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PLUGGING INTO THE GLOBAL DIGITAL ECONOMY:

OPPORTUNITIES AND CHALLENGES FOR CANADA

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Creating Digital Opportunity is a national research partnership funded by the Social Sciences and Humanities Research Council and based at the Innovation Policy Lab in the Munk School of Global Affairs. The mission of the project is to identify strengths in current and emerging digital sectors, by examining the place of Canadian corporations, products and services in the global economy. The project is also investigating the extent to which digital technologies are being adopted and diffused across a wide range of other sectors—from advanced manufacturing to natural resources and business services – which are crucial for the future competitiveness of the Canadian economy. The project addresses the question whether we are taking full advantage of the opportunities on offer.

The Innovation Policy Lab (IPL) at the Munk School of Global Affairs is committed to applying novel methods and disciplines to the study and teaching of innovation and its impact on economic opportunity and society. The IPL focuses on core questions in a number of areas including innovation and growth, innovation and inequality, globalization and innovation, social innovation, new technologies and their impact on society, innovation in traditional industries, and arts and innovation. Since our aim is also to effect change, we pay particular attention to the role of public policy in nurturing innovation, while at the same time enhancing its positive impacts on society and limiting its negative consequences.

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SUMMARY

Canada enjoys a tremendous opportunity to grow its digital economy both at home and globally. Domestic upgrading and global integration, to be sure, are two sides of the same coin. Growth and development in firms' productive capacity and upstream R&D in the digital economy in Canada should create opportunities for Canadian firms and organizations to "plug into" the global scale. For many firms, this is happening already.

According to the CanAsia database – developed at the Munk School of Global Affairs and Public Policy – 81 Canadian digital companies operate in at least three continents. "Digital" firms include software companies, digital content creators, hardware firms, and IoT service-based companies. Of the 81 Canadian global firms, four of them (5%) have operations on five continents; meanwhile, forty of the firms (49%) operate in four continents. The majority of Canadian digital firms with global operations, 48 of them or almost 60%, are small and medium sized enterprises (SMEs). Of them, 20 Canadian global digital SMEs operate in at least four continents.

Opportunities

Though Canada is not yet a global digital technology giant, there are many opportunities for innovative and entrepreneurial Canadian firms to plug into the global digital economy.

1. Asian firms, dominant in hardware manufacturing, are searching for global partners and suppliers. Canada's brand and expertise in software design are able to compete in such market niches.

2. Canadian digital sector firms are largely SMEs. The increasingly modularized and fragmented global (production and innovation) networks presents many entry points for Canadian firms to plug in.

3. Owing to the innovation imperative and the need for Asian firms to upgrade, governments in the region (and around the world) are creating policies to invite more global collaboration, investment and trade with international firms.

Challenges

Despite opportunities for Canadian global firms to create digital opportunities, several challenges continue to mitigate success in the sector.

1. Despite policy rhetoric and business efforts to open up production and innovation networks in the digital sector, governments and firms – especially dominant incumbent firms – constrain entry into supply, production and innovation networks. Systems integrators (Japan), protectionist policies (China) and tightly integrated supply chains (Korea) make it difficult for Canadian tech firms to displace existing networked firms.

2. Given national constraints, Canadian firms must displace rather than replace incumbent firms in existing supply or value chains. This means that the prospects of plugging in are less likely based on price competition alone. Canadian digital firms need to be (radically) innovative in order to add value and displace incumbents.

3. Canadian firms must localize their products and services to meet the demands (and tastes) of varied international markets.

4. Canadian digital firms lack the scale and patience to penetrate international markets. Making it in Asian markets requires time for the development of trust, familiarity and local customization.

Policy Implications

Ultimately, Canadian firms will need to adapt to global markets if Canada is to realize its potential digital opportunities. However, government policies at all three levels – municipal, provincial and federal – can facilitate and accelerate Canada's digital aspirations.

1. The government must support Canada's innovation capacity. It is difficult for Canadian firms to displace incumbents in existing production and innovation networks on price alone. Rather innovative products and services are likely the most effective way for Canadian firms to plug into the global digital economy. As we see in other successful digital economies, the government must make radical innovation a policy priority, perhaps by resourcing a dedicated autonomous agency for innovation.

