

Industrial Policy in the Context of Global Value Chains: Evidence from the Electronics Sector in Guangdong

The expansion and increasingly intricate governance structures of Global Value Chains (GVCs) have been seen as a limiting factor in the implementation of industrial policy. The increased leverage of lead firms, the import-intensity of production and exports, and the bluntness of sectoral measures in a value chain landscape have all been cited in the literature. This paper contributes a fresh perspective to this debate by offering a case study of industrial policy implementation in a GVC landscape, namely that of the electronics sector in Guangdong province. This allows us to go beyond the simple question of whether industrial policy is possible, to considering the interactions of different types of industrial policy and foreign direct investment measures on one hand, and the needs of GVCs on the other. Using a mix of quantitative and qualitative evidence, it is argued that the interaction between successive policy regimes in Guangdong during the period 1980-2015 and the evolving needs of GVCs has led to the development of a dynamic domestic industry that has gone beyond the typical foreign-led clusters seen in other Southeast Asian Locations.

Keywords: Industrial Policy, Global Value Chains, Guangdong, Electronics, Industrialisation

JEL Classification: L16, L52, N65, O25

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Introduction

The debate on whether industrial policy is essential for development is as old as the economic discipline itself, but the conditions under which such policies might be implemented change as the world economic structure evolves. The Global Value Chain (GVC) and Global Production Network (GPN) literatures have developed over the past few decades a rich understanding of this changing structure¹. A GVC lens allows us to see not just the final product that is exchanged and consumed but all the complicated business and institutional relationships and processes that have led to its inception, development, production and consumption (Gereffi, Humphrey and Kaplinsky, 2001; Henderson et al, 2002).

Within GVCs production is coordinated across space and time by lead firms and their suppliers, with price, quality and technology determined largely by the structure of competition in each layer, the power dynamic between firms and the institutional environment within which they are located. Lead firms do not manufacture anymore an entire product within one country², but shift parts of the production process to wherever suits them best, either by offshoring to their own affiliates or by subcontracting to suppliers. In turn, these suppliers can either work with these companies at arms-length, be completely dependent on them or they can be situated in between. These forms of governance (extensively reviewed in Gereffi, Humphrey and Sturgeon, 2005), imply that traditional industrial policy which aims to develop a fully vertically integrated

¹ The term “GVC” will be used to refer to governed international production structures. While this paper recognises the theoretical differences between the GVC and GPN literatures, for the purposes of this paper we will treat them as interchangeable.

² Recall for example the case of iPhone by Xing and Detert (2010)

industrial system is out of date and would probably only work in sectors that are governed by arms-length relationships (Gereffi and Sturgeon, 2013).

Sturgeon (2005) suggests that policy makers should instead identify the specific governance structure present in a chain and adapt policy to suit that. For example, whereas Import Substituting Industrialization (ISI) policies might work for market-based governance, a sector that relies on Multinational Corporations (MNCs) offshoring to their own affiliates would need improved infrastructure and education to make a region enticing for relocation. For industries such as electronics for example, where first tier suppliers take up manufacturing while lead firms are essentially fab-less, countries should focus on attracting the suppliers rather than lead firms (Gereffi and Sturgeon, 2013) and work towards increasing standard adoption in their suppliers (Sturgeon, 2005). Gereffi and Sturgeon (2013) and Milberg, Jiang and Gereffi (2013) further argue that policy should also look more towards South-South trade, regional production networks and generally encourage more global interconnectedness.

These contributions make clear that a rethinking on industrial policy is due given the expansion of multilateral and bilateral trade treaties and expansion of GVCs since the heyday of the developmental states. However, they also show that the aims of such GVC-centric policies are supposed to be rather modest; it is about looking at what industries are already there and incrementally expanding domestic value added (Gereffi and Sturgeon, 2013) by promoting any of the identified types of upgrading (Gereffi, Humphrey and Kaplinsky, 2001). Is this incremental approach justified theoretically and empirically? This paper will explore this question further, first by looking at the theory behind industrial policy and how that might be affected by the expansion of GVCs and then by offering an example of a contemporary case of industrial policy in a sector characterized by deep immersion into GVCs. In particular, we will look at the Chinese province of Guangdong and how it built up its electronics sector, attempting to leverage GVC expansion to further its own domestic firm development.

At this point it will be useful to clarify what we mean by industrial policy. There are many definitions that differ in scope and depth (see Warwick, 2013). This paper will adopt Chang's (1994) definition of industrial policy as "a policy aimed at particular industries (and firms and their components) that are perceived by the state to be efficient for the economy as a whole" (p.60). This definition points to sectoral selectivity as the key element that differentiates industrial policy from any other policy that might affect industry. Tariffs, subsidies, the promotion of national champions, R&D-related tax breaks, local content requirements for foreign investment, industry coordination councils, publically funded high-tech research institutes with business links and many more are instruments used in promoting selectively but should not necessarily become synonymous with industrial policy.

Industrial Policy and Global Value Chains

Sectoral Focus

Somewhat unsurprisingly, international institutions that have traditionally been against sectoral policy interventions continue to promote this perspective with renewed fervor. For example, OECD et al (2014, p.20) insist that the role of the governments now:

"is not to create, subsidize, or tax GVCs, nor to regulate them more than is necessary to maintain desired standards of social and environmental protection. Instead, governments should foster environments that are friendly to production, investment, transportation, communication, and trade, allowing firms to take fullest advantage of their own skills and those of their business partners."

This is based on a mix of reasons. Some authors have pointed out that countries now do not trade in products, which can be reliably divided into sectors, but in tasks, which are horizontally similar across sectors. It is after all a key insight of the study of GVCs that a product requires not just a range of components to be put together, but also a range of services such as R&D, branding, after-sales service, and that these can be performed at different production sites and by different companies. If one combines this insight with the theory of comparative advantage as Grossman and Rossi-Hansberg (2006a, b) did, then this means that countries might specialize in tasks rather than components. This has prompted some to declare industrial policy redundant since specialisation in sectors is not compatible with specialization in tasks (De Backer and Miroudot, 2014).

