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## **SME upgrading in emerging market clusters: The case of Taiwan's bicycle industry**

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# SME upgrading in emerging market clusters: The case of Taiwan's bicycle industry

## Abstract

Existing arguments on the economic upgrading of small and medium-sized enterprises (SMEs) in emerging markets emphasise the role of multinational enterprises (MNEs) from developed markets in providing the necessary new knowledge based on a top-down logic. Adopting the Taiwanese bicycle industry cluster as a case study, we investigate alternative factors influencing the upgrading of SMEs in emerging markets through vertical and horizontal relationships within global value chains and clusters. The findings show that knowledge exchange and collaboration via horizontal, trust-based linkages between SMEs within a cluster and the development of formal and informal institutions by leading local MNEs are crucial for the upgrading of locally clustered SMEs. We provide typologies for vertical and horizontal interfirm linkages and show how the combination of linkages affects the upgrading of these emerging market SMEs. Our typologies can assist practitioners with identifying options for successful upgrading through strategic engagement and development in interfirm relationships.

**Keywords:** Global value chain, Cluster, Upgrading, Bicycle industry, Interfirm relationship, Linkage.

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## Introduction

The United Nations Conference on Trade and Development (UNCTAD) has predicted a substantial restructuring of global value chains (GVCs) in response to changes in global trading patterns over the last decade, with GVCs becoming more regional and less fragmented and having a higher concentration of value added in the same location (Enderwick & Buckley, 2019; Zhan, 2021). Such fundamental changes to global production and trade systems have implications for industrial districts and clusters. The increasing regionalisation of GVCs potentially threatens SME clusters in emerging markets that are highly reliant on global trade, especially in intermediate goods, but the changes may also offer opportunities for firms to upgrade their positions within the restructured value chain.

Changes to GVCs are primarily driven by changes in multinational enterprise (MNE) strategies (Buckley, 2021), while changes to the structures of clusters are driven by local firms, particularly small and medium-sized enterprises (SMEs), which are often the pioneers of cluster development (Guo, 2012) and subsequent drivers of local innovation and entrepreneurship (Aslesen & Harirchi, 2015), especially in emerging economies (Anand et al., 2021). Over several decades, researchers have examined the development of clusters and the way in which knowledge is developed and transferred, thus how clusters (and firms) upgrade. This study emphasises the role of local interfirm cooperation (i.e. horizontal linkages between partially competitive firms within a local district) and institutional structures in developing the knowledge needed for upgrading (Ingstrup & Christensen, 2017). From another perspective, the GVC literature emphasises the governance role of leading foreign MNEs in providing new knowledge to assist upstream suppliers in improving value and quality (i.e. vertical supply chain linkages between suppliers and customers) (Humphrey & Schmitz, 2002).

Therefore, how should existing clusters, and the firms within them, respond to ongoing changes in GVCs? We are particularly interested in SMEs within clusters in emerging economies because the benefits of greater globalisation noted by Zhan (2021) have failed to trickle down

consistently to emerging economies (McDermott & Pietrobelli, 2017). Understanding their place within the structures of GVCs and their access to knowledge may assist emerging market SMEs to better allocate their limited resources for future success. While the upgrading of firms in clusters may be researched at different levels of analysis, including the aggregate level of the overall cluster and the individual firms that comprise the cluster (Molina-Morales et al., 2019), we focus on the firm level and pose the question: *How do emerging market SMEs located in clusters manage to upgrade?* To address this question, we investigate firm relationships both within the GVC and within the cluster. Drawing on studies on economic upgrading in both developed (Ingstrup & Christensen, 2017; Karlsen, 2005) and emerging (Beerepoot, 2008) economies at the GVC (Humphrey & Schmitz, 2002), cluster ((McDermott et al., 2009) and firm (Corredoira & McDermott, 2014) levels, we develop typologies of horizontal and vertical linkages influencing firm upgrades.

In this paper, we empirically explore the influence of various relationships on SME upgrading in the Taiwanese bicycle cluster, the ‘Silicon Valley’ of bicycles. We find that SMEs in this cluster primarily source the knowledge they need to upgrade from other cluster firms. Local MNEs provide leadership to the cluster by initiating institutional structures that allow knowledge to be passed between SME competitors and complementary actors.

We contribute to the theory on SME upgrading by investigating knowledge sources at multiple levels (Humphrey & Schmitz, 2002). While the GVC literature argues that SMEs must learn from foreign MNEs to acquire the necessary competencies to perform a wider range of value-added activities, another strand of cluster theory argues that SMEs learn through mutual collaboration and knowledge sharing. We analyse the vertical and horizontal linkages that influence firm upgrading at the GVC, cluster and firm levels, finding that the most important factor is inter-SME knowledge sharing via collaboration, supported by institutional work from local MNEs. Based on the geographical dispersion of vertical linkages, we propose a typology to make sense of firm relationships in multiple value chains. We also theorise a typology for horizontal linkages based on

whether linked firms are in the same or different industry value chains and locations (local or foreign). The combination of these typologies provides a solid base from which to discuss emerging market firm strategies for upgrading through the purposeful development of interfirm relationships. Managers of emerging market SMEs can apply these typologies when making upgrading decisions; therefore, this research also contributes to practice.

Our paper first examines the literature on the various linkages influencing firm upgrading at the GVC, cluster and firm levels. After presenting our research and analysis methods, we describe the evolution of the bicycle production cluster centred in Taichung, Taiwan. We then analyse the Taiwan bicycle cluster against the linkages identified and conclude with suggestions for future research and potential limitations to our approach.

