpose transforming the local economy. Clusters are groups of inter-related industries starting from suppliers to end products that drive wealth creation in the district. Companies that start on their own will have a hard battle to fight and need to have huge investment to get advantageous provided by industrial parks and cluster.

Over and above the establishment of industrial parks and cluster promotion, the bottom-up industrial policy identifies instruments that promotes systematic and harmonious relationship between local stakeholders (private sector, the local government and the youth or part of the population that is growing rapidly). The formation of association of local entrepreneurs, workers and youth helps to build relationships of trust and interdependence among stakeholders. Unexpected consequences of interventions can easily be understood and rectified through applying a systematic and network relationship among local actors.

6.2. Top-down Policy Support

For bottom up policy to work, it is necessary to get top-down support. Local economic transformation has to be integrated with national and regional development programs. To achieve the goal of industrialization at district level, it is necessary for the central government to deliver the following tasks: planning for factor mobility and productivity growth, diversifying, upgrading and balancing industrial structure, ensuring spatial balance and design of operational principles. It may be so that the central government deliver each of these dimensions and skills in different proportions, but the government must leverage some combination of all the dimensions at any point in time context.
Factor mobility

Industrial policy (plan to reallocate resources with and between sectors) requires a well-developed input market and private sector system. At the initial stage growth factors have important contribution to industrialization. At this stage the policy focus on factor mobility (the ability to move labor, capital or land between firms within an industry and between sectors within a country. It is not given that factors of production move freely without obstruction, particularly in least developed countries with faster population growth. For instance, privatization of rural land is necessary for agriculture specialization and creation of industrial linkages.

Diversification in the manufacturing sector

In addition to addressing the issue of land privatization, the central government has an important role in the diversification of the manufacturing sector. The abundance and structure of factor endowments (natural resources, labor, human capital and physical capital) change and differ from one stage of development to another. The industrial structure of the economy will also be different at different stages of development. Initially, the majority of the manufacturing industries can be labor-intensive, low-technology industries engaged in relatively low value-added activities like textiles/garments. With time firms and industries faces stagnation and decline. There is a consensus that broad-based interventions to support industrial upgrading and diversification are crucial to facilitate industrial structural transformation and productivity growth.

Different industrial structures imply differences in optimal firm size, scale of production, market range, transaction complexity, and also different nature of risks. As a result, each industrial structure requires corresponding soft and hard infrastructure to facilitate its operations and transactions. Examples of hard infrastructure are power, transport and telecommunication systems. Soft infrastructure includes the financial system and regulation, education system, the legal framework, social networks, values and other intangible structures in an economy. (Lin, 2014; Lin, 2010)

Designing Industrial balance

Upgrading and diversification focuses on the subnational scale, in particular at the level of towns and regions. In least developed countries there is also a need to balance the industrial structure of the country. The manufacturing sector is classified into light and heavy division based on the intensity of capital and technological use. The prevailing industrial structure is lopsided dominated by consumer goods industries. There is a glaring absence of basic and heavy industries which process raw materials, examples include power generation, steel mills,
copper smelters, oil refineries, sugar refineries, meatpacking, chemical refineries, fertilizer plants, coal coking, natural gas processing, semiconductor mfg. etc. The capital requirement of these industries is heavy and they need very specific infrastructure like vast amounts of electrical power, coal or natural gas for process heating, continual deliveries by rail or truck from nearby or adjacent raw materials sources. Since basic and heavy industries have strategic importance (provides a base to the other industries), industrial policy should seek to bring balance in the industrial structure.

**Design of Balanced Regional Growth**

National industrial policy should not be blind to spatial variations and local economic development: character of uneven and unbalanced growth of towns, differences in overlapping markets or functional areas, network of economic flows, the concentration of unemployment and regional income inequality, availability of natural resource, etc. It is therefore necessary to construct a comprehensive geography of functional economic areas. Industrial policy aims at correcting regional imbalances in industrial development.

Balanced regional industrial development would mean not only the levelling down of inequalities of income and wealth but also avoidance of emigration of labour to different industrial centres. It would also avoid the agglomeration of industries in a few centres or cities, resulting in housing problems, creation of slums, pollution, moral degradation and environmental degradation.

**Establishing Facilitation Centers, Coordination and Macro Stability Responsibility**

In order to help local efforts of economic transformation, the central government has to adopt as well a new law regarding the establishment of industrial parks at district levels. This law shall specify legal and organizational framework for creation and functioning of the industrial parks in the districts. The law among others aims to provide tax and customs incentives for the manufacturing enterprises that occupy the district industrial parks.

Central government providing industrial park law and enabling environments is not enough for starting industrialization from scratch. For good local institutional and organizational performance, the central government has to design program that builds the capacity of local governments particularly in the area of engineering skills. Industrial park feasibility studies, value chain analysis, “picking winners” among heterogeneous firms, choice of champion activities/products, deepening local linkages, fostering strategic collaboration between local public and private sector, and other principles related to effective industrial policy requires programs of local capacity building and development. The central government has a role in building the bureaucracy capacity of the district governments.
To manage the tension between close coordination and capture, there is also a need for a sufficiently competent bureaucracy (procedural governance) that is self-regulating and learn from its practice. There is a need for transparency, accountability, monitoring and evaluation of policies to explain poor performance. Otherwise, authorities act in an erratic or discretionary manner.