2. The Canadian government's foreign trade offices (i.e. trade commissioners) located in global markets should play an even more proactive role in not only "introducing" Canadian firms to global partners and providing important market intelligence but also actively and strategically facilitating entry into otherwise restrictive supply chain, production and innovation networks.

3. Government policies need to not only acknowledge and identify the myriad flows of people, ideas and experiences among global partners, most of which are informal in nature, but also facilitate and support these flows through investment.

OPPORTUNITIES

CANADIAN DIGITAL FIRMS have emerged during a period when the global digital economy, in many respects, has become more open with more opportunities for new firm entry. The structure of the global economy is fragmenting, thus creating opportunities for innovative Canadian firms to plug in. In some sectors, once vertically organized networks are becoming more horizontal. Globally, production and innovation networks are increasingly modularized. Rarely does one firm capture the entire value chain in the digital sector; rather, innovations in production and sales are becoming more and more spread out geographically, connecting globalized firms. Global digital SMEs compete in niche markets, selling products and services directly to consumers, or more often, plugging into global production and innovation networks, selling to other businesses. That so many of Canada's global digital firms are SMEs is not a surprise given the structure of the global digital economy.

Geographically speaking, the East Asia region presents tantalizing opportunities for Canadian ICT and digital firms to globalize their brand, operations and customers as well as gain a foothold in the growing Asian market. In this regard, the Asia region is not only a priority for Canadian digital firms but reflective of the myriad opportunities globally.

In addition to China – a giant but still relative newcomer to the global ICT sector – places such as Japan, South Korea, Hong Kong and Taiwan are home to a mix of agile digital SMEs and technology giants and globally dominant firms. Digital content industries are already well-established in places like Japan, but are only emerging in Southeast Asian economies such as Malaysia. Canada's digital technology firms should have opportunities to plug into innovation and production networks in the Asia region.

Moreover, governments in East Asia are looking to spark a new wave of innovative products and services in their ICT sectors through domestic competition. Specifically, governments there are keen to transform and evolve existing firms and create new ones in the software sector. This imperative is especially pressing as leading hardware manufacturers in the ICT sector have started to lose their competitive edge to latecomers and challengers from China. This is of particular concern for Japanese and Korean ICT hardware manufacturers. Finally, East Asian governments look to grow their domestic SME and start-up sectors and encourage new tech firms to engage global markets and partnerships. They also aim to foster more inward FDI. The Japanese government, for instance, aims to double the amount of inbound FDI by 2020. These economies are open for business.

In terms of the digital sector, Canada enjoys a great opportunity, specifically in software development. East Asian policymakers and entrepreneurs stress that Canadian technology firms are creative and have extraordinary R&D capacity. The Canadian brand is strong. While Asian companies have done very well in hardware manufacturing in the digital sector, Asian firms are lagging far behind with respect to software. As such, many Canadian firms operating in the Asia region are creating, localizing, implementing and selling software, either directly to consumers, but often working with East Asian hardware manufacturers. Canada appears to have a significant presence in software applications for business process improvements, servicing the IoT, and for graphics and gaming. Though large Canadian manufacturing or hardware companies have longstanding operations in the Asia region – firms, for example, like Celestica and Sierra Wireless – much of their business is driven, by after-sales servicing and increasingly software improvements.

Canadian firms seem to follow one another in the information and communications technologies (ICT) sector. Pairs of firms, and sometimes larger groups of Canadian companies, will operate in places together around the world. This is consistent with Dan Breznitz's finding that FDI does not flow seamlessly to where market opportunities and potential spillovers lay but rather follow an enclave pattern. Interestingly, this followership pattern is not as evident in other industrial sectors such as advanced manufacturing or energy, but rather, is especially pronounced in the globalized digital economy. For example, Canadian business software companies Mitel and OpenText not only operate in the same countries – they are co-located in 25 countries – but are located in close proximity to one another, often in the same cluster or neighborhood. Smaller firms will follow larger established firms, such as Guidance Software, which initially followed and was then acquired by OpenText. One consequence of the "followership" model, is that firms share talent, facilitating talent circulation especially at the leadership level. Geographically clustered Canadian firms also share supply chains and customers, and collectively mitigate risk. Canadian trade commissioners will often open the door for one Canadian firm and then invite others into the local market.