## Literature review

Upgrading, or “moving to higher value activities, is important for economic development and job creation in the global economy” (Gereffi & Lee, 2016, p. 25). Firm-level upgrading can be categorised into several types. *Process* upgrading involves improving production systems to transform inputs into outputs more efficiently, typically by reorganising or improving technology. *Product* upgrading means developing more sophisticated product lines, typically with a higher value-added component. *Functional* upgrading involves adding new functions to (or deleting existing functions from) the value chain of a focal firm to increase the firm’s overall skill level. *Intersectoral* upgrading involves moving horizontally to apply firm skills in a different, higher value industry sector (Humphrey & Schmitz, 2002). In the following section, we examine the literature on upgrading through vertical and horizontal linkages at the GVC, cluster and firm levels to understand the range of factors enabling the upgrading of SMEs in emerging market.

### *GVC-level linkages for SME upgrading*

GVCs develop as a result of global economic and institutional systems and MNE strategies. This leads to complex global production and distribution systems encompassing numerous (mainly vertical) linkages (Buckley, 2021). MNEs have learned how to coordinate and control (i.e. govern) complex GVCs that integrate a large number of subcontractors and suppliers, who are often from emerging markets.

Governance modes within a GVC provide upgrading opportunities. SMEs within a GVC experience modular, relational or captive governance by the MNE dominating the GVC (Gereffi et al., 2005) and develop vertical relationships with MNEs. Through these relationships, SMEs may access new and specialised knowledge and complementary resources and capabilities from MNEs, enabling them to engage in higher value activities (Lahiri et al., 2022). Modular governance, in which the MNE provides leadership by strictly categorising its product requirements into modular components (Gereffi et al., 2005), provides suppliers with the flexibility to innovate within set parameters and potentially recommends improvements to the specifications only they can fulfil. Relational governance, in which reputation, family and ethnic ties act as social enforcers of lead firm governance (Gereffi et al., 2005), permits complex interactions between members of the GVC and allows an SME to upgrade to a higher value position by leveraging its social ties. In captive or quasi-hierarchical GVCs, firms are mutually reliant on one another because of high switching costs (Gereffi et al., 2005); however, this also encourages upgrading within the GVC because upgrading costs may be lower than switching costs.

Thus, the GVC literature assumes that the lead firm, typically a large foreign MNE, plays a crucial leadership role by determining the specific organisations to be included in the GVC (or excluded as the GVC develops) and shaping the way in which these organisations add value by deliberately passing on critical knowledge (e.g. product specifications, quality standards, technologies and operational routines) to create and improve products (Gereffi & Lee, 2016). This

implies that upgrading is a top-down process based on vertical relationships between sellers and buyers and that emerging market SMEs are willing but somewhat passive recipients of the upgrading knowledge they require.

Emerging market SMEs may face major barriers to accessing knowledge or lack the capabilities or resources to apply the knowledge received from foreign MNEs through GVC structures (McDermott & Pietrobelli, 2017). Institutional support structures such as civic and industry associations, public research institutions and training centres are necessary to help SMEs understand and apply the knowledge sourced from MNEs (Corredoira & McDermott, 2014; McDermott et al., 2009).

#### *Cluster-level linkages for SME upgrading*

Clusters are geographical concentrations of firms and associated institutions in a particular sector, linked by commonalities and complementarities (Porter, 2008). Cluster members simultaneously compete and cooperate, the latter by pooling resources and sharing knowledge across horizontal and vertical relationships. Factors beyond simple market dynamics, including the nature of interorganisational relationships, location-specific factors (LSFs) (Gerke et al., 2015; Karlsen, 2005) and institutional developments such as trust building (Guo, 2012; Oba & Semerciöz, 2005), explain the emergence and evolution of clusters.

LSFs, which are relevant to specific districts or regions, determine whether a cluster forms in the first place and how it could upgrade. *Geoeconomic* LSFs refer to the location, distribution and spatial organisation of economic activities. *Historic* LSFs are significant events, people and activities that influence the development of a location over time. *Political* LSFs refer to local politics, rules, legislation and government support decisions that influence the location's attractiveness. *Socioeconomic* LSFs are the social processes affecting economic activities, and vice versa. More specific factors related to geography and industry may also be relevant (Gerke et al., 2015).



Social processes are central to cluster emergence and development because cluster knowledge is transferred through horizontal and vertical relationships between complementary and competing firms. These cluster relationships are based on verbal agreements rather than contracts (Gerke et al., 2018; Oba & Semerciöz, 2005), meaning that firms must trust each other to obtain valuable information and cannot rely on legal protection. Antecedents of trust include country-level government institutional structures, financial and legal systems, informal institutions such as codes of conduct and norms of business behaviour, and social structures of family, reputation and perceived competence (Oba & Semerciöz, 2005). Organisations also form special institutions to support knowledge flow and provide local governance, particularly for clusters that operate within GVCs (Humphrey & Schmitz, 2002). These include trade and industry associations or standards testing facilities that provide formalised rules and business norms (McDermott & Pietrobelli, 2017) or informal social systems such as reputation, which is based on the ability to exclude organisations that do not comply with accepted norms (Wei et al., 2016).

The emphasis on geographic concentration within the cluster literature often means that the new knowledge required for upgrading is assumed to be “in the air” and that cluster relationships remain static (McDermott & Rocha, 2010). However, because knowledge is co-created by actors in interrelated organisations, purposeful action is necessary for upgrading to occur (McDermott & Rocha, 2010), often requiring social and institutional support structures that allow firms to develop, communicate and apply knowledge.