At the operational level there is question of alignment and coordination between the different sectors (trade, agriculture, education, infrastructure, local development, etc.) and multiple institutions. The interface and coordination between the sectors should not be taken as given. The overlaps between sector policies calls for greater and effective coordination between sectoral and line ministries, central banks and planning agencies.

In addition to addressing the issue of policy alignment, the central government has an important role in financial development. It is important to continue to scale up public investment in infrastructure by exploring new sources of finance including domestic and external private borrowing. The central government has to ensure domestic macro-economic and financial stability and sustainable public debt positions.

6.3. Methods of Implementing Policy Design: Who are the Designers

Industrial policy design changes depending on the stages of product diversification, level of productivity growth, change in demographic situation and political system. To cop up with diachronic change and pressure, the government must establish National Industrial Policy Council (NIPC) to continuously enhance the design performance at national level. The council would assist the government to understand when and how policy design changes over time. It advice the government on the institutional quality and technical requirements needed to adopt a genuine and appropriate design action. The Council will be composed of relevant sector ministries, leading members of the private sector, representatives of trade unions and district councils, academies and practitioners. Team diversity, iteration, learning styles, creative confidence, and team communication are key success attributes discussed in design thinking literature. (Florian Huber (2017),

The NIPC will focus on different thematic areas (such as factor mobility and private sector development, structural transformation, balance in industrial structure and spatial variations, operational procedures, technology, finance, etc.). Each area is driven by a technical sub-committee with members from the public and private sectors. The NIPC will also have district industrial councils responsible for local feasibility study, cluster promotion, local economic transformation, etc.
The NIPC will also be responsible for funding research-based evaluation which utilize research methodology and expertise both at the design of implementation process and learning outcomes. Research-based evaluation will have to fulfil the same requirement of high scientific quality as ordinary research projects. However, in research-based evaluations, there is a need for the NIPC authority to influence the scope of the research project.

Conclusion

National industrial policy is not a framework of instrument use (vertical and horizontal) and their specific objectives (productivity and structural transformation). It is more than the traditional thinking on instrument mix and finding justification for intervention. National industrial policy is all about solving methodological questions (why, what, how and where questions) of growth and expansion of the manufacturing sector.

This paper examines the potential use of design reasoning and methods to develop national industrial policy and enhance its performance. Design thinking is a systematic method of problem solving under conditions of uncertainty and ambiguity. Outside the domains of traditional design, it is used as a tool to address problems around products, services, and to tackle complex problems of business and management. Linking design thinking and industrial policy development at macro national level is not common.

The study examines the core of design thinking in industrial policy, specify the procedures and tasks of designers in developing the policy process model, discusses the rational and options of industrial policy practice. The research uses Sub Saharan African countries with faster population growth as case study to develop the tools and procedures of design thinking based industrial policy. In least developed countries, “creative destruction” of a traditional economy comes as a result of balancing top-down and bottom-up approaches to industrial policy. Design thinking has particular relevance for least developed countries which start industrialization from scratch under conditions of low level of input market and private sector development and rapid population growth effects.

In developed countries industrial policy design thinking is already in use as a framework for innovation and growth at sector level. The design thinking approach had slowly evolved over many decades of experience and, currently it is embedded in practice at firm and sector levels. There is, however, a call for design thinking at national level, which is often discussed in terms of long-term strategies. East Asian countries are successful in applying design thinking at all levels (national, sector and firm levels) by combining top-down approach and system-based thinking.
In Western Europe and East Asian countries design thinking based industrial policy is the secret to successful industrialization. In the case of least developed countries, mostly in sub-Saharan African countries, there is a non-design practice and contextual parameters. The market-based economy, which is the engine of growth and job creation, is weak both in its size and domestic interactions. There is a glaring lack of conditions that are vital to the function of industrialization such as infrastructure development, construction of basic industries and building technology absorption capacity. Performance assessment (monitoring and evaluation) are not significant determinants in the formulation, introduction, change and reverses of industrial policies. To make the condition worse, population is growing exponentially. Under these circumstances, poor or non-design effort is costly and that is why we find manufacturing at the same level of productivity and growth over the years.

System-thinking design is best for least developed countries, but there are at least two preconditions for its use. Preparation of a national industrial policy document is seen as the first precondition to the use of design thinking in least developed countries. Establishing a National Industrial Policy Council (NIPC) is another precondition to continuously enhance the design performance at national level. The NIPC will focus on different thematic areas and houses the designers (relevant sector ministries, leading members of the private sector, representatives of trade unions and district councils, academies and practitioners).