NATIONAL NETWORKS

THE GLOBAL PRODUCTION AND INNOVATION "network" is an appealing metaphor and framework for understanding how innovative firms can effectively plug into the global digital economy. The modularization of R&D and production offers opportunities for new and late entrants into the sector. The shift in the global center of gravity towards Asia in the digital economy has formed new networks. Large firms increasingly become less anchored in co-national networks, becoming more embedded in international ones. The expected efficiencies that come with such global networks suggest that they are – or should increasingly be – seamless and transaction cost-free.

The reality, however, is different. Nations matter and political economies remain political. Companies remain tightly integrated. Enduring patterns of industrial organization within countries differ from country to country, and they are consequential. Plugging into different global economies is not without friction. Government policies can both facilitate and frustrate entry into so-called global production and innovation networks. Restrictive local practices and norms make it difficult for Canadian firms to plug into global networks. What is more, national policies and practices vary among countries. Canadian firms thus require country-specific strategies to plug into the region.

South Korea

Family-affiliated conglomerate firms called chaebols dominate Korea's industrial economy. The chaebol firms, such as Samsung, LG and Hyundai, are massive organizations, internally diversified spanning different sectors, and in control of their own capital financing. The dominant chaebols also maintain very tight vertically organized supplier networks, making it difficult for entrants (generally SMEs) to penetrate supply and innovation chains. As large diversified firms, the chaebol also look to absorb key links in the value chain within the firm. When the leading ICT chaebols engage with innovative technology SMEs, their strategy is to acquire the firms or technology. Samsung and LG, for example, have set-up R&D centers around the world with the explicit aim of "scouting" new technologies and where possible, acquiring promising technology firms.

Not only are the chaebol large and dominant in the ICT industry landscape in Korea, they are also predatory. Given their size, the chaebols are able to leverage their monopsonistic purchasing power to keep entrant firms out of existing supply networks and to ensure they are forced to intensively compete on price. As one chaebol executive explained, the firm maintains 2 to 3 supplier firms for each component to competitively lower their prices. To the extent that foreign firms (notably large software firms such as CISCO and IBM office solutions) have penetrated Korean markets at all, they have tended to be global giants. Canadian firms typically have a difficult time breaking into these supplier networks.

Despite a policy commitment in Korea to strengthen, develop and ultimately globalize the domestic SME and start-up sectors, the fact is that smaller tech firms – both Korean and foreign ones – have a difficult time in Korea. As pointed out above, price determines firms' entry point into the chaebol-dominated supplier networks. Once in, SME firms are unable to be innovative, as margins that could be invested into R&D are eaten up by lower price margins. In other words, to survive in the ultra-competitive, chaebol-dominated economy, smaller technology firms generally give up innovative commercialization. This also makes it difficult for Korean SMEs to globalize, limiting partnership opportunities for Canadian firms.

Japan

Despite Japan's earlier dominance in the global ICT sector, the fact is that the Japanese market is not well positioned to be a gateway to the Asia region. Canadian (or foreign) firms looking to base their operations in Japan need to be producing for or servicing Japanese customers, a large consumer market. As one observer put it, it is not sufficient for a Canadian firm to be "market-ready"; rather, it is imperative the firm be "Japanese market-ready."

Like in Korea, a small group of very large firms dominate the Japanese digital and ICT industry landscape. Though the supplier chains are less tightly integrated than in the Korean sector, Japanese suppliers are nonetheless vertically organized into networks around large customers. Localized supplier networks are difficult for new firms to penetrate. Large Japanese firms, like the Korean chaebols, enjoy monopsonistic power to both keep supplier prices low and maintain supplier network loyalty. Would-be entrants need to not only compete on price, but they also need to provide enough new value to the top firm in order to make it worthwhile to displace existing suppliers and to disrupt the network (and the associated transaction costs of such change). Displacement is not the same as replacement, whereby the barriers for the former are much higher. Supplier networks are rigid, as Japanese managers and executives are conservative. We are told that foreign firms will often take more than a decade of consistent effort before penetrating local Japanese markets.

