~~**An organizational network analysis on semiconductor global value chain oriented state policy formation [1st DRAFT]**~~

Introduction

- **Covid-induced Chip shortage**

The Covid-induced chip shortage exposed the. The consequent/following/follow up coverage and

In 2020, industries using semiconductors as raw materials began to experience a pandemic-induced chip shortage. The shortage exposed the vulnerabilities in automobile production management and inflexibilities in their coordination with the semiconductor supply chain. In response to the shortage, the neoclassical economic paradigm predicted that organizations would internalize the production process to reduce transaction cost (Williamson, 1981). However, that is not entirely the case. Although automotive-related integrated device manufacturers (IDM), which are corporations that design, manufacturer, and sell microchips, have invested in building new foundries or reopen shuttered fabs to ensure control over their production, IDMs, as well as fabless chip designers, both in and beyond the automotive industry, continue rely on outsourcing and deepen their partnership with the few key actors in semiconductor manufacturing. Moreover, public and private actors, triggered by the fear of future shortages, have expressed a heightened urgency for state intervention in global supply chain security and participate actively in the state policy making process to address their interests. Several policies were thus created in aim to lower transaction cost not by lowering the entry barrier for organizational internalization but rather subsidize the few leading-firms in the

oligopoly market of semiconductor manufacturing, keeping the organizational boundaries blurry. It is therefore hard to depend only on the theory of transaction cost without the supplements of other organizational theories and network analysis to depict the governance structure of the global semiconductor production network.

Transaction cost economics provided an economic approach to analyze when activities would occur within an organization. However, the existing literature on transaction cost has three limitations: 1.) The scope of analysis is limited to bilateral relationships between firms, 2.) the three governance structures are assumed not to coexist simultaneously, and 3.) lack of middleground between internalizing and outsourcing.

The news coverages, business analyses, and government reports allowed us to peek at the complexity of the semiconductor production network.

- This is majorly the result of automobile maker's decision to cut down their orders for chips in the beginning of COVID outbreak due to their expectation of decline in market demand for cars. When the automobile market began to rebound, the chipmakers had already reallocated their manufacturing capacity for other customers, making it hard for car-related chips to be acquired.
- The shortage exposed the vulnerabilities in automobile production management and inflexibilities in their coordination with the semiconductor supply chain. Public and private actors, triggered by the fear of future shortages, have expressed a heightened urgency for state intervention in global supply chain security and participate actively in the state policy making process to address their interests.

- **Characteristics of semiconductor supply chain related policymaking.**

The formation of semiconductor supply chain policies possess organizational and sociological characteristics. The growing concern of geopolitical uncertainty with the concentration of advanced chips production capacities in East Asia among American national security officials, Intel's duality in its action to extract governmental subsidies by encouraging nationalism and fear for chip reliance on its East Asian counterparts while outsourcing a share of its chip production to TSMC's plants in Taiwan, as well as TSMC and Samsung call for continuity in global trade liberalism, all coexist and clashed with each other at the same time in the collective decision process. It is therefore reasonable to say that the semiconductor-related state policy formation is not motivated by monolithic class interests of capitalists, but rather the dynamic interaction and negotiations of organizational actors with conflicting and contradicting interests.

The diversity of organizational participants in the network indicates that the network structure is far more complex than power elite networks with individuals as units of analysis. The Biden administration invited and welcomed foreign companies in the semiconductor supply chain, such as TSMC and Samsung, as well as their US counterparts like Intel and Micron, to discuss state response to the chip shortage (Miller, 2022) and negotiate financial subsidies in exchange for geographical supply chain reconfiguration (Semiconductor Industry Association, 2024). Not only strong ties like interpersonal relationships among local elites played a role in semiconductor production networks, the knowledge intensive and global dispersion nature of global supply chains indicate that weak ties like supplier and buyer connections are also crucial to the power structure.

The cruciality of knowledge spillover and information flow in the management of global supply chains determined the significance of network location in the power relations among organizational actors. Automobile maker's suffered cancellation in chip orders. [Need expansion here:] (Chris…)

Lastly, [Need expansion here:] (Laumann and Knoke (1987), institution???)

- **Goal of this paper and a (potential) main argument???**

This paper aims to examine the power structure among organizational participants in semiconductor related state policy by mapping out the network structure of core organizations in chip supply chain related policy domain. [Need expansion here:] (Defend why influence over domination to the dimension of power exercised via exchange relationships that connects organizational actors in a political system. Because influence is defined as a relational dimension of power with one actor providing information to another with the intention of altering the latter's action. Since all actors which belong in a national policy domain cannot be specified a priori and must ultimately be determined empirically (Knoke, 1993), based on the characteristics of the semiconductor industry, information flow is more powerful than anything (There is a bunch of relevant literature in Kano et al.'s review, (2020)).

