THE CHANGING LANDSCAPE OF SUPPLY CHAINS AND IMPLICATIONS FOR ANTITRUST

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Supply chains form the backbone of value creation and are crucial for economic prosperity. Over the years, supply chains have become increasingly long, intricate, complex, global, intertwined and less transparent. As, in a supply chain context, antitrust primarily implies restricting competitors' access to supply (or inputs) at higher tiers or limiting access to markets at lower tiers of the chain, longer and more opaque chains may make enforcement more challenging. In this article, I provide a highly abbreviated review of the history of supply chains to shed light on how they are evolving over time to subsequently touch on more recent considerations that bear implications for antitrust rules.

Supply chains form the backbone of economic prosperity. Over the years, supply chains have become longer, more intricate, complex, global, intertwined and less transparent. In a supply chain context, antitrust primarily implies restricting competitors' access to supply (or inputs) at higher tiers or limiting access to markets at lower tiers of the chain. Hence, longer and more opaque chains may make the enforcement of relevant laws more challenging. In this article, I provide a brief review of the history of supply chains to illustrate how they are evolving over time to subsequently touch on more recent considerations that bear implications for antitrust rules.

I. A BRIEF HISTORICAL OVERVIEW

Supply chains, broadly defined as complex networks of activities and logistical processes that transform raw materials to goods and services ultimately delivered to end consumers, date back to the trade routes of ancient times. Humans have developed routes, such as the Silk Road — effectively a network of routes — connecting Europe to East Asia through Central Asia and over the Indian Ocean facilitating movements of luxury goods, primarily durables, such as silk, tea, spices and ivory from the east to the west, as well as animals, textiles, and fruit from the west to the east. Transportation of other goods, such as food, was primarily to support military activities. Throughout history until fairly recently, trade was limited, and it was slow: it was restricted to the speed of pulling animals, so the distance goods covered in a day was a mere 20-25km.

During the 20th century, however, supply chains evolved phenomenally in terms of speed, length, and complexity. The next paragraphs elaborate on the drivers behind these trends.

A. Transportation: Standardization, Economies of Scale, and Hub-and-Spoke

Advances in shipping technology during the industrial revolution enabled transport on larger scales. However, it was not until Malcolm McLean — with the highly destined and befitting name — who invented the shipping container that the transportation process of goods became standardized and hence more efficient. Until that point, trade suffered from frictional costs — theft, damage, shrinkage, inaccuracies — coupled with long processes (packing, hauling, piling, sorting, counting and so on) that kept trade prohibitively expensive. **Standardization** eliminated many of these hurdles and allowed new players to enter. The iconic container implied a common unit of transportation that simplified the flow of goods around the globe, in a secure fashion, mostly free of interferences along the way.

With containers being the common coin, seagoing vessels started specializing in moving containers and an arms race for maximizing **economies of scale** had begun. If the largest vessel from the 1960s showed off a capacity of 1500 TEUs,[2] more recent vessels such as the MSC Irina (and her 5 siblings) showcase a jaw-dropping capacity of 24,300 TEUs. While these enormous vessels make shipping goods around the globe incredibly cheap, economies of scale are also challenging for competition as they introduce entry barriers for small players. It comes as no surprise that the three largest shipping alliances command a market share of 80 percent of the global container market.[3]

The ever-growing size of container vessels initiated a change in shipping networks which shifted from point-to-point to **hub-and-spoke**.[4] In the new setup, the larger vessels only travel between key major ports (termed the middle mile) where transshipment takes place, and the smaller vessels further distribute the goods (termed first and last mile). Hub-and-spoke complicates analysis of antitrust cases as markets get mixed up — see e.g. aviation cases involving alliances across the Atlantic involving two hub-and-spoke carriers.[5]

B. Trade Agreements

New wind is blown in the sails of the trading vessels by governments around the globe that engage in **trade agreements**. The EU's internal market and its European Economic Area ("EEA") extension, NAFTA (now replaced by USMCA), and ASEAN, are just three examples of trade agreements that aim to remove barriers to trade, simplify processes, and ease the movement of goods. Despite growing global tensions and the ongoing realignment of supply chains (e.g. the China Plus One business strategy, which aimed at diversifying investment), global trade is reaching new heights. Indeed, according to the DHL Global Connectedness Index, which measures international trade relative to domestic activity, global

2 TEU is the standard unit of container capacity referring to Twenty-foot Equivalent Unit, about 6.1m.

3 https://www.container-xchange.com/blog/shipping-alliances/; accessed 17 December 2024.