The use of system-based design thinking of industrial policy for least developed countries has international significance. The debate on international migration crisis has led to policy formulation at curbing immigration at the destination end and using aid as a tool to stop migrants. Spreading the awareness of design thinking approach in national industrial policymaking and implementation helps to tackle the root causes of internal and international migration crisis.

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Annex: An Illustrative Construction of Contextual Factors: Case Study of Countries with Rapid Population Growth Effects

I do not have resources at my disposal to empirically develop the industrial policy input and process analysis based on the core design thinking framework (figure 1) and following the different steps of the model discussed in the section above. To underline complexity, I find it necessary to emphasize the elements of contextual factors that have decisive influence on industrial policy input and process development. The literature review about industrial policy emphasizes on the arguments for or against state intervention and on policy factors related to the choice and mix of instruments—i.e., on “What do we need industrial policy for” and “what is a policy instrument”. The studies do not evaluate and make judgments (questions of right and wrong) about the appropriateness a policy factor outcomes based on the assessment of the non-policy contextual factors. In this section I see the need to emphasize the elements of contingency in policy process based on normative analysis and abductive reasoning peculiar to designing thinking process.

Designers work on complex problems characterized by high degrees of uncertainty, not having clear solutions and often having temporary solutions due to the nature of their value judgments and prescriptive tendency. Their abductive conclusions and tendency to recommendation is important in a situation where the contextual factors of industrial policy are complex and dynamic.

Population growth as an independent force and its effects

According to UNFPA report, the current world population of 7.6 billion is projected to increase by 1 billion over the next 11 years and reach 9.6 billion by 2050. The growth will be mainly in developing countries, with more than half in Africa. The population of developed regions will remain largely unchanged at around 1.3 billion from now until 2050. In contrast, the 49 least developed countries are projected to double in size from around 900 million people in 2013 to 1.8 billion in 2050. (UNFPA 2013).

Population growth is autonomous existing independently of the politicians’ control. To absorb the surplus rural labor into a wage based productive economy and to avoid uneven and unbalanced growth of towns, and to ensure consumer production, there is a need for industrial policy. In the absence of successful industrial policy whereby an increased population increases the productivity with which factors are used, economic structural transformation will be trapped in self-reinforcing process of lower-productivity activities: high consumption,
low investment, low human capital development, low labor productivity, annual population growth, massive scarcity and outmigration.

Factor mobility and Input market Development

One of the theoretical argument for industrial policy is dynamics of scale economies (doing things more efficiently with increasing size or speed of operation). Industries that creates more jobs may need to reach a certain size of scale to be successful. The government through some kind of tariffs for new/infant industries or subsides (such as an ad valorem subsidy) can help the industry to grow that size of scale.

Economies of scale arise from the reduction of inputs consumed per unit of output at higher scales of output. To physically organize the production activities there should be factor mobility (the ability to move labor, capital or land between firms within an industry and between sectors within a country). Factor mobility enables different factor combinations to be made into use. For instance, more capital and labor can only be used if either of these factors is mobile to facilitate a change in the production technique. This enables the producers to search for a least cost method of production.

Even if industries receive government protection or subsidies, based on the argument, they cannot obtain advantages of large scale if factors of production are immobile and their market not developed. It is not given that factors of production move freely without obstruction, particularly in least developed countries with faster population growth. One has to question the common assumption about the existence of monetized goods and labor markets, division and specialization of labor, market incentives, entrepreneurship, technology use and production scale.

State Capture and Private Sector Development

The policy of targeting particular firms or industries based on subsidies, traffic protection, and state ownership bear the risk of government failure (political corruption and state capture). Industrial policy, among others, have an impact on the degree of state capture in the national economy. State capture is the effort of political elites to shape the rules of the game to their advantage through illicit, non-transparent provision of private gains to public officials. The political economy of least developing countries shows that there is a link between corruption with vested economic, social and political interests. Industrial policy can be used for the advantageous of the political power elite and party-owned business.
In countries where the economy is controlled by political power elite, (such groups as the military, ethnic groups and kleptocratic politicians) the market based private sector is less developed and by far the least important part of the economy. For instance, in Ethiopia the share of the private sector to the gross domestic product (GDP) currently stood at 20 percent, while the economy controlled by the political elite accounts about 39%. In developed countries, the market-based private sector generates on the average 80% of aggregate gross value added in the national economy. This means that the ability of the private sector to organize and push for regulatory reforms have been limited in Ethiopia.

So the question is: what should be industrial policy given these complexity and uncertainty? Under conditions of rapid population growth, and in a situation where both market and state failures (quality and availability of institutions), it does not make sense to argue for or against state intervention, on the question "what do we need industrial policy for". The analysis should rather focus of on the normative question of which industrial policy practices and methods are appropriate under complex situation difficult to observe directly. Managing the complex and uncertain context is not the primary task of national industrial policy. Rather, the goal is to adopt itself taking into account of risks and norms of complexity and uncertainty. In least developed countries industrial policy is more than about efficiency and effectiveness of instrument use (vertical, horizontal and functional) and their specific objectives (productivity and transformation).