However, this assertion implies that all tasks or components are sector (or GVC) neutral, which would contradict the evidence that there is a great deal of asset specificity involved in tasks, especially as we go into capital and skill intensive products. For example, South Korean firms have developed expertise in DRAM design, but they are not as competitive in other types of IC design. Given that skills of similar tasks within the same component industry are not directly transferrable, it seems a bit of a stretch to imagine that policy can encourage “design skills” in general in this example. Inadvertently, policy will target a specific type of task or component within a sector, and this hopefully will have spillovers. Furthermore, the governance of GVCs differs greatly by sector, as explained by Gereffi, Humphrey and Sturgeon (2005). In this sense, industrial policy has to look at the sector, to understand the GVC governance prevalent there and adjust policy accordingly, as mentioned above.

Despite these objections, the GVC lens indeed blurs the lines between sectors. For example, with speed-to-market of paramount importance in the electronics industry, the development of suitable logistics is necessary, even though logistics is technically a services sub-sector. In turn the development of logistics would be beneficial to all sectors where speed-to-market is similarly important. We see then that the rationale for industrial policy in targeting specific sectors has not changed, but what GVCs imply is that *within* the industries of interest, targeting could be done at the component or task level, looking at the *entire value chain* and not just the narrow definition of the sector.

Tariffs

The ineffectiveness of tariffs in the context of GVCs is perhaps the most widely argued impact of GVCs on industrial policy. There are several reasons for this. First, the context for tariffs has changed as countries increasingly trade components with each other instead of finished goods. This was identified in trade literature with the emergence of vertical trade and the growing trade in intermediate products (Greenaway, Hine and Milner, 1995), which implied a comparative advantage in components rather than finished goods (Jones and Kierzkowski 1988; 2001, Arndt, 1998). At first glance, industrial policy could adapt and instead target a component instead of a finished good. However, apart from some practical consideration, such as the difficulty to identify which products are finished and which are components (Collier and Venables, 2007), there is a bigger problem regarding the impact of a component tariff.

In the old ISI policies it was assumed that the product protected would find some domestic demand to make tariffs worthwhile. In the component case there cannot credibly be a domestic demand without an already existing industry that uses it, such as a domestic assembly/production industrial cluster that uses this component intensively. Therefore, somewhat counterintuitively, a tariff on a component would make sense only after an industry has been established. A further issue comes from the various barriers to entry erected by GVCs (Pack and Saggi, 2006); price

ceases to be the only determinant of competitiveness in a new reality where various ISO and other types of requirements are needed to enter an approved supplier list, especially as technical requirements for more high-tech components are particularly great.

A more popular argument against tariffs is that GVC-based production is highly import-intensive and therefore tariffs could actually hurt industrialization (De Backer and Miroudot, 2014, Hummels, Ishii and Yi, 2001). Each country's producers are supposed to add a proportion of value to the final product. If the government puts a tariff on imports then they are essentially taxing the produced good that incorporates these imports. Whereas that might be less of a problem for producers that export exclusively and are able to receive import duty rebates, this can hurt local firms that supply to local clusters. Baldwin, Kawai and Wignaraja(2014) go a step further to argue that because of this logic of GVC production, developing countries themselves entered voluntarily into multilateral and bilateral agreements.

GVC theorists however argue that the point is not to never use tariffs but rather that this instrument like others have to be tailored to the specific value chains, in what could be viewed as a "demand-responsive" industrial policy (Hamilton and Gereffi, 2009). According to Gereffi (1995) a mix of both ISI and export oriented industrialization (EOI) strategies were used by East Asian and Latin American NICs, but were implemented selectively according to the type of chain they wanted their firms to engage with. ISI policies targeted producer-driven chains that were predominantly capital-intensive, such as automobiles, and steel. In contrast, EOI strategies promote buyer-driven light industrial products such as textiles, garments and electronics. This meant that policy instruments were different in each case; in ISI strategies countries used tariff barriers, technology transfer and local content requirements but in EOI strategies the state assumed a more supportive role as "facilitators", by providing infrastructure, creating Special Economic Zones (SEZ) or Export Processing Zones (EPZ), customs drawbacks, easy credit, export credit.

National Champions

An early rationale for industrial policy was that there is a structural tendency in the world economic system to accrue more benefits of progress in the so-called core countries, at the expense of the periphery (ECLAC, 1950). However, a key problem of the core-periphery theories has been the lack of micro-foundations that can credibly explain why there is a tendency for unequal exchange (Schwartz, 2007). Schwartz (ibid.) tries to bring economic geography models such as those of Thünen and Krugman (1990) to explain why there is a tendency for geographic peripheries to be less developed. Under such circumstances, state action, as proposed by writers who emphasize state autonomy (Evans, Rueschemeyer and Skocpol, 1985) would be required, as in the case of East Asian developmental states. GVCs could be perceived as an institutional mechanism through which this unequal exchange is taking place³. However, GVC theory in itself very rarely discusses these more radical political economy implications, focusing instead on how GVCs are organized and governed and what it means for developing country suppliers (Bair, 2005).

³The very concept of commodity chains was developed by Hopkins and Wallerstein (1986) to show the very impossibility that states can have such autonomous action. In Wallerstein's theory, capitalism has always been one system (the world-system) and institutions "obey certain systemic rules" (2004, p.17). State policy is conditioned by dominant class interests and the market exchange, reducing the scope for state autonomy (see Skocpol, 1977; Brenner, 1977).

The suggestion above has some foundation in GVC theory. Milberg and Winkler (2013) argue that the structure of competition between chain links is what creates the endogenous incentive for lead firms to increase profits by offshoring their production. Lead firms are usually oligopolistic and have become even more so during the latest phase of globalization (see Nolan, 2002). Their oligopoly power is perpetuated mainly by holding on to process and product innovation, which requires high amounts of R&D as well as brand power. Moreover, lead firms can offload risk to suppliers, induce competition amongst them and minimize technology sharing. On the other hand, lower tier suppliers face significantly more competition, as production of low value added manufacturing has sprung up in many locations around the world. This structural imbalance along the chain makes for an endogenous tendency for profits to accrue to lead firms (Milberg and Winkler, 2013).