In emerging markets, which are characterised by institutional voids and sometimes weak social capital, public-private institutions may be necessary catalysts for upgrading (McDermott et al., 2009). These bridging organisations connect cluster firms with, for example, government and university actors that can engage in collective problem-solving and build a sense of mutual support (Corredoira & McDermott, 2014). Many factors influencing the ability of an individual firm to upgrade are endogenous to the firm, as examined in the following section.

### *Firm-level linkages for SME upgrading*

A precondition for the upgrading of SMEs in emerging economies is managerial commitment and investment in equipment and people within the firm (Humphrey & Schmitz, 2002). However, with typically limited resources and constrained access to additional resources, SMEs require more than just strategic intent. SMEs must make use of their greater flexibility compared with that of large firms (Anand et al., 2021) to take advantage of non-financial resources such as network relationships.

McDermott and Corredoira (2010) argue that firms develop different kinds of upgrading capability based on variations in their network resources, with vertical (customer) links, which require regular discussions about product and process improvements, contributing most to a firm's ability to upgrade. This implies that the primary influences on upgrading are the firm's position in the value chain and the quality, rather than the quantity, of its interfirm relationships. Emerging market SMEs with sufficient capital may also acquire developed market firms within the value chain to access new knowledge necessary for upgrading (Hansen et al., 2016; Torres de Oliveira et al., 2020). SMEs within multiple GVCs, particularly those under modular or relational governance, can use the knowledge from one value chain to help them upgrade their position in another, potentially increasing their value over time and across multiple customers.

Horizontal links are network resources that may also provide knowledge and contribute to SME upgrading. Horizontal links are "collaborative relations between firms that are located in the same value chain portion (i.e., task) or industry segment, which are built to access lateral 'intra-task' knowledge competencies (e.g., technology sharing agreements, co-production agreements)" (Turkina & Van Assche, 2018, p. 710). In other words, horizontal relationships with direct or potential competitors or with firms specialising in similar functions in different value chains provide task-oriented knowledge that can support upgrading.

Synthesising the above arguments, we identify three potential explanations for how SMEs upgrade: 1) as somewhat passive recipients of upgrading knowledge from lead MNEs that govern

GVCs; 2) as a purposeful action initiated by firm management to seek the necessary knowledge; or 3) as an adaptive process over time as SMEs apply knowledge gained from various vertical and horizontal relationships across the cluster and potentially multiple value chains.

Combining the GVC, cluster and firm levels explained above, we theorise that multiple factors may influence whether emerging market SMEs in clusters can upgrade their position within a GVC. To investigate this empirically, we examine the economic upgrading of SMEs in the bicycle cluster in Taiwan.

## Method

We conducted an abductive, in-depth case study to understand multiple interdependent factors within a complex structure (Dubois & Gadde, 2002). Learning from context and contextualised sampling, in this case to extend the existing knowledge about the upgrading of SMEs in clusters, is crucial for theory-building research on international phenomena (Poulis et al., 2013). A qualitative study based on semi-structured interviews, observations and secondary data was appropriate to answer our open research question (Eisenhardt & Graebner, 2007).

Taiwan is classified as an emerging economy by financial analysis organisations such as the Financial Times Stock Exchange and the Dow Jones (Batho, 2021; Dow Jones, 2021) but not by the International Monetary Fund (Duttgupta & Pazarbasioglu, 2021). The Taiwanese bicycle cluster is a relevant research context because it has demonstrated upgrading in the face of global competition, and SMEs remain an important element of the industry (Chen et al., 2009; Chu & Li, 1996; Y.-M. Wong, 2005).

### *Data sources*

Our primary data sources were semi-structured interviews with actors in SMEs and related organisations, complemented by field observations (by the lead author) and secondary data. All firms

in the sample apart from three met the definition of SMEs in Europe (i.e. less than 250 employees) (European Commission, 2021), although definitions for Asia vary (Vandenberg et al., 2016).

Firms were selected using a theoretical purposeful sampling strategy (Eisenhardt & Graebner, 2007), which allowed us to couple interviewee sampling and research contextualisation (Poulis et al., 2013). We used the cluster member typology proposed by Gerke et al. (2020) to identify suitable participants, then recruited interviewees with the help of a local industry specialist. Interviewees were senior managers and entrepreneurs with titles such as Owner/Director, Manager, President or Founder. Eighteen of the participating organisations were based in Taichung and Changhua, and five were based in Taipei. We also interviewed a wide range of actors within the cluster. Table 1 provides codes and definitions for these actors.

----- Insert Table 1 about here -----

In total, we interviewed 25 people during an international bicycle industry trade show in Taipei (see Table 2 for a summary of key information about the interviewees). All interviews were conducted by the lead author onsite and in person, either in English or in Chinese using a local interpreter. The large and diverse range of interviewees enabled a holistic understanding of their views in a natural setting. Prior to each interview, the purpose of the study was explained to participants, and ethical consent was obtained. All interviews were audio recorded, then transcribed by a bilingual Chinese native speaker. Transcripts were sent to interviewees for verification and validation. The interview questions are shown in Appendix 1.

----- Insert Table 2 about here -----

The interviews were complemented with secondary data collected from trade show exhibitors about products, company information and industry trends. The main sources of industry information included Taiwan Bicycle Association (TBA) publications, the *Bike Market Update* magazine and the *Taiwan Bicycle Source* guide (see Appendix 2). Observations took place during visits to a cycle race, cycle tourism locations, local bicycle rental outlets, bicycle trade show events and the national sport museum and were documented through photographs and a field trip diary (see Appendix 3). Secondary data completed our knowledge of the research context and the evolution of the local bicycle industry.