4 This echoes the hub-and-spoke concept from the airline setting, an innovation attributed to Fred Smith who founded Federal Express with the first hub in Memphis, Tennessee, 1973.

5 For example, see the antitrust procedure of CASE AT.39964 – *Air France/KLM/Alitalia/Delta* from 12.05.2015 to lesser degree the merger procedure of Case M.8964 - *Delta/Air France-KLM/Virgin Group/Virgin Atlantic*.

trade reached a record level of 25 percent in 2022 and is likely to remain at that level (based on currently available data).[6]

There is some general agreement that trade liberalization and antitrust regulation are complementary tools in the facilitation of competitive markets; however, the relationship between trade policy and antitrust law remains a topic of debate. Bradford and Chilton (2021) reviewed the ways in which antitrust laws are addressed in trade agreements. They explain the diffusion of European style antitrust laws around the world with the European Union's use of Preferential Trade Agreements ("PTAs") to induce its trading partners to embrace similar/compatible antitrust laws.[7]

C. Transparency

Some of the resources ultimately used in modern supply chains come from places stained with human rights violations. Consider the case of Cobalt, a raw material this is instrumental for our energy transition. Batteries account for about 50 percent of global demand for Cobalt, and this demand is expected to increase further in the near future. The Democratic Republic of Congo is supplying 70 percent of the global Cobalt supply with about 30 percent of its mining in coming from "artisanal mines" — a euphemistic term to describe high-risk small-scale mining — and the rest from massive mining operations, most of which are Chinese owned. Cobalt found in products purchased in the West, is likely sourced from the Congo under sub-human working conditions, including child labor.[8,9] Instead of tackling such issues within their supply chains, companies may find it easier to **externalize their accountability** by integrating intermediaries into the process or working primarily with such intermediaries rather than approaching firms higher up in the supply chain. By doing so, they shrug away any demands to clean up their supply chain and maintain a fragmented and opaque supply chain, expecting to be relieved from the responsibility of cleaning up the challenges at higher tiers of the chain. Although tackling such issues is likely to lead to higher retail prices, several examples demonstrate that transparent supply chains are attainable. Tony's Chocolonely's Open Chain (Beantracker)[10] is one such example where agents along the supply chain share data to enhance traceability and transparency while incurring higher procurement costs. We will return to transparency later in this article.

D. Highly Specialized Supply Chains

Many of the products we use continue to become more and more sophisticated. **Complexity** of products has increased dramatically over time. For instance, computer chips are now embedded in a wide array of products — toys, appliances, cars, industrial machines, mobile phones — and those chips are complex in their own right. The manufacturing process of chips involves more than 1000 steps. Of these steps, consider, for instance one stage: lithography. The most advanced lithography machines are produced by ASML, with technology that is on the verge of science fiction. Lithography machines rely on a large number of exclusive suppliers who have come to specialize in producing or suppling highly unique components (such as high-grade and high-purity chemicals, optics, valves, pumps, tubes, fittings, and wafer carriers) without which the process cannot be completed. The resulting supply chains have evolved over the years and, in a way, became fortresses that are hard to enter and/or imitate. We will revisit ASML later.

E. Information And IT Innovation

The technological advancement of **information and IT innovation** facilitated a wave of speed and cheap flow of information, which contributed to the further sophistication of supply chains by expanding the scope of suppliers and demand. More specifically, firms now share data to coordinate their moves and flows of goods to an unprecedented degree; they can search and find new suppliers and access new markets to sell their goods; and they collect and harvest data on larger scales to facilitate insights and expedite decision making across all geographical scales almost instantly.

Empowered with (vast amounts of) data, companies can curtail competition. This is in particular true for the prevailing growth of **platforms**. Dual format retailing, whereby a retailer operates as a traditional merchant (i.e. reselling) while offering a platform for third-party sellers (known as agency model), endows them with significant asymmetry so they can discipline the suppliers of the goods they resell.[11] Disciplining

6 Steven A. Altman and Caroline R. Bastian (2024). DHL Global Connectedness Report 2024; available at https://ultraviolet.library.nyu.edu/records/7jt4h-p0738; accessed on 13 December 2024.

7 Chilton, A. & Bradford, A. (2021). Regulating Antitrust through Trade Agreements. *Antitrust Law Journal, 84*(1), 103-125.