If we combine this insight with the observation that lead firms actually reside mostly in developed countries, then we can see how there is a structural tendency for unequal exchange. Some recent contributions have incorporated this more radical perspective. Mahutga (2014) for example argues that the “viability of national economies is increasingly a function of the bargaining position of the firms located within them” (p.174), with core countries at a much better bargaining position by virtue of having lead firms located within them. Industrial policy in this context is still necessary from a political economy perspective to achieve development within a system that would automatically not produce it.

One way states have tried to correct this firm-level imbalance is by encouraging “national champions”, as in the case of the Korean *chaebol* and Japanese *keiretsu*. The idea is to promote specific firms in a sector, through not only tariffs in the products they produce, but also through a combination of other industrial policy measures such as subsidies, restrictions in competition and easy finance. However, even though supporting national champions might be desirable given the analysis above, it might not be realistic to expect them to reach a truly global lead firm status. Oligopolistic lead firms in almost every sector tend to accumulate an increasingly large amount of resources that is often spent on creating barriers to entry and maintaining the technological gap. Under such circumstance, even countries with large resources might not be able to prop up their firms enough to succeed (Nolan, 2002).

Due to these problems, what the GVC literature offers as an alternative is the concept of upgrading within value chains, while accepting that a latecomer might just never reach lead firm status. Nevertheless, there is a need for industrial policy instruments, which increase the bargaining power of suppliers so as to achieve upgrading. Such instruments can include the promotion of specialized clusters (Pietrobelli and Rabellotti, 2007; Sturgeon, 1998), public-private partnerships in developing high-tech products to shoulder risks from suppliers (Weiss, 1998), negotiating technology transfer agreements in exchange for market access as in the case of China and so on.

The discussion above indicates that we need to rethink industrial policy in the current world production context. The rationale for implementing such policies remains strong, with GVCs reinforcing a sectoral perspective and providing a strong reason for state action to increase the bargaining power of developing country producers. However, tariffs cannot be used with the same effectiveness and supporting national champions has become a more uphill battle. How have contemporary industrializing regions dealt with these challenges? In the next section we will examine the case of the electronics in Guangdong. The experience of this region in a sector embedded in GVCs shows that while tariffs are not an instrument of choice, it is doubtful whether

local industry could have evolved beyond a foreign-led assembly centre without other industrial policy measures.

Industrial Policy in the Guangdong Electronics Sector

The global electronics industry has been a pioneer in international production networks. Ernst commenting back in 1985 wrote: “in fact, inside almost any electronic product – whether it is a computer or a consumer item – components can be found which have been made in more than a dozen factories in at least half a dozen countries. Even one subassembly may be the result of an odyssey” (Ernst, 1985, p.25). However, mapping these networks is a challenge, not least because the sector in itself encompasses an array of different products. Semiconductors are the most important component in electronics and these, along with other components, are assembled into products with distinct features and markets such as telecommunication equipment, consumer electronics, automotive electronics and others. This complexity and wide fragmentation means that detailed value chain studies can be undertaken only at the product level (for example Xing and Detert, 2010; Dedrick, Kraemer and Linden, 2010) while studies at the sectoral level focus on key global firms (for example Sturgeon and Kawakami, 2011).

A key feature of the electronics value chains is their increasing use of modular governance structures (Sturgeon, 1998). What this means is that lead firms, particularly from the US and Europe, do not perform volume manufacturing by themselves but subcontract this and other related functions to Electronic Service Manufacturing (EMS) firms (Sturgeon, 1998). There has been significant consolidation within the EMS sector over the past decades with a handful of firms grabbing the majority of the global market while hundreds of smaller players operate locally in niche areas. EMS firms pool customers together in order to be profitable and offer a wider range of services, but usually do not undertake much design or R&D. In contrast, Japanese firms usually offshore production to their own affiliates and rely much more on their Japanese suppliers to move offshore with them than on the local supply base (Sturgeon, 2006; Ernst, 1994). Similarly, there are differences in strategies of Korean and Taiwanese firms, related to their own position in GVCs and their vision for upgrading. This implies that the type of investor is potentially crucial for the type of industry that emerges and its developmental potential.

The increasing demand for subcontracting and offshoring starting in the 1960's was coupled with a widespread adoption of export oriented industrialization strategies by a number of Southeast Asian locations, most often with the creation of Export Processing Zones. Guangdong, a Southern Chinese province can be seen in a similar light, as the SEZ was meant to provide reliable export platforms for GVCs. On the eve of reforms in 1978, Guangdong accounted for only 4.6% of Chinese GDP. In 2009, after almost thirty years of phenomenal growth, that portion had risen to 20% and the province had the 8th largest GDP per capita in China (Guangdong Statistical Bureau or GBS, Various Years). Before the implementation of opening up reforms, Guangdong was underperforming compared to other Chinese provinces mostly because the priority of the central government was the development of the hinterland. Precisely because of this relative lack of industrial assets and its proximity to Hong Kong, Guangdong and the Pearl River Delta within it were chosen to become the test bed of economic reforms in China, setting up the earliest Special Economic Zones (SEZs) in Shenzhen, Zhuhai and Shantou (Vogel, 1989).