### *Data analysis*

We followed the abductive and nonlinear systematic combining analytical approach (Dubois & Gadde, 2002, 2014). First, we imported all transcripts into NVivo 10 software and used ‘nodes’ as containers to structure and code the data (Miles et al., 2014). Initially, we anchored our analysis in a theoretical framework comprising LSFs (Dunning, 1980), interorganisational relationships (Oliver, 1990), networks (Provan et al., 2007) and behaviours (Keast et al., 2007). However, this framework failed to align with the rich case data, particularly in relation to networks and behaviours. We then recoded the data several times as we revised and redirected our theoretical framework, seeking to match the theory with our empirical findings. After several iterations, we identified a set of factors, mainly interfirm linkages at the GVC, cluster and firm levels (as outlined in Section 2), that showed the best fit to the empirically gathered data.

### **Results**

In this section, we first provide the background of the Taiwanese bicycle cluster and how it upgraded before examining it against the upgrading factors presented in Section 2.

### *The Taiwanese bicycle cluster*

The Taiwanese bicycle cluster provides a wide range of bicycles, from children’s bikes to vehicles for personal transportation to advanced composite material constructions for Olympic sports. Firms compete in three main and several smaller segments. The three main segments are mass market bikes (22% of the value of all assembled bicycle exports from Taiwan), mountain bikes (39%) and road bikes (28%). E-bikes represent only 2% of all Taiwanese bicycle exports but have a major potential for growth (TBA, 2015). Around 60% of Taiwanese bicycle exports go to European Union (EU) countries, while the largest individual country destinations are the United States (US), China and Japan (6–7% per country).

The Taiwanese bicycle industry is clustered within two adjacent cities, Taichung and Changhua, located on the central west coast of Taiwan. This industry agglomeration includes local original equipment manufacturers (OEMs), parts manufacturers and suppliers and Taiwanese-owned MNEs. Taiwan’s bicycle industry cluster has demonstrated both growth and upgrading. Exports of assembled bicycles grew from US\$0.9 billion in 1990 to US\$1.1 billion in 2020, while the export of bicycle parts and components grew from US\$0.3 billion to US\$1.6 billion over the same period (Bureau of Foreign Trade Taiwan, 2021) (see Figure 1). Figure 1 illustrates the shift from assembled bicycles to components in the economic slump following the 2007–2008 Global Financial Crisis. While the number of bicycles exported in the 30 years from 1990 to 2020 decreased by 80%, the value of each bike increased fivefold, from US\$100 to US\$640, because of higher unit prices, strongly demonstrating economic upgrading (see Figure 2). The export of high-value bicycle components (e.g. frames, cranks, wheel rims, brakes and derailleurs) manufactured using advanced materials or precision engineering has also increased (Bureau of Foreign Trade Taiwan, 2021).

----- Insert Figure 1 about here -----

----- Insert Figure 2 about here -----

Given the significant presence of OEMs in other industries (Johnson et al., 2013), including carbon-fibre manufacturing (Chen et al., 2009), Taiwan has developed advanced technologies and capabilities relevant to bicycle manufacturing, thus has become the preferred manufacturing nation for Western bicycle brands. Given continuous development, the focus of Taiwanese SMEs has moved from manufacturing to technological innovation and knowledge-intensive activities (J. Wong, 2016). In the following sections, we explore the factors influencing upgrades in the Taiwan bicycle cluster using the theoretical lens of horizontal and vertical linkages.

### *GVC-level linkages*

The bicycle industry is global, with China dominating exports (35%), followed by Taiwan (15%). European countries comprise the majority of the remaining top 10 exporting countries. Taiwan is home to many leading global bicycle and bicycle parts brands (e.g. Giant, Merida, Marwi), along with local OEMs, components suppliers and product assemblers. In 2020, parts and components represented 59% of the total export value of the Taiwanese bicycle industry, with the balance in assembled bicycles (Bureau of Foreign Trade Taiwan, 2021). Well-known brands come from a range of countries, but their components are often manufactured in different locations globally; bicycles are also often assembled elsewhere.

Several forms of GVC governance are evident. Captive governance by foreign MNEs does not appear to be dominant. Rather, local MNEs appear to act as GVC leaders, deploying a network model for their Taiwanese suppliers based on reputation and mutual reliance. Relational governance was also emphasised by participants. For example, one participant stated, *“Because we have a long relationship together, we openly share information. Of course, because we trust each other since we are working closely. So, they need to help us how to do [things]”* (CE1).

Smaller brands needing specialist components such as pedals or cranks use modular governance, where Taiwanese SMEs build according to lead MNE specifications, or Taiwanese

suppliers offer new components as OEMs: *“Generally speaking, we just follow the trend according to company’s leader and vendor’s suggestion. Even though we have some ideas, it doesn’t mean that they will accept this idea”* (CE3).

Taiwanese MNEs and OEMs are well connected internationally through their buyers and suppliers (vertical linkages) and to their competitors (horizontal linkages) through regular visits to bicycle trade shows. Although smaller suppliers and assemblers are less connected internationally, they remain well integrated in the national industry.

### *Cluster-level linkages*

In the 1990s, the Taiwanese bicycle industry cluster upgraded from a production-based to a competence-based cluster. For example, one participant commented, *“Basically, in our company, we focus on manufacture and design. In mainland China, we do [a] labour-intensive process”* (AS1).