8 Kara, S. (2023). *Cobalt red: How the blood of the Congo powers our lives*. St. Martin's Press.

9 Consider the case *International Rights Advocates v. Apple, Microsoft, Dell, Tesla.* In March 2024, the Court of Appeals for the District of Columbia Circuit decided not to hold Apple, Tesla, Google, Microsoft, and Dell accountable for their alleged involvement.

10 https://tonyschocolonely.com/pages/bean-tracker.

11 Mantin, B., Krishnan, H. & Dhar, T. (2014). The strategic role of third- party marketplaces in retailing. *Production and Operations Management, 23*(11), 1937-1949.

can take another form through encroachment whereby an upstream supplier opens a distribution channel that can bypass the buyer to reach next tier buyers (think of a supplier opening an online store for direct sales).[12] Such actions can serve as an indirect threat as, for instance, violations of Resale Price Maintenance can trigger a price cut by the supplier.[13] The original European Commission's Vertical Block Exemption Regulation ("VBER") perceived dual distribution as a relationship where the vertical element predominates the horizontal aspects. In light of these recent changes in distribution, the new VBER and accompanying Vertical Guidelines seek to remedy the situation by imposing limits based on market share assessment. Nevertheless, encroachment theory suggests that an upstream supplier need not sell anything to discipline downstream retailer — it is the upstream supplier's mere presence that can support the intended outcome. It is worth mentioning that India has banned online retailers from selling their goods through vendors in which they hold an equity stake since 2019.

II. CONTEMPORARY SUPPLY CHAINS

A. Supply Chain Resilience

All these gradual shifts — in transportation, growth of trade agreements, complexity, externalization of accountability, evolution of information and IT innovation — have resulted with long, complex and somewhat opaque supply networks, which are often prone to disruptions. Disruptions can lead to more serious problems as companies may not be able to deliver as bound by their contracts or as rapidly changing prices may leave one party at a disadvantage (e.g. clients locked into fixed-price freight contracts signed at COVID rates against the backdrop of falling prices). Recent years have seen a surge in supply chain disruption cases (e.g. *BAE Indus., Inc. v. Agrati-Medina* on force majeure notice, *Isuzu N. Am. Corp. v. Progressive Metal Mfg. Co. and Tufco L.P. v. Reckitt Benckiser (ENA) B.V.* on force majeure labor shortages). This reminds us that in case of disputes, Dispute Resolution Procedures (DRP) need to be "sufficiently clear and certain" in order to be enforceable[14] and that a force majeure clause requires the parties to be engaged in "reasonable endeavors" so as to mitigate or overcome such an event.[15] The latest disruptions, due to e.g.COVID-19, the war in Ukraine, increased occurrence of more severe draughts and floods, have stretched many supply chains beyond their limits and thus sparking a broader interest for **resilience**.

In working towards resilience, companies seek to protect their seven cores: supply, internal operations, communication, transportation, distribution, financial resources, and human resources.[16] Our focus herein is on supply, given its relevance to competition. A traditional method to protect supply is through diversification of the supplier portfolio. This method consists of a spectrum of options ranging from reactive approaches (e.g. seek alternative suppliers once disruption occurs) to proactive ones (e.g, pre-approve alternative suppliers[17] and activation of alternative suppliers in their portfolio of procurement activities[18]). An even more proactive approach is seeking some form of vertical integration with suppliers. ASML, for instance, has purchased a minority share (24.9 percent) of ZEISS subsidiary Carl Zeiss SMT while committing R&D and capex for approximately EUR 760 million.[19] This is an ultimate instrument for business continuity especially given the criticality of the components provided by Zeiss to ASML. In principle, such vertical arrangements are permitted as the primary intention is the development of better-quality goods. However, while not immediately restricting supply to competitors, such arrangements raise questions regarding the limit and competitive

12 Gupta, A., Jayaswal, S. & Mantin, B. (2024). Who Benefits from Supplier Encroachment in the Presence of Manufacturing Cost Learning? *Production and Operations Management*, forthcoming, and references therein.

13 Resale Price Maintenance (RPM): This is a form of agreement that aims to restrict a seller's capacity to determine the selling price. This can assume a variety of forms, but most commonly state a minimum sales price. RPM does not necessarily restrict access to markets, but it may limit competition on prices. (The objective of antitrust is not to ensure low prices as low prices may, in fact, be a liability for a firm through a suspected mechanism of predatory prices.) This subject has been discussed in detailed in an earlier CPI issue (G. T. Gundlach and R. T. Krotz (2022) Insights from Marketing and Supply Chain Management: Implications for Competition Policy and Antitrust Law; CPI Antitrust Chronicle April 2022), though it continues to attract interest, among others due to the growth of online distribution channels and supplier's aspirations to control the price distribution. In a recent case, *Super Bock Bebidas* (C-211/22), the European Court of Justice concluded that a vertical agreement that includes a minimum resale price is a restriction of competition by object can be determined only once it is shown that this agreement entails sufficient harm to competition, implying that such vertical agreements need to be assessed on a case-by-case basis.