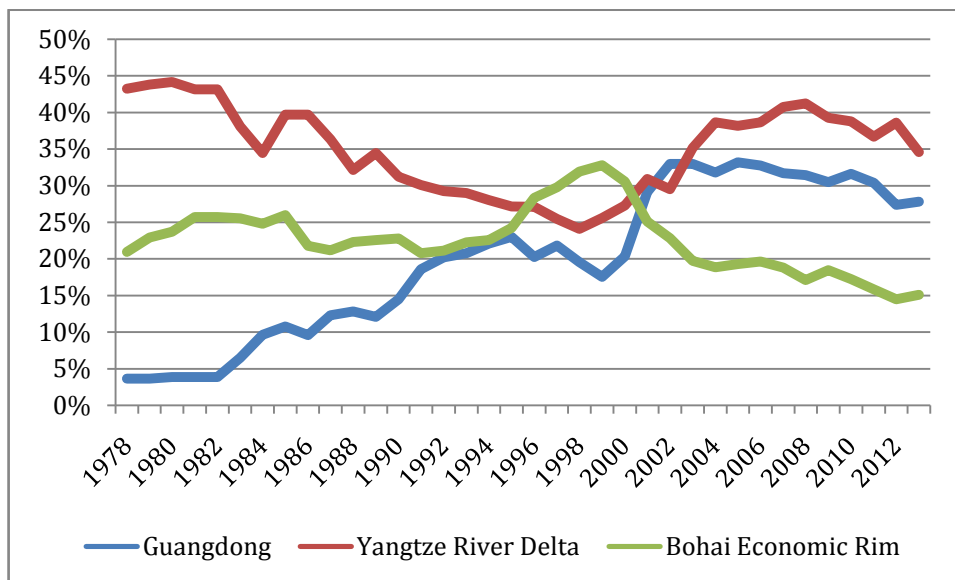
However, as we shall see a key differentiating point between this region and Southeast Asia was the vision of the Chinese government at all levels to develop the domestic industry during this process, invoking more parallels with the earlier experience of Taiwan and Korea. This contemporary experience of reliance on well-developed and complex GVCs together with activist industrial policies makes Guangdong a unique case study to illustrate the limits and opportunities for industrial policy in the context of GVCs. The success of this strategy is difficult to appraise

given that the province has not reached the technological frontier. However, it is a region that has become an integral part of electronics GVCs and boasts some of China's best-known brands in the sector such as Huawei, Xiaomi, TCL and ZTE.

The Electronics Sector in Guangdong

Guangdong features one of the main industrial bases for electronics manufacturing and assembly in China, along with the Yangtze River Delta and the Bohai Economic Rim⁴(Luo, 2014). The province's electronics revenue in China's total has been steadily increasing over the years. From only 3.6% on the eve of reform it reached steadily 22.1% in 1994 and jumped to 33% in 2001, dropping slightly ever since. It is second only to the Yangtze River Delta, which accounted for 35% in 2013 (see Graph 1).

Graph 1: Share of Key Economic Zones in China's Total Electronics Revenue



Source: China Electronics Industry Statistical Yearbook (Ministry of Industry and Informatization –MII , Various Years)

⁴The Pearl River Delta is an economic region within Guangdong encompassing some of the most prosperous cities there such as Guangzhou, Shenzhen, Zhuhai, Foshan, Jiangmen, Dongguan, Zhongshan, Huizhou and Zhaoqing. Due to the availability of statistical data at the provincial rather than at the Delta level, this paper focuses on the province as a whole. The Yangtze River Delta includes Shanghai and parts of bordering Zhejiang and Jiangsu Provinces. The Bohai Economic Rim includes Beijing, Tianjin and areas in Hebei, Liaoning and Shandong provinces.

The sector has become very important for the provincial economy, from representing only 8% of total provincial Industrial Output Value (IOV) in 1985, to a peak at over 27% a decade ago, and then stabilizing at around 23%.

Table 1. Statistics on the Electronics Sector in Guangdong

	1985	1989	1993	1997	2001	2005	2009	2013
IOV as % of Provincial Total	8%	9.7%	11%	15.6%	22%	27.3%	23%	23.6%
Value Added as % of IOV [^]	18.4%	18.6%	24.8%	22.1%	21%	21.3%	21.8%	22.2%
Share of FIEs in IOV			91.2%*	83%	78%	84%	74%	64.0%
Share of FIEs in Value Added			78%	82%	71%	78%	58%	51.10%

[^]1985, 1989 values is for net output value as % of IOV

*value is for 1995.

Source: Author's elaborations on data from the Guangdong Statistical Yearbook (GBS, Various Years)

One can easily see the large presence of Foreign Invested Firms (FIEs) in the sector, with their dominant share in IOV. That said, this indicator is likely overestimates foreign investment as domestic investors sometimes routed funds through Hong Kong and Macau to take advantage of special incentives. The FIE share in value added has been consistently lower than that of their share in output value, indicating that on average they engage in more low value added activities than domestic enterprises.

The main bases for electronics production in Guangdong are Shenzhen, Guangzhou, Dongguan, and Huizhou (Table 2). Out of these, Shenzhen is the most developed one and with the highest value added in production. Dongguan has emerged as a popular production site in the 1990's although operations there are still relatively labour intensive.

Table 2: Share of Key Sites in Total Electronic Industrial Output Value and Value Added

	Shenzhen	Guangzhou	Dongguan	Foshan	Huizhou	Others
Output Value as % of Total						
1985	37.6%	24.4%	0%	14.2%	0%	23.8%
1995	49.3%	5.6%	5%	3.7%	13.7%	22.6%
2005	58.3%	7.2%	12%	2.4%	7.9%	12.2%
2013	49.2%	7.5%	16%	3.6%	11.7%	12%
Value Added as % of Total						
2013	56%	6.7%	13.4%	3.8%	10%	13%

Source: Guangdong Statistical Yearbook (GBS, Various Years)

Guangdong province, and the Pearl River Delta in particular, has become a centerpiece in electronics GVCs (Lüthje, 2004). Thousands of small contract manufacturers have located there and almost all large EMS firms have significant facilities in the province. Guangdong is especially involved in the production of telecommunication devices and equipment, computers, components and electronic devices. In 2013 a majority of consumer electronic products were manufactured in Guangdong; 50% of mobile phones, 55% of laser disk players and 50% of colour TVs were manufactured in Guangdong. Its record in more high tech products was less stellar, with only 6% of microcomputers, 12% of displays and 21% of ICs ((MII, 2014). This imbalance

has prompted some observers to dismiss the technological capabilities of provincial firms as just about assembly. However, the recent rise of brand firms in consumer electronics indicates that the province is able to support and launch potential lead firms with value added activities such as design, materials research, procurement and logistics among local firms' strengths.

The most high profile Guangdong electronics firm is undoubtedly Huawei, followed by other brands with a strong home presence such as ZTE and TCL. Huawei's income from foreign sales in 2013 was almost 39.5 US\$ billion, surpassing Ericsson for the first time (Luo, 2014). It has also developed patented technology in 4G-LTE and can cooperate globally for LTE networks. However, the company does not have its own proprietary operating system (it operates on Android) and several of its components are imported such as the CPU, GPS, LPTS, the AMOLED screen and memory chip (Li, 2012), although it has started to make its own processor. TCL similarly relies on foreign technology; it purchased French TV manufacturer Thomson's CRT business in 2004 and established a joint venture with Alcatel, although both of these have struggled financially (Lau, 2006).