Other participants made similar comments:

*At the beginning we did [simple production], but during 1992 to 2001, the Chinese market opened, and we were not able to compete with Chinese companies by producing low-end products. We started doing other products—relatively high end—and we don’t have factories in China. We started focusing more on quality in terms of orders that we took.* (SS1)

*I think there is very successful technology in Taiwan, as well as suppliers, more makers, machines; everything is very advanced. Secondly, we invest in robots and automatic machines so that we can control cost well and also quality.* (SS2)

Some science-based elements were evident in relationships with universities and research centres, consistent with the industry moving beyond simple production. In particular, a research and development (R&D) centre specialising in cycling and health technologies has worked with different firms from the Taiwan bicycle cluster to advance new products and technologies. This centre



possesses testing facilities and specialised software and researches the performance of bicycles and the human body and the relationship between the two.

System suppliers confirmed the importance of geoeconomic LSFs in the cluster, including the proximity to core equipment manufacturers and assemblers in central Taiwan and to other firms in the bicycle industry, to help reduce costs and increase access to skilled labour and advanced technologies. Other benefits include better communication (particularly face-to-face interactions), transportation, time efficiency and production quality. Firms have established their R&D centres within the Taichung/Changhua cluster and worked with other local firms on material and product testing. Participants from small firms reported that they operated there because they could order small quantities from other Taiwanese SME suppliers: *“Why Taichung? It is because the cycling industry in the middle of Taiwan is quite mature, and it is beneficial in terms of time efficiency”* (CE2).

One historic LSF was the growth of Taiwan’s bicycle industry as part of the broader economic and political development of Taiwan over the last 50 years. Taiwan’s rapid economic growth in the 1960s and 1970s arose from policies allowing for the provision of indirect fiscal incentives, which enabled the expansion of an industry base dominated by SMEs (J. Wong, 2016). Such policies encouraged Taiwanese companies to upgrade from being primarily suppliers of components and assemblers of finished products for non-Taiwanese brands to being knowledge-based businesses. Consequently, Taiwanese SMEs formed international connections and integrated early into global economic structures (Johnson et al., 2013; J. Wong, 2016). Figure 3 provides a timeline of the cluster, showing how the industry upgraded its low-quality manufacturing in the 1980s to become globalised in the 2000s.

----- Insert Figure 3 about here -----

Another historic LSF is that, unlike Western entrepreneurial ventures, which are frequently turned over for capital gain, most bicycle companies in Taiwan are owned by Taiwanese businesspeople who take a long-term, multigenerational view of ownership (Cefis & Marsili, 2011):

*Most [company owners] are Taiwanese. They have owned their company for a long time. So, most companies have a long history. It is not only the big ones; there are lots of small ones as well, making different kinds of cycle parts. (GB2)*

Political LSFs include lower tariffs on Taiwanese bicycles exported to major markets in the EU and US compared with the tariffs on bicycles manufactured in China. However, this advantage has declined with the convergence of tariffs in recent years. More recently, tariffs on the growing e-bike industry of up to 25% for the US and up to 180% for the EU have been levied on China, while Taiwanese exports have been spared these higher rates (Bike Retailer, 2018). The Taiwanese bicycle cluster has navigated political tensions with China by working within the GVCs of large Chinese bicycle brands and opening their own production facilities in China. Interviewees regularly commented on the shared destiny of the people of Taiwan.

Another political LSF mentioned by participants was government support for the bicycle industry. Some interviewees were positive about this, while others were more sceptical. SMEs and lesser known Taiwanese bicycle companies receive little government support because a minimum business volume is required to access government assistance. Participants from some eligible firms reported obstructions in the application process. Professional cycling is supported by a government-funded bicycle research centre, which aims to connect firms in the Taiwanese bicycle industry to boost innovation and development:

*The Taiwan government spends tons of money and effort trying to help the brands ... If one of your products wins the Taiwan Excellence Award, or if you talk to people from the Taiwan import/export centre and they see the potential of your product, then they will try ... to take it outside of Taiwan and to promote it. (D1)*

A socioeconomic LSF was the growth of cycling in Taiwan over the last decade as a leisure activity, a mode of transport and a professional sport, increasing the importance of the domestic market for local firms to test their products and obtain immediate customer feedback before exporting them overseas.

Government support through innovation catalyst organisations such as universities and R&D centres appear to be valuable but not central to SME upgrading in the later stages of cluster development. Government initiatives are critical in the early stages, but for the cluster to develop, networks developed by individual firms matter most.

To encourage innovation within the wider cluster, leading Taiwanese MNEs have built formal and informal industry associations that have included SMEs as members. For example, the A-Team, comprising a small group of actors from the 20 top bicycle brands and selected component suppliers, was created in 2003 as a nonprofit industry association to “progress Taiwanese manufacturing of high value-added products through development of management, R&D, quality control, production and marketing practices” (Wheel Giant, 2015). Participating companies shared their knowledge and experience and even opened their factories to visits by competitors and suppliers (Wheel Giant, 2015). The A-Team alliance disbanded in 2016, but the initiative continues under the TBA, the umbrella industry association (Van Schalk, 2016). For example, one participant noted:

*This industry is very healthy; even the big firms joined a group named A-team for sharing all information. Me too, we are one of the top manufacturers for pedals. I also invite my competitors [to] visit our factory. We are very open minded. (SS2)*

#### *Firm-level linkages*

Taiwanese SMEs have demonstrated strategic intent and willingness to invest in upgrading, notably through innovation, as illustrated by the following quote: “*We always do innovation because I am specialised in industry design. This bicycle is our product; we did innovation on materials. There are some sports teams using our products such as the Taiwanese, German, Japanese, Swiss*” (CE4).