14 See *Kajima Construction Europe (UK) Limited v. Children's Ark Partnerships Ltd* [2023] EWCA Civ 292.

15 See *MUR Shipping v. RTI.*

16 Mantin, B. & Pathak, R. S. (2021). Redefining resilience: Integrative review and development of an assessment tool. Available at https://orbilu.uni.lu/bitstream/10993/46576/1/LCL-DP2021-01.

17 Pre-approval of suppliers exhibited weaknesses in recent disruptions as clients have simultaneously approached the same pre-approved supplier, not ending up with the volumes of supply they were looking for.

18 This means the firm start procuring from the alternative supplier on a regular basis, either non-core inputs or core inputs, in which case the firm needs to determine the split between the key and the alternative supplier. Another option is to identify, jointly with the core supplier, solutions in case of shortages.

19 See https://www.asml.com/en/news/press-releases/2016/zeiss-and-asml-strengthen-partnership-for-next-generation-of-euv-lithography.

implications of vertical integration.

B. Restoring Transparency

Securing supply can also be achieved via measures of transparency and by reversing some of the trends described earlier (e.g. by bypassing intermediaries). While traceability is mandated only in certain domains (e.g. healthcare and aviation), the recent trends towards mandating sustainability require insights deeper into the supply chain, both up and downstream in all affected domains.[20] The EU Directive 2024/1760 on corporate sustainability due diligence ("EU CSDDD"), which entered into force on 25 July 2024, aims "to foster sustainable and responsible corporate behavior in companies' operations and across their global value chains." As such, it requires firms to enhance their efforts to gain transparency into their supply chains and it explicitly allows to engage in cooperative actions with third parties (Art. 5(2) CSDDD). This is in line with the general tolerance of exchanges of information related to sustainability, as such exchanges may help companies fulfil their due diligence obligations. As firms may jointly set up databases with information about their suppliers, it is crucial to understand what and how information is shared. Gaining access to information is a sensitive matter as it involves information pooling. At the same time limiting or preventing certain companies from accessing the shared pooled data may create distortions as those excluded companies may suffer from a competitive disadvantage.

C. Information Revisited

Access to information is also linked to two commonly applied mechanisms in retail: Vendor Managed Inventory ("VMI") and category captains. In the former, a supplier (the vendor) and a retailer engage in an agreement to streamline the management of inventory at the retailer. The agreement entails the exchange of information on sales or inventory level of goods to be managed by the vendor who would then replenish them on a regular basis to avoid stock-outs and excessive levels of inventory. By doing so, the supplier gains downstream transparency, which allows better planning and elimination of waste and losses. Among the challenges of VMI are the need for trust as the retailer is required to transmit sensitive data to the vendor and the increased reliance on the vendor. Such contracts are intended to be long term but sometimes, the relationship can break down after a while (see e.g. *Whitesell Corporation v. Electrolux Home Products*). By gaining access to demand information and by managing inventory at multiple locations/retailers, suppliers may ultimately facilitate coordination across stores, potentially violating antitrust laws.

Access to sales and inventory data is further established and managed via the more comprehensive category captain arrangement. This is an arrangement where a retailer appoints one of the suppliers within a product category — usually the largest or the most experienced — to become a category captain. As the category captain, this supplier optimizes decisions relating to the product category, such as assortment, stocking decisions, shelf/space allocation and shelf organization (planograms). The category captain must carry these out in an unbiased manner. However, such arrangements can lead to serious antitrust issues, see, e.g. *Conwood Company v. United States Tobacco Company*, where the latter, through its category captain arrangements, unfairly dominated the smokeless tobacco industry. Two primary concerns in the context of category captain relate to competitive exclusion whereby the category captain will exclude some category rivals, and competitive collusion in the category or across retailers. Other concerns include access to superior information and allocative efficiency (how gained benefits are distributed). Companies have been further working on less restrictive methods which include co-captains, delegations to third parties, and alternatives to specific types of exclusion.[21]