The data above is suggestive of a production system in the sector that shows significant heterogeneity. The labour intensive, low value added element coexists with some of the most sophisticated businesses that China has to offer. This tension is ongoing although hardly sustainable; wages have been rising fast, with low-end production increasingly moving inland or to other Southeast Asian locations. Several questions arise; is the sector in Guangdong foreign-led as in many other clusters in the region? Has the state played an important role in its development? How? The next sections outline the successive industrial policy and FDI regimes that have shaped the sector's path.

1st Phase 1978-1995 – Hong Kong is King and Infrastructure the Queen

During the first years of reform, there was little in the way of industrial policy, defined as targeted sectoral promotion. Instead the emphasis was on rebalancing the industrial mix from heavy to light industry and implementing ownership, marketization and liberalization reforms. The provincial 6th Five Year Plan (FYP) (1986-1990), 7th FYP (1986-1990) and 8th FYP (1991-1995) focused more on improving the overall performance of the province and its investment environment. Issues such as infrastructure, including energy, transport, telecommunications and raw materials were high on the agenda and absorbed a high proportion of funds. While the macroeconomic deterioration in the late 1980's led to a dip in investment, renewed growth in the 1990's led to a significant revision of planned targets (Zhu, 1993). Shenzhen entered the new decade with a new plan to boost infrastructure, spending 50 billion RMB on large capital projects such as the Yantian port, complementary facilities at Huangguan port and a super highway between Shenzhen and Guangzhou (South China Morning Post, 28 November 1990).

This did not mean that no funding was directed to the electronics sector. During this time there was an effort to upgrade the industrial capabilities of the province, especially its production equipment. For example, during the 7th FYP, 13 billion RMB was earmarked for technology upgrading (Ye, 1986). The electronics industry received almost 1.9 billion RMB for 307 upgrading and automation projects between 1981-1990 (Ye, 1994). Electronics was also

supported as part of the high-tech industries⁵ that started to be promoted during the 1980's, most notably with the Torch programme.

While all firms could benefit from these infrastructural projects, financing was mostly directly to domestic enterprises, and specifically to the state-owned sector that was undergoing reform. State enterprises were rationalized with duplicate and very inefficient facilities shut down, followed by several experiments with increasing managerial autonomy (Vogel, 1989). Eventually, the state in Guangdong retained ownership in utilities, infrastructure and defense as well as a large management stake in sectors that were deemed strategic such as high-tech industries (Brousseau, 1998). The private sector was gradually established after 1988, but the main players during this phase in the electronics sector remained the State Owned and State Controlled Enterprises⁶ (SOSCEs) and the Foreign Invested Enterprises (FIEs). Some of the SOSCEs that were established during this period would later become large enterprise groups as we will see in the next section, but at this point a lot of the supply base had to be created by FIEs. The reliance on FIEs was described as a strategy of “borrowing the ladder to climb up” (*jieti shanglout*), that is using foreign investment to bring in capital and technology (Ye, 1994).

The FIEs flocked into the Special Economic Zones (SEZs) that were established in Shenzhen, Shantou and Zhuhai in Guangdong province and Xiamen in Fujian province. The SEZs were allegedly inspired by Singapore (Cartier, 2001), Korea and Taiwan (Sit, 1985) and offered generous fiscal incentives⁷, duty free imports on raw materials and intermediate goods, while sales to inland areas were restricted (Chu, 1998). Moreover, wholly owned FIEs were welcome in Shenzhen and other SEZs, unlike the rest of the country, which required Joint Ventures. Enterprises were encouraged to be export-oriented to increase foreign exchange earnings and limit domestic consumption, while high-tech enterprises could get an extension of their tax holiday (Wu, 1998).

This openness led to the establishment of thousands of small operations, which did assembly and processing, often on consignment⁸. However, this low-end work was not in line with the original aims of the SEZs, which had become a political project. The pressure to succeed and attract high-tech projects was high and in the end such expectations were unrealistic, with many joint ventures often failing. Vogel (1989) writes: “*Considering the unrealistic hopes that Beijing had for attracting the latest technology at virtually no cost, the political pressures on Shenzhen not to make concessions to foreigners, and Chinese officials’ low level of technical and international experience, it is perhaps surprising that any of these ventures worked at all*” (p.143). However, the zones did manage to operate at a profit and earn considerable foreign exchange (Vogel, 1989).

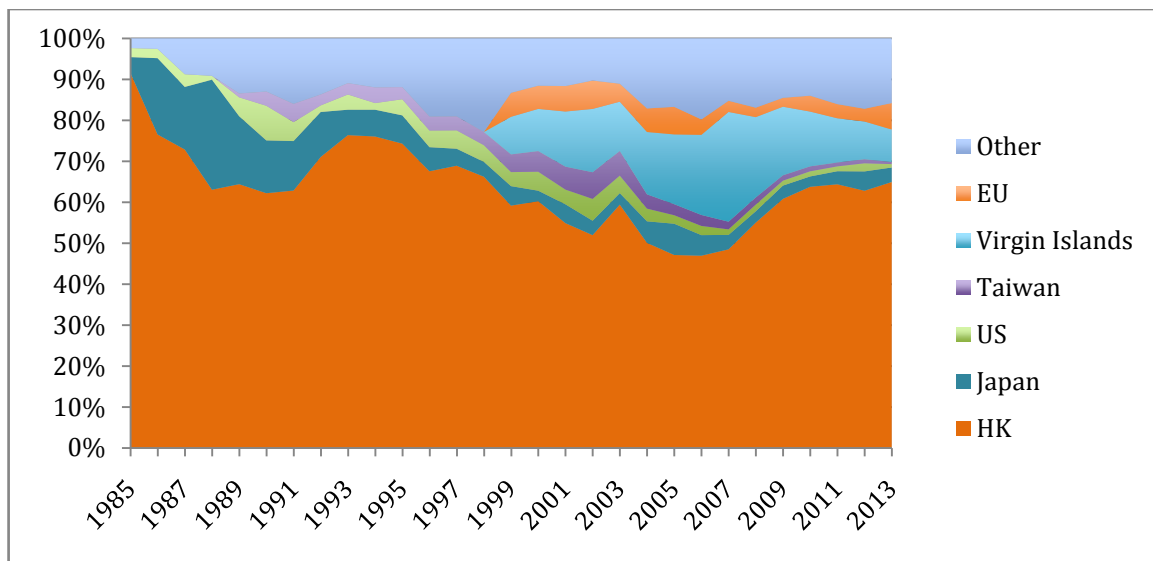
Graph 2: Sources of Foreign Capital (1985-2003) and FDI (2004-2013) in Guangdong