The successful development of the cluster overall highlights that firms have obtained results from their investments, potentially assuring other cluster firms of the benefits of upgrading. Horizontal and vertical relationships at the firm level have played a major role in this.

#### *Firm vertical linkages*

Interviewees emphasised that trust in the relationship and the contributions made by each actor was more important than whether the actor was a customer, supplier or competitor.

When discussing formalised links (documented or contractual), interviewees emphasised vertical buyer–seller dyads within the cluster’s localised value chain. Informal vertical linkages were based on personal relationships, such as downstream feedback from professional international riders, customers and local distributors through informal brainstorming and discussion. For example, one participant noted, *“Our sales managers go through these customers and find market trends according to the environment and product ... We just ask them in person, about the feeling, which part is good and which part is bad”* (SS2).

Informal vertical networks between three or more actors were mostly embedded in buyer–supplier relationships between assemblers, manufacturers and designers. Interviewees emphasised the importance of proximity, enabling face-to-face interactions and providing access to new information that is useful for upgrading:

*It is very easy for us to get help, such as after making a call; they are able to come here in 1 hour. Talking face-to-face is always better than via email. If you meet in person, sometimes you can see new things which are just invented; besides, you can always check what is going on. That is the benefit for us to locate in Taiwan.* (D1)

*Lots of things cannot be done by phone call or by email. We go visit them and talk about customers’ requirements and how to match them. So, you have lots of discussions before the project is actually being made.* (SC1)

Strong personal relationships with university sector researchers allowed firms to cooperate informally on R&D issues: *“I have contacts in the material science department in the university. Some of them are industrial doctors, but all of them are my personal relationship[s]”* (CE2).

The specialised bicycle technology research institute was an important actor in helping to create loose R&D collaborations. Large companies provided leadership that encouraged informal networks among SMEs:

*This trend is led by big companies, small companies and the suppliers. It is a big system, so [the suppliers] just do the components and parts and they follow the big companies ... I think that is one of the advantages of the Taiwan bicycle industry; they can realise the whole [bicycle] system.* (ER1)

#### *Firm horizontal linkages*

Interviewees identified few formal (documented) horizontal relationships between competitors. However, direct, informal horizontal ties to competitors within the cluster provided important intratask knowledge for upgrading existing firm activities. This allowed typically under-resourced SMEs to invest in building local capabilities rather than their own international networks.

Interviewees emphasised four key networks containing horizontal links (see Table 3): the TBA (the largest national bicycle industry association), the Taiwan Bicycle Exporters’ Association, the A-Team and the Chinese Taipei Cycling Association. These industry associations, representing a mix of horizontal and vertical linkages between firms, represented cliques within the larger cluster.

----- Insert Table 3 about here -----

Three regular patterns associated with horizontal linkages were evident in firm interactions in the Taiwan bicycle industry: co-competition, collaboration and citizenship. Interviewees noted co-competition in the industry, evidenced by cooperation between competitors:

*In the marketplace they are basically competitors, but they know they have the same issues, so they come together to do something. Taiwan manufacturing companies need to survive; this is the common consensus of the bicycle industry. They can expand worldwide, but they need to be rooted in Taiwan. (ER1)*

Long-established relationships facilitate information exchange between the government, suppliers and competitors in the industry. The development of new products and markets has enabled collaboration because competitors perceive the market as large enough for everyone. Firms also collaborate with research centres and professional cycling teams, with the shared objective of improving the overall performance of products:

*We have long relationships [with the supplier], so we openly share information because we trust each other since we are working closely together. We share information, and that is why we can create and develop very quickly ... They [the suppliers] sometimes share their own patents, own design [so that we use it in our products], but of course they will also show it to competitors ... but it is still inside of the Taiwan bicycle industry. We are a group of bicycle businessmen. (CE1)*

The A-Team initiative represented an important collaboration for upgrading, but to be successful its members had to behave differently from how they would behave during typical commercial relations. They jointly recognised that their long-term competitors were not those within the cluster but were overseas and that they could not succeed on their own. Trust and commitment were required for cooperation and collaboration to occur. Cluster members showed commitment and even a form of citizenship to the Taiwan bicycle industry cluster, evidenced by an appreciation of a shared destiny and an understanding of its role in upgrading:

*It's going to be more cooperative in the coming years because right now in Taiwan we are making more high-end products. So, entry-level products are made in China, Indonesia, etcetera, because they have cheap labour. In Taiwan, we keep doing innovation, new*

*production, new ideas, make the technology better. Sometimes you cannot do that by yourself; you have to work together with other people to make it happen. (SC1)*

*For the Taiwan bicycle industry, you can see Taiwanese companies put lots of effort into R&D; besides, everyone has a consensus on keep advanced things in Taiwan instead of moving everything to mainland China. For our company, we didn't go to mainland China; there is a disadvantage in China, which is they move so fast you cannot really do high-quality products. Taiwan is relatively stable. Technique is complicated as well; if it is small scale, there is [a] higher entry level. (CE2)*

## Discussion

The decades-long evolution of the Taiwanese bicycle industry has provided sufficient time for large and small firms to develop extensive experience and capabilities, and to upgrade. Firms are unlikely to be in a position to upgrade until the cluster is beyond the establishment and emergence stages and is moving towards growth and maturity (Täube et al., 2019). The Taiwan bicycle cluster appears to be an example of SMEs following an adaptive process of upgrading over time by applying knowledge from multiple GVCs, rather than firms being passive recipients of knowledge from a single foreign lead MNE or being driven by independent managerial action.