However, network rigidity is not just a function of price, especially for foreign companies. International (i.e. Canadian) firms require "local partners" to plug into the Japanese market. Local firms and customers are hesitant to work with outside firms. Trust needs to be developed over time. The local partner can come in a variety of forms. One Canadian software company we interviewed stressed the pivotal role played by a local Japanese individual – a veteran of the sector – who was instrumental in introducing the software firm to potential customers. Local partnerships can also entail a distributor relationship (i.e. a "box mover"). Foreign firms may also choose to create a local branch that operates under the foreign brand, but is nearly entirely run locally by Japanese senior staff and management. IBM Japan, for example, is headed-up by Japanese leadership and operates separately from HQ. Japanese industry observers stress that IBM Japan adheres to a very different corporate culture than its parent company.

The central role played by "systems integrators" (SIs) represents a specific kind of partnership, but one that is very prevalent in Japan. SIs operate essentially as value chain integrators. However, by playing that role they also function as the main gatekeeper, essentially determining whether a foreign firm is able to gain entry into a local supply and innovation network. For instance, as one senior leader in a Canadian-based software company explained, firms that look to service Japan's huge internet service providers (ISPs) must work with a local system integrator; without an SI entry into the market is impossible. In the telecom space, Docomo, Softbank and KDDI are Japan's three ISPs. They are dominant firms, with de facto monopolistic power in the sector. In order to service any of those three firms, foreign companies have to work with one of a handful of system integrators, and often at a significant cost. The Canadian software entrepreneur told us the cost to the firm could be as high as 35-50% of its margins, essentially a pay-off to the local Japanese SI. It is virtually impossible for a Canadian company to sell services directly to the Japanese customer.

Taiwan

Taiwan's industrial economy and the ICT sector specifically, unlike in South Kore and Japan, is organized around agile small and medium-sized enterprises (SMEs). In the absence of large-scale firms and given the relatively small size of its domestic market, Taiwan's ICT manufacturing companies have had to integrate into global production and innovation networks. Taiwan's most successful ICT firms are hardware OEMs and ODMs. Globally branded companies from Taiwan are rare; for the most part, Taiwanese SMEs manufacture high quality components for brand-name assemblers. Taiwan Semiconductor Manufacturing Corporation (TSMC) and Foxconn, for example, are essential manufacturers and suppliers of electronics hardware for major ICT products. As the government there concedes, Taiwan's success in hardware manufacturing beginning in the 1980s, and hence the industry's focus on hardware, has meant innovative firms and R&D organizations in Taiwan have missed the software side of the digital economy.

In many respects, Taiwan's ICT industry presents many opportunities for Canadian firms. Canada's existing strengths in software and emerging leadership in artificial intelligence (AI), for instance, are areas that Taiwan looks to grow and develop domestically through global partnerships and collaboration. Taiwanese hardware manufacturing firms are used to working with foreign companies in globalized supply chains and production networks. Many of the constraints in Korea and Japan are not an issue in Taiwan. The ICT landscape, dominated by SMEs, is considerably more decentralized in Taiwan.

The fact is, however, that Canadian ICT and digital firms do not have a significant presence in Taiwan. This is potentially set to change. The Canadian government recently announced plans to locate its first Asia-based Canadian Technology Accelerator (CTA) in Taipei. Building on the success of the CTA model in the US and with a significant injection of public funds, the Taiwan-based CTA looks to attract promising Canadian technology start-ups to Taipei. The strategy is to focus on already mature start-up technology firms and to help them scale-up and develop partnerships and customer networks in the region. Unlike in Korea and Japan where Canadian digital firms have to penetrate relatively closed production networks and vertically organized supply chains, Taiwan's SME landscape presents more opportunities for horizontal collaboration and sales and servicing within supply chains.

Entry into the Taiwan-based CTA will be selective and intentional. The Canadian government's strategy is to "piggy back" Canadian firms with local Taiwanese ones to grow their markets in Taiwan, China and beyond. "Picking" potential winners requires complementarity between Canadian and Taiwanese firms.

China and Hong Kong

The Hong Kong – Shenzhen border region in southern China is the heart of China's digital manufacturing sector. The HK-Shenzhen region is effectively a borderless ecosystem in which a tight network of firms and individuals brings together investors and suppliers. Hong Kong, given its expertise in financial services is a source of tremendous investment capital. Shenzhen, meanwhile, has emerged in the past three decades as a manufacturing base for both local and foreign firms. According to the CanAsia database, the number of Canadian firms (digital sector and non-digital) in the HK-Shenzhen region is nearly twice the firms in Tokyo and four times the number of Canadian companies with operations in Seoul.