⁵ Other high-tech industries included bio engineering, new materials, fine chemistry, machine electronics system technology and new foods technology.

⁶ SOSCEs was an ownership category introduced in 1998 that includes unreformed SOEs and other types of enterprises in which the state has a controlling stake, whether that is by holding more than 50% of capital, by being the largest investor or by having an agreement designating that the state has control rights (Holtz, 2013)

⁷ These included “a 15% corporate tax rate, 1-3 years tax holidays in general but 5 years for investment over US\$5 million, repatriation of corporate profit, personal income after tax, and repatriation of investment capital after completion of contract” (Chu, 1998:491)

⁸ These were often called “three supplies and one compensation” (*sanlaiyibu*). According to Yang (2012, pp. 142) “are signed as cooperative contracts with town or village level foreign economic and trade offices (*waijingban*) in the form of business entities and are registered in the name of the Chinese partners”



Source: Guangdong Statistical Yearbook (GBS, Various Years)

We can see in Graph 2 that Hong Kong dominated FDI in the province and has rarely accounted for less than half of overall investment. Sources of foreign capital continued to diversify in later years, with Japan entering dynamically in the first half of the 1980's and others followed. However, this data is only suggestive, since Hong Kong is often used as a financial tax haven, with both domestic and foreign investors choosing the island to route their investments into China. The majority of foreign capital was used in industry. In 2001 72% of FDI went into manufacturing, declining steadily into just over half of total in 2013.

Detailed evidence is hard to get but we can look at some data from Shenzhen between 1979 and 1990. Hong Kong firms invested cumulatively \$1.9 billion US dollars in Shenzhen during that time, more than 10 times the amount Japanese or US firms invested at the time. However, only 8.7% of their investments (US\$ 165 million) were in electronics. Japanese firms invested US\$ 77 million in electronics and this made up 52 % of total Japanese investment. US firms invested US\$ 15 million or 13% of their total in computers and electronic systems. These three countries accounted for 92% of investments in the sector (Wu, 1999, pp.36-37).

The early dominance of Hong Kong investors in the electronics sector, as in almost all other areas, is easy enough to understand. At the onset of reforms Guangdong relied heavily on attracting overseas Chinese investors, and Hong Kong has a significant population with familial ties to many parts of the province. Overseas Chinese were more understanding of the cultural context and could generally operate with more ease during these first years of development. For Hong Kong investors Guangdong was in very close proximity and offered considerable savings. A company could afford for the same investment value 10 times the land space and 5 times the workers compared to Hong Kong (Grothall, 1989).

These investments were a promising start. The main goal for the government was to upgrade these operations and attract more high-tech investments in order to be able to compete with the YRD, and realize Guangdong's plan to become one of the "little Asian tigers".

2nd Phase The Rise of the National Champions 1990-2005

In the mid 1990's SOSCEs became the centerpiece of China's sectoral industrial policy, which promoted key pillar industries. For Guangdong these were car manufacturing, petrochemicals,

machinery, ICT, light industry, textiles, building materials and construction, pharmaceuticals, metallurgical industry and forestry (GPG, 1996). The reformed SOEs became large enterprise groups in these sectors to take advantage of scale economies and invest in R&D. In the electronics sector, the Guangdong Electronic Machinery Bureau chose 10 enterprise groups and 16 backbone enterprises⁹ to support, most of them SOSCEs (Guangdong Yearbook Compilation Committee - GYCC, 1998).

Some of the chosen enterprises include three of today's best-known electronics companies in China, namely ZTE, TCL and Huawei. ZTE, a Chinese telecommunication equipment giant, was founded in 1985 in Shenzhen by Hou Weigui who was working as a technology officer in a factory under the Ministry of Aviation and Aerospace of China (Tian and Wu, 2015). It was listed in 1997 and has been run as a private company even though the state holds large shares (Harwit, 2007). Similarly, TCL a large TV maker established by the Huizhou city government was also listed in 1999 and the government subsequently retained a 41% share in the company, which was subsequently reduced (Chinadaily, 10 November 2003). The exception is perhaps Huawei, which was set up as a private trading enterprise in 1988 in Shenzhen but grew to become the largest telecommunication equipment maker in China. While Huawei did not receive the early state backing that the other two firms did, it was nevertheless a chosen "champion" since the late 1990's.

In terms of policy measures, first there were efforts to increase funding available to undertake technology upgrading and capital construction projects. Some companies were listed in the stock market; others were given subsidies for technology upgrading or received discounted loans from China development bank. Second, policy was targeted according to current production abilities and future market potential. For example, in areas of overcapacity M&As were encouraged to reduce it; in areas with certain sizeable capacity which could not satisfy the market entirely, key support was given to companies so that they increase production or raise quality; for products with large future potential but weak current capacity R&D support was given (GYCC, 1998). The 2001 Implementation Plan for Industrial Restructuring of the ICT industry emphasized that government funding and public research should focus on areas that display steep learning curves (semiconductors) or base technologies such as microelectronics, digital technology, computer aided technique and standard formation. Mature technology research was to be undertaken by private enterprises and efforts would be made for such as R&D to be relocated from lead firms to Guangdong (Guangdong Economic and Informatization Committee - GDEIC, 2001).