This paper argues that organizational actors' position in the communication and resource exchange network could brokerage information and knowledge flow by closing structural holes, giving these organizational participants more power to affect state policy formation.

Chain governance and network dynamics of global supply chains

Global value chain(GVC) and Global production network(GPN) are two major explanatory frameworks for understanding the structure of a deeply interdependent global economy (Neilson et al., 2014; Kano et al., 2020). The concept of value chain was first introduced by Michael Porter in 1985, where he defined value chain as a series of activities where a firm performs to create a marketable product. The term supply chain is often used interchangeably with a similar definition that removes the value adding sequences. It is widely recognized that Gereffi's work in 1994 expanded the concept to a global scale and provided the first explanatory framework on the power relationship between large buyers and their producers (Neison et al., 2014; Kano et al., 2020). Gereffi (1994; also 2018) introduced the framework buyer-driven global commodity chain (GCC), in which he operationalized the measurement of organizational participation in the global economy on three dimensions: 1.) an input-output structure, which is a series of connected products and services in a sequence of value-adding economic activities, 2.) a territoriality, which is the spatial dispersion or concentration of enterprises in the production and distribution networks, and 3.) a governance structure, which is the authority and power relationship that determines the flow direction of information, knowledge, and resources between organizational actors (Gereffi, 1994; also Gereffi, 2018, p.44-45). However, despite its popularity for subsequent empirical studies, the GCC framework

was criticized for not being a theory but rather a methodology, creating a need for theorization of global chain analysis.

Building on the inter-firm governance dimension of the original GCC framework, Gereffi et al. came up with the most significant theorization of GVC governance in 2005 (also 2018). Gereffi et al. examined three intersecting supply-chain variables- complexity of transaction, codifiability of transactions, and the capabilities within the supply base- to identify a fivefold topology of governance structure within GVCs (2005). [Need expansion here:] (Criticized for limiting the scope to dyadic and static perspective of global industrial governance (Yeung and Coe, 2015))

In parallel to the governance structure, Dicken et al. (2001) and Henderson et al (2002) developed their branch of theorization on global supply chains. The global production network was proposed to supplement the insufficiency in the analysis of environmental and institutional factors and focus on the dynamic networks in which the chains embedded themselves. [Need expansion here:]

- GNP 1.0 (Henderson et al (2002))
- GNP 2.0 (Yeung and Coe, 2015) (Most recent theorization in GPN)

[Need one paragraph here:](Attempts to merge the GVC and GPN theories):

- Value-chain reference framework (VCRM), which delivers a 4 level examination of global supply chains: value-adding activities (GVC theories), supply chain (input-output structure), end-use markets, an supporting business environments (GPN theories) (Frederick, 2010; also 2014).
- The VCRM emerged in need for efficient configuration of global supply chains.

[Need transition and expansion here:] (Types of global supply chain configurations)

Triggered by the oil crisis in 1973, the inflated prices in raw materials and labor pushed manufacturers in the supply chain to relocate in foreign states with cheaper labor, land, natural resources, and investment friendly laws. This reconfiguration strategy is known as offshoring, With the path laid from Western developed countries and Japan to the four Asian tigers in the 70s, Latin America in the 80s, People's Republic of China and South East Asian countries in the 90s. Offshoring would not be possible without decreasing trade cost in cross-border trades, which is the result of global trade liberalism in the past few decades. However, this configuration has faced significant challenges from the rising geopolitical uncertainty. A new configuration in the structure of the global supply chains has emerged in response to disruptions in supply chain security after the US-China trade war and Covid. This reconfigured structure is known as reshoring, With manufacturers relocated to geographical position closer to the buyers in the supply chain, using rising production cost as tradeoff for reduced uncertainty. Both reconfigurations could coexist in the same supply chain, and this phenomenon has been particularly obvious in technological industries, most notably the semiconductor production.
[Need revision and expansion here:] (common configuration patterns (Baldwin & Venables, 2013): Spider, Snake, and Sinker)

[Need one paragraph here:] (Insufficiencies in the current development.)

A combination of all GVC, GPN, and global configuration of supply chain to address why this paper attempt to analyze the semiconductor global value chain oriented state policy formation with an organizational network analysis approach)

- The state intervention via policymaking on semiconductor industries was focusing on the reconfiguration of the semiconductor global supply chain, aiming to move parts of the chip plants spatially closer to the buyers (That's why we need to revisit literature in supply configuration).
- The GVC-GPN debates have largely avoided theorization of State's role in global supply chain management. Even in the empirical studies with narratives on state action and inaction, they mostly focus on industrial upgrading in developing countries. There is "Literally " no literature on the phenomenon of state involvement in trying to attract semiconductor manufacturers from developed countries to developed countries. The power relations among organizational actors as well as participation level in state policy making is completely different from all existing theorization and empirical studies. That's why the power structure of the core organizations in the policy making network matters and also why core organizations have to be identified empirically.

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