The HK-Shenzen region is marketed as a "global business accelerator" and not a gateway into the Chinese market. In a small survey of Canadian firms based in the region, not a single firm indicated access to the Chinese market as a motivation for locating in Shenzhen. Concerns about intellectual property protection and local corruption are significant. The risks that come with collaborating with Chinese firms are high. Competition with local firms is fierce. The fact is the Chinese market is difficult for foreign firms to plug into, especially with the technonationalist "Made in China 2025" policy implemented by the Chinese government.

Take, for example, the battery sector. With support from the Chinese government, Chinese firms are solidifying their positon up and down the value chain, from access to essential minerals to innovations in materials and energy storage systems. What is more, owing to local content restrictions, the potentially huge and lucrative market for Chinese alternative energy (i.e. electric vehicles, or EVs) vehicles market favors Chinese battery makers.

Access to the Chinese market is not the motivation for Canadian firms to locate in the HK-Shenzhen region. Rather, firms indicate the principal reasons for being in Hong Kong and Shenzhen are access to local suppliers and capital, as well as to cutting-edge manufacturing knowledge. Most of the Canadian firms operating in the region are SMEs and even micro-scale start-ups. They do not have an interest in a long-term presence in Shenzhen, but rather a short-term operation to learn about manufacturing processes, new materials and to prototype their products. Shenzhen-based factories are high quality and also cheaper and faster than in other markets. We find that in Shenzhen specifically, Canadian start-ups and SMEs rapidly prototype their product ideas, plug into densely connected supplier networks, learn innovative manufacturing methods and technologies, and springboard into global, not Chinese, markets.

For example, Pinpress is a Canadian hardware manufacturing start-up firm, originally spun-out of the University of Waterloo. From Waterloo, Pinpress located in the HAX incubator in Shenzhen. From there, HAX supported Pinpress in various trade shows from the US' Bay Area to Shanghai. With exposure to potential global clients, manufacturing know-how, and Shenzhen-based suppliers, Pinpress eventually formed a collaborative partnership with Johnson & Johnson and moved its operations to J-Labs in MaRS, in Toronto. The firm also pivoted to biotechnology applications for its hardware. According to Pinpress founders, the firm's global tour, which has seen the firm end up back in Canada via China and the US, would not have been possible without the HAX accelerator in China.

CHALLENGES

TO BE SURE, THE ASIAN ECONOMIES – and the global economy more generally – present many opportunities for Canadian firms to participate in the global digital economy. The globalized and networked economy, in production and innovation-driven collaborations, should open up many entry points for Canadian firms with global ambitions. Yet, global production and innovative networks are not completely open nor are they friction-free. And they also vary from country to country.

A significant challenge for Canadian digital firms is plugging into constrained or even closed networks. Entering firms must, for instance, **displace** incumbent firms in existing supply chain networks. Canadian firms need to demonstrate competitive advantages in price or productivity to displace incumbent firms. They need to be innovative. In already crowded supply networks, this not easy to do. In some cases, such as Japan and Korea, large firms which dominate local supply chains actively frustrate the entry of new firms. In others, such as in China, government policies restrict entry into its domestic market by raising barriers to entry. Either through company or government behavior and strategies, the effect is to make it difficult for foreign entrants in global digital networks.

Constrained or restricted networks are not the only obstacle or challenge in the way of Canadian firms realizing emergent global digital opportunities. Firms themselves are often to blame. As expected, foreign producers and innovators must **"localize"** their products and services to fit foreign markets. This is most obvious in Japan, but language barriers in other parts of the region reflect the challenges to localize, for local consumers as well as business-to-business supply chain customers. The localization and customization processes take time, and Canadian firms, we are told, lack the patience to "stick it out" in Asian markets. A common observation among Canadian entrepreneurs and government trade officials is that Canadian firms shutter their operations too soon after locating in Asia.