Our empirical study offers two key conclusions: (i) a reliance on local linkages for the required knowledge to upgrade and (ii) the role of local lead MNEs in creating institutional support structures for upgrading. Building on these, we propose two typologies for horizontal and vertical relationships within clusters and discuss the Taiwan bicycle cluster's potential future evolution within more regional GVCs.

### *Local linkages as the main source of upgrading knowledge*

SMEs within clusters in emerging economies use their linkages within the cluster as their primary sources of knowledge to support upgrading. In the Taiwan cluster, this includes links to local

suppliers and customers, who provide relevant knowledge for upgrading, as well as to local competitors. The direct influence of foreign lead MNEs on SME upgrading appears limited in the Taiwanese bicycle cluster. The knowledge gained by individual firms through international connections is shared with other firms in the cluster because SMEs have sufficient trust in one another. Such trust cannot be gained rapidly but requires multiple interactions between actors, who regularly fulfil each other's expectations and do not behave opportunistically (Oba & Semerciöz, 2005). The decades-long industry evolution has allowed time for trust-based relationships to develop in the Taiwanese bicycle cluster. This is an LSF based on informal institutional structures: compared with Westerners, Chinese businesspeople prefer face-to-face interactions and rely on collective verification of trustworthiness via extensive business networks (Haley et al., 2009), increasing the importance of proximity in the cluster. Firms access the knowledge necessary for upgrading through these trustworthy relationships, including horizontal relationships with competitor firms.

#### *Role of local lead MNEs in building supportive institutions*

Trust within horizontal relationships is a taken-for-granted cultural element grounded in LSFs but understood as an informal institution. Industry networks such as the A-Team and TBA, driven by Taiwanese lead MNEs, act as formalised institutions that may enforce firm behaviour through access to or exclusion from the network. That is, if individual firms fail to act in the interests of the industry (i.e. as industry citizens) or take advantage of the information provided, they are shunned by the industry and struggle as outsiders. Interviewees constantly stressed a mutual reliance on each other's success.

Not all SMEs have been invited to participate in these industry networks. Local lead MNEs are selective in the firms they perceive as able to contribute to upgrading the cluster, leading to a multitiered reputational structure. Pioneering firms, including SMEs, indirectly create industry standards when other firms seek to mimic them (Odlin, 2019). Accordingly, local lead MNEs are



instrumental in developing institutions that support the dispersion of knowledge in emerging market clusters (Anand et al., 2021).

### *Typologies of SME linkages for upgrading*

Based on our findings and evaluation of network relationships, we have identified that SMEs in clusters have various types of relationships or links with other firms. Vertical links represent supplier–customer relationships in the value chain, from the manufacture of raw materials through to design, production, sales and after-sales service. Value chains may be local or global depending on the location of firms across the entire value chain. Individual firms may only contribute one of the value-added activities in the chain, connecting via vertical links to firms both upstream (suppliers) and downstream (customers). Customers may purchase intermediate goods, such as a bicycle assembler buying parts from a wheel manufacturer. Further, a firm’s internal value chain may be local or global if they have operations in multiple countries or outsource elements in their production process. For example, one of the sample firms in this study had part of its manufacturing located in China but its upstream design and downstream marketing located in Taiwan. Accordingly, we theorise four vertical link subtypes (see Figure 4) according to whether the broader industry value chains in which these firms operate are local or global (*x-axis*) and whether their internal value chains are local or global (*y-axis*). *Domestic-focused* links represent relationships between a firm with a local value chain and firms within larger local value chains; for example, fresh food production and distribution value chains. *Global inside* links are those between firms that have globalised their value chains and other firms within local value chains; for example, a pharmaceutical MNE operating within a local healthcare value chain. The next two types of links are specific to firms in GVCs: *Domestic-based* links are those between firms with local internal value chains but which are part of GVCs, while *globetrotter* links are those between firms with their own value chain spread out globally and other firms that are in GVCs.

----- Insert Figure 4 about here -----

The vertical linkage types classify the multiple links a firm may experience. For example, a firm may have *domestic-based* links with multiple GVCs, as is the case with many SMEs in the Taiwan bicycle cluster. A pharmaceutical company may have *global inside* links if the value chain in which it participates is defined as local health care. However, it has *globetrotter* links if the value chain is defined as global drug production and distribution. This raises potential issues with the GVC literature on upgrading in relation to operationalising the concept of GVC. Empirical research from the perspective of a lead MNE may show a tightly defined GVC with specific participants, making it appear that the lead MNE disseminates its knowledge, and participants follow suit by upgrading. However, from the perspective of GVC participants, the situation is less clear because they are likely to be part of multiple GVCs (as in the Taiwan bicycle industry) rather than being dependant on a single lead MNE for all their business, which means that the knowledge needed to upgrade could come from multiple vertical linkages. Further, research from the perspective of the lead MNE is likely to adopt the definition of GVCs used by the MNE rather than that used by participants. Firms in the Taiwanese bicycle cluster are conscious of various suppliers and customers but not necessarily of being part of a GVC. That is, the GVC concept makes sense from the perspective of lead MNEs but is not as obvious to participants.

We further theorise four configurations of horizontal linkage types between a focal firm and another firm providing a similar product or service (see Figure 5). We distinguish whether the horizontal link is with another firm in the same value chain or another industry value chain (*x-axis*) and whether the other firm is located locally or internationally (*y-axis*). *Direct competitor* links are those with firms in the same value chain locally, such as in a cluster. *Indirect competitor* links are those with local firms in different value chains; for example, firms building carbon-fibre frames for racing bikes may have relationships with firms building carbon-fibre masts and spars for racing

yachts. *Global competitor* links are those with overseas firms in the same value chain, while *global innovator* links are those with overseas firms in different value chains.