D. Cross-Category Portfolio

Numerous companies have dramatically increased the portfolio of their products and services. For example, Amazon is certainly not only an online book seller anymore, it has now become a behemoth seller engaged in offering a wide selection of products and services, which include but are not limited to platform operations, e-reader devices, web services, grocery deliveries, streaming services, online games, and a virtual assistant (Alexa). Expansion of product range allows companies to command significant bargaining power. Studying cross-category mergers in U.S. retailing, Hendrik Döpper (in his ongoing work) finds that conglomerates spanning multiple product categories, or even sectors, experience significant changes in post-merger sales and that this change in sales is driven by quantity, not price.[22] This suggests that mergers (aimed at expanding their product scope) allow firms to leverage their bargaining power in different ways. In that regard, in June 2024, the European Commission has accused Microsoft of abusive bundling of its Teams and Office products, thereby breaching antitrust rules (and as a remedy, Microsoft offered to unbundle them again). Nevertheless, the issue goes beyond the pricing of the two products, which is part of the antitrust claim, in that Teams' integration with Office provides a competitive advantage, which restricts competitors' capacity to compete.

20 Interestingly, the CSDDD does not define the boundaries of responsibility (that is, how many tiers).

21 Gundlach, G. T., Loff, A. & Krotz, R. T. (2019). Competitive exclusion in category captain arrangements. *Available at SSRN 3374933*.

22 See http://www.doepper.com/.

E. Territorial and Channel Restrictions

Territorial allocation is either horizontal or vertical. The former implies that competing firms implicitly, or explicitly, agree on the division of the market (usually in terms of geography).[23] Such division is, in essence, a violation of antitrust. The latter implies division of geography at different levels of the supply chain (such as allocation of exclusive areas to distributors) — a form of division that is often acceptable. In the EU, territorial restrictions need to be handled with care, as a supplier cannot limit a seller's resale scope or prevent a seller with exclusive distribution right in one member state to respond to request from a client from another state.[24] One domain of challenge is that of parallel imports, also known as gray market goods, which are sold by resellers outside the brand owner's distribution channels.[25]

With the growth of online sales, the geography naturally expands to include territorial restrictions as well, as demonstrated in the *anti-trust procedure Character Merchandise (CASE AT. 40432)*, in which case restrictions imposed by Sanrio prohibited online sales or only allowed in-territory online sales (while limiting the languages licensees could use). Similarly, the Competition and Markets Authority ("CMA") found that *Ping Europe Ltd* violated competition law by banning online sales of its golf clubs,[26] as it implemented a dynamic face-to-face policy so as to engage consumers in in-person advice and customization.[27]

III. CONCLUSIONS

Supply chains are dynamic, and they keep on evolving. In this article, I reviewed some of the major aspects that have been shaping and are reshaping supply chains in recent history. Ultimately, current supply chains continue to grow more global, intertwined, and complex. Information technology has transformed distribution channels, and nowadays online sales of goods entail novel modes of managing vertical and horizontal relationships. Better access to more and more data and the rise of AI may endow certain players with even greater influence over shaping and controlling markets to a degree that will be increasingly difficult to regulate and monitor. Contemporary supply chain research can offer insights into interactions between various supply chain members, some of which were reviewed in this article. This article has shown how important the link between supply chain actions, their impacts on competition and antitrust, which is why it deserves further academic exploration.

23 In Mantin et al. (2024), we show that allocation of territory can apply to airlines' schedules (though it may not qualify as violation of antitrust as airlines may target different types of passengers with different types of products). Mantin, B., Gillen, D., & Delibasi, T. T. (2024). Measuring the impact of scheduling overlap and market structure on prices: Evidence from the airline industry. *Transportation Research Part A: Policy and Practice, 183*, 104044.

24 See for example *GlaxoSmithKline Services Unlimited v. Commission*, where Glaxo prohibited wholesalers from exporting their medicine to other EU member countries.

25 See e.g. *Hyundai Motor America, Inc. et al v. Direct Technologies International, Inc.*

26 *Ping Europe Ltd v. Competition and Markets Authority.* The decision by the competition appeal tribunal (2018) was upheld by the court of appeal (2020).

27 For additional discussion of territorial restriction in the EU, see Ibáñez Colomo, P. (2021). Territorial restrictions in EU competition law: from Consten-Grundig to Ping and Pay-TV. *Vertical Restraints in The Digital Economy: Vertical Block Exemption Regulation Reform and the Future of Distribution (Kluwer 2021).*