The attention to SOSCEs waned somewhat after 2001. For example, the 2001 ICT Plan argued that firms in the sector should be further reformed in terms of ownership, leaving state ownership to only a few strategic sectors, such as defense. Only SOEs that could demonstrate potential should be helped out. Policy also started to encourage domestic private firms, mainly by focusing on innovative small and medium enterprises (SMEs). Additionally, the focus on large enterprise groups did not mean that their development was to be based on purely domestic talent and investment. On the contrary, large enterprises were encouraged to set up JV projects with suitable foreign investors and internationalize through M&As, as part of their "going out strategy". Indeed,

⁹ The groups were Huaqiang, Konka, TCL, Shenzhen Electronics Group (SAIGE), Foshan Electronics Group, Guangdong Colour Picture Tubes (now Dongguan Development Holdings), SED electronics group, DESAY group, Fenghua Advanced Technology and Guangzhou Electronics Group. All of these are SOSCEs, with varying degrees of state participation. The 16 backbone enterprises included Shenzhen Primatronix (Nanhu), Guangzhou Radio Group, Huawei, Shenzhen Great Wall Computers, Shenzhen Kaifa Technology, Shenzhen Yuebao Electronics Technology, Chaozhou Three Circle Group, Shinwa Industries, Zhongshan Jiahua Electronics, Dongguan Shengyi Futongban (Now Shengyi Technology), Guangdong GoWorld, Guangdong Jiali Group, Tianma Group, Jinghua Electronics, Shenzhen Advanced Science and Technology Group and AF Technology. Some of these were sino-foreign joint ventures, and Huawei was private, but most were also SOCHes.

the attraction of foreign investment and the development of domestic enterprises seemed to go hand in hand.

In terms of FDI, this phase was marked by Deng Xiaoping's "Southern Tour" in 1992, which called for an intensification of reforms and the spread of open-door policies in the other parts of China. FDI was also facilitated by improving the investment environment, incentives and cutting red tape, while services started to open up in preparation for entry into the WTO. In some cases FDI approval was more selective, especially for sectors that used old technologies or were too energy intensive (Cabatit, 1990). However, this phase also saw intense inter-city competition for foreign investments, which rose sharply after 1992.

Building on a supplier base that had already formed in the 1980's, the 1990's saw increased diversification of projects in the sector. First, Taiwanese investments, which had been difficult to get due to political considerations started to rise markedly as restrictions were gradually lifted. (Electronics Times, 1995). While most Taiwanese investments ended up in Fujian's Xiamen SEZ, which sits opposite Taiwan, and in the YRD, Taiwanese investments in Guangdong concentrated in Dongguan and these factories formed an export-oriented cluster in computers and peripherals, Taiwan's mainstay industry. Given that the Taiwanese suppliers were themselves second or third tier suppliers, most of these operations were for low-end assembly. However, Taiwanese firms unlike those from Hong Kong would later go through a process of upgrading that left room for more skill-intensive operations to be shifted in the future (Ernst, 2013).

Second, large lead firms from Japan, US and the EU (for example Matsushita, Samsung and Nokia) started to set up operations in Guangdong. Their share of local production quickly became noticeable. Almost 67% of mobile phones made in the province in 1999 came from Dongguan Nokia, a JV with a local firm (GYCC, 2000). For these firms, market access was especially important and this was often leveraged by the government to pressure for technology transfer by establishing JVs with promoted firms. These JVs helped domestic firms to both build up OEM capacity and to launch their own brands (Arvanitis et al, 2006) even if their technological targets were not often met¹⁰.

Third, some of the largest first tier suppliers such as Foxconn (Taiwanese), Flextronics (US interests, based in Singapore) and Jabil (US) also located their operations in the province. Given the very low profit margins of these companies and the large production scales they operate in, they rely heavily on low cost component sourcing, good transport infrastructure and tax incentives. These conditions started to mature for Guangdong in the late 1990's and have remained the main draw for these suppliers, even as wages have started to rise (Interviews with EMS managers in Shenzhen and Guangzhou).

3rd Phase: Indigenous Innovation & Strategic Emerging Industries (2005-now)

Since 2005, there have been several changes to industrial policy. First, Guangdong adopted countrywide policies that pushed for indigenous innovation launched during the 11th FYP, and later with the launch of the Strategic Emerging Industries (SEI) initiative during the 12th FYP (2011-2015) (GPG, 2006; 2012). Given the focus of the province on the electronics sector, all these initiatives have put emphasis on developing high-tech areas of ICT products, such as advanced screens, IC design and advanced packaging, embedded systems, TD-LTE compatible equipment and terminals and navigation system applications and chips. The importance of the

¹⁰For example, the Shenzhen Electronics Group, a state-owned and chosen "backbone" enterprise group, partnered with SGS Thomson (now STMicroelectronics) to build a wafer fabrication plant in 1994 (Electronics Times, 1992). The plans were too ambitious though and the plant was in the end only for assembly and post-production processing. Now SEG has shed all high-tech production and is focused on electronics retailing and wholesaling.

electronics industry in these plans is evident by a cursory look at the “important” projects listed in them; 48% of planned investment (by mainly private sources) in the projects of the Guangdong High-tech Plan and 20% of those in the Guangdong SEI plan were in the ICT sector during 2011-2015.