Related to the lack of patience, most Canadian digital firms that look to base part of their operations in Asia **lack the scale** to mitigate the high risks of entry into that market. The majority of Canada's globally facing digital firms are SMEs. They are agile and fast, and aim to move ahead on the innovation curve in order to generate value for customers and network partners. But they are small, and scale constraints not only limit their ability to "stick it out" in Asia, but also their margins and thus their ability to absorb risk or generate the economies of scale required to out-compete lower priced, high quality competitors in the region. Several trade commissioners explain that it is not unusual for Canadian firms to quickly realize their scale and capacity limitations in meeting local buyer demands.

FLOWS

The interactions between Canadian firms and international ones are often measured in terms of trade and investment. We generally assess how Canadian digital firms are doing in global markets by looking at their investments into foreign markets, the amount of R&D collaboration (again generally assessed in terms of research dollars) they are engaged in, and the extent to which they sell products and services to international customers. We generally look at "where" firms are operating, thus treating location as the key indicator of "plugging in." Understandably, government policies have tended to promote Canada's global digital opportunity by focusing on these location-specific dimensions.

These are important – critical – factors in realizing Canada's global digital opportunities; but they are not the only ones. Firms interact with global partners and markets in other ways. We call these "flows," and because they tend to be overlooked when it comes to assessing Canadian firms and related policies to promote them in the digital sector, it is more accurate to refer to these as "invisible flows." Here the interest is in interaction between countries' firms and organizations rather than exclusively on their (co-) location.

An important insight generated by our research is that firms – and the people and ideas within them – flow back and forth and throughout global production and innovation networks in ways that may not be captured in (measurable) trade and investment. For instance, virtual networks are forged all the time through virtual person-to-person meetings. Meetings through internet-supported communications technologies (such as Skype and Zoom) enable researchers and business decision-makers within firms to connect globally without setting up a physical office or lab overseas. Quick fly-ins similarly facilitate the flow of people and ideas without a long-term investment. We are told that such flows are critical for scouting new business opportunities.

As the Pinpress example illustrates, innovative firms are not necessarily anchored in one geography or market, but rather talent and ideas rapidly circulate through global networks. Over a very short period of time, the Pinpress start-up went from Waterloo to Shenzen, China, then to the US and Shanghai, and then back to Toronto with investments from a US-based medical technology giant. Another Montreal-based firm recounted how several trips to Shenzhen and working with local manufacturers allowed it to explore options not available in North America. These circuitous, informal routes are not uncommon, and demonstrates critical flows of capital, ideas and talent that might not be captured by conventional trade and investment measures.

And last, firms are continually learning through global networks, not through formal collaborative partnerships but rather informal networks and interactions. The basis of these relationships are not necessarily formal long-term technology sharing or licensing and investment agreements. Instead, as we have learned, entrepreneurial tech firms engage in short-term relationships in which producers rapidly prototype their products, learn new manufacturing processes, share ideas, or are informally introduced to others in the supply chain network. These kinds of informal interactions and flows of talent, ideas, experiences, and know-how are important to Canada's global digital firms, though often missed and underappreciated.

MERGERS AND ACQUISITIONS – THE CASE OF CONSTELLATION SOFTWARE

CONSTELLATION SOFTWARE (CS) is perhaps one of the best cases to demonstrate the potential impact of mergers and acquisitions (M&A), especially of smaller firms. Founded in 1995 in Toronto, CS has slowly and relatively quietly managed to acquire more than 400 companies in over 40 verticals worldwide and reach a valuation of C$15B. Its stock rose from C$37 in 2010 to C$1,095 in 2018. This case demonstrates a strategy that is often overlooked – the power and effectiveness of a coordinated group of small companies.

CS's clients are typically small to medium firms but are the leader in a niche market. Vertical software markets are usually very fragmented and with small competitors as the required software is highly specialized, requires significant investments to develop, while has limited applications in other verticals. Larger software companies typically do not bother to develop solutions for vertical markets because of the relatively low return on investment and limited applicability in other markets. Clients also tend to stick to the firms they use because of the high switching costs. Therefore, both clients and firms in each vertical have limited options, creating a favorable situation for acquirers like CS.

An important difference of CS is its decentralized approach: first, it is not CS that makes the acquisitions but its subsidiaries. Each of the six subsidiaries is more focused in a particular set of sectors or geography. Second, the management of each subsidiary is decentralized as well. Operating managers of acquired companies often remain in their positions after the acquisition and operate their business. The difference compared to operating alone is that coordination by CS can help them dominate their verticals more easily.

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