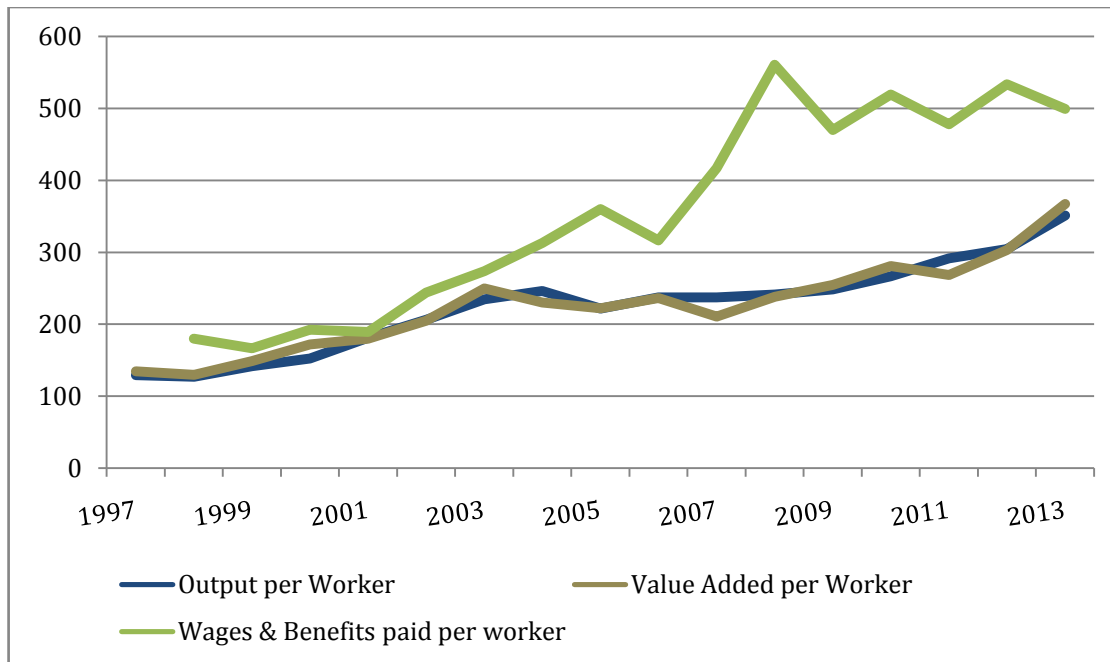
Second, this attention to innovation, especially domestically, has created a new policy goal; that of building not necessarily complete vertically integrated national champions, but *complete domestic industrial chains*. A report on the ICT sector by the Guangdong Science and Technology Bureau (GDSTB) in 2004, whose policy recommendations were adopted in later plans, found that even though Guangdong’s competitiveness over other provinces was the highest, there was a large technological gap compared to leading countries. Most core technology and key component technology were not indigenous, the chain links domestically were very weak and human capital was lower than in other provinces, suggesting areas to be improved particularly in core chip design.

Third, policy instruments were expanded. There is more attention to cluster promotion, strengthening intellectual property protection, improving human capital and implementing a standards strategy to raise quality. More attention has also been paid to diversify the financial channels available to enterprises, including the promotion of venture capital. Guangdong was among the first regions to set up government-owned venture capital funds to take equity stakes in start-ups or in specific projects of established enterprises. For example, the GDEIC, the government agency largely responsible for the ICT industry, invested 1.25 billion RMB in high-tech screen production projects during the 12th FYP (GDEIC, 2014a; 2014b).

The target of these measures are nominally all firms in the province, although in practice it might be easier for domestic firms or JVs to obtain access to funds (Interview with business consultant in Guangzhou). The very successful champions of the previous era now depend on attention from the central government to consolidate their domestic position and grow abroad (see for example Harwit, 2007), but the provincial and local government continue to target local firms with in niche technologies with good potential with a variety of grants, awards and promotional activities.

During this phase Guangdong, like other parts of China, has also let wages rise dramatically over the past few years (Graph 3), with wages far outpacing value added and output per worker growth. This has led to some low-end operations moving inland, where they can also take advantage of new tax incentives or to cheaper Southeast Asian locations. The province has been pushing instead for the adoption of automation and robotics as a way of cutting labor costs (Electronics News, 2015; Balinski, 2015).

Graph 3: Growth in Output, Value and Wages per Worker, 1996 = 100



Source: Author's own elaborations on data from the Guangdong Statistical Yearbook (GBS, Various Years) and the Guangdong Statistical Yearbook of Industry (GBS, Various Years)

During the third phase, following the phasing out of fiscal incentives for foreign investors as part of the WTO agreement, investment incentives have become increasingly difficult to obtain. Incentives are now given either on a regional basis (for example for investment in inland areas) or for certain industries such as the high-tech. These measures aimed *inter alia* to reduce the ability of local governments to compete with each other on the basis of tax incentives, although these are still given on a case-by-case basis (Interview with Foshan Investment Promotion Agency, 2015). As a result, margins have decreased significantly for assembly operations, whether they are SMEs (see for example The Chinese Manufacturers' Association of Hong Kong, 2013), or large EMS firms (Flextronics, 2013). The government would wish this to be counterbalanced by a wave of more high-tech investments, but the evidence is still mixed; some foreign investors are still hesitant to move sensitive activities, owing to a lack of protection of intellectual property (The American Chamber of Commerce in South China, 2014) but projects continue to be established¹¹.

Concluding Discussion

The logic of governed international production systems poses a significant problem for contemporary industrial policy. Developing country producers cannot rely on lower factor prices, as these have become available to everyone through offshoring and subcontracting and they face steep competition in climbing up the technological ladder. Industrial policy remains relevant even

¹¹For example, LG is establishing a \$4 billion plant in Guangzhou for 8th generation LCD screens in a Joint Venture with Guangzhou Development District and Skyworth (Lee and Luk, 2010)

in this context, but measures need to be polished and adapted to specific circumstances facing the industrial sector at hand.

The electronics sector in Guangdong shows that industrial policy is possible in different configurations. In the sector's beginning, not much was planned and the emphasis of the state was on infrastructure and attracting investment in general. Guangdong's proximity to Hong Kong made it a natural heir to the electronics industry developed in the island state. If the story ended here, it would not be much different from policy in other Southeast Asian destinations where the state was active only in the sense of making infrastructure and labour available for foreign firms to exploit. However, the government at all levels, with lines of support between the different them blurring at times, has tried to develop a domestic industry that is not just an assembler or component maker for GVCs, but one that can also reach lead firm status with powerful brands.

One should not overstate this success. The province is still weak technologically, especially in the semiconductor industry, and low-level operations abound. Besides some top firms, Guangdong enterprises still miss out on the more value-added functions such as design and branding, which is done overwhelmingly by clients in more developed regions.

What the Guangdong story emphasizes is that caution is needed when exploring industrial policy in this post-WTO paradigm. More empirical evidence is needed on the kind of policies pursued and their relative success in order to understand in depth the implications, both in terms of attracting foreign capital and connecting to firms in GVCs and in terms of developing the capabilities of domestic suppliers to advance.

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