----- Insert Figure 5 about here -----

An individual firm may have multiple links across all four categories, with each type of link potentially offering different kinds of knowledge for upgrading. If firms rely only on *direct competitor* links for upgrading knowledge, the overall cluster risks becoming obsolete over time by being inwardly focused and overlooking new external knowledge (Pouder & St. John, 1996). Applying the knowledge obtained from *global competitor* and *global innovator* links depends on international business competencies in language and adaptation as well as having the resources to develop and sustain such interfirm linkages, which may be beyond the capacities of emerging market SMEs in the early stages of firm development. Thus, institutional work by lead firms is essential for making the knowledge gained from these sources accessible and applicable to less developed firms in the cluster.

## Conclusions

### *Main findings*

Prompted by UNCTAD's predictions that GVCs will become more regionalised, we examined the positions of SMEs in emerging market clusters. While UNCTAD suggests that firm upgrading is an opportunity for SMEs as GVCs become less fragmented and more involved in value-adding processes, firms need to constantly consider their position within the changing dynamics of global trade. We examined how vertical and horizontal relationship linkages influence firm upgrading in relation to the Taiwanese bicycle cluster from GVC, cluster and firm perspectives to answer our research question:

*How do emerging market SMEs located in clusters manage to upgrade?*

Depending on the level of internationalisation of the focal firm (i.e. its internal value chain and the external value chain in which it is embedded), firms in the Taiwanese bicycle cluster develop different types of vertical and horizontal linkages that provide knowledge to support upgrading. Our data show that explanations of upgrading from both GVC- and cluster-based perspectives are valid, but their application depends on the focal firm, its geographical dispersion of value-added activities and its capacity to explore and apply knowledge and competencies that become available to them through interfirm linkages. Institutional work by lead firms in the cluster encourages the dispersion of knowledge through the cluster.

### *Contributions to theory*

Our research makes three contributions to theory.

First, the GVC literature argues that firms in emerging markets depend on vertical linkages with MNEs in developed economies to access the necessary knowledge for upgrading. These foreign MNEs pass knowledge to selected firms through vertical relationships using a top-down, captive governance mode (Buckley, 2021). Our research shows that emerging market SMEs that are embedded in GVCs still source knowledge from local vertical relationships within a cluster if their internal value chain is local (i.e. *domestic-based* links), despite their connections to GVCs. Firms with global internal and global external value chains (i.e. those with *globetrotter* vertical links) have wider access to knowledge for upgrading (see Figure 4). Further, SMEs may have horizontal linkages to firms within their own local value chain within the cluster (i.e. *direct competitor* links) and globally (*global competitor* links) (see Figure 5), providing design, manufacturing and quality knowledge, as well linkages to firms in different value chains that provide complementary knowledge. These findings suggest that a more nuanced analysis of the embeddedness of emerging market firms in GVCs and its influence on upgrading is warranted.

Second, cluster research argues that vertical and horizontal relationships are characteristics of a cluster because firms cooperate (vertically) or compete (horizontally) in the same localised

industry (Porter, 2008). We further develop this idea by developing typologies of the horizontal and vertical linkages possessed by firms to highlight that, in practice, the potential sources of knowledge for upgrading are much more complex than those often portrayed as being either from a lead MNE in a GVC or from cluster linkages. Specifically, SMEs may operate within multiple GVCs, so the lead MNE may not be the primary source, even if it appears to be so from the MNE's perspective. Further, horizontal relationships may be far more important sources of information for emerging market SMEs in clusters. Our typologies offer a structure and language for examining interfirm linkages in other contexts.

Third, we extend the research on emerging market SME upgrading, showing that the support of institutional work by lead firms is critical (Anand et al., 2021; Corredoira & McDermott, 2014; McDermott et al., 2009). These institutions potentially offer more than just industry networking, training and technological support; they may establish informal institutions such as norms of behaviour that permit knowledge sharing within the cluster and an industry culture of inclusion, where emerging market SMEs assume that they are able to upgrade.

### *Contribution to practice*

The various linkages that influence the way in which emerging market SMEs in clusters upgrade their position within GVCs may offer a useful framework for managers and business consultants. Following an effectual logic, entrepreneurial managers may first consider their firm's existing resources with questions such as 'What do I know?', 'Who do I know?' and 'What can I do?' (Saravathy et al., 2014) to analyse firm linkages locally and globally and reflect on knowledge and institutions located in the cluster. Our typologies of horizontal and vertical linkages provide tools for people external to the firm, such as consultants, to systematically analyse the portfolio of relationships a firm possesses to identify those that are the most valuable.

Zhan's (2021) argument that GVCs will become more regional, less fragmented and with more value added at each stage has implications for the Taiwanese bicycle cluster and its continued

upgrading. European MNEs may bring their GVCs closer, possibly incorporating emerging economies in Eastern Europe or the Middle East that can provide bicycle components. Little change is likely in Asia-Pacific because GVCs are already regional, and North American MNEs are unlikely to see bicycle production as sufficiently strategic (or costly) to justify reshoring. Firms in Taiwan's bicycle cluster have already upgraded their processes, products and functions. Potentially, they could adapt their skills intersectorally to diversify into more advanced personal transport devices.

### *Limitations and future research*

By evaluating firms within the same cluster, thus those within a single industry and country, the conclusions we can draw are limited because we cannot distinguish the potential importance of various interacting factors in other contexts. However, our typologies of linkages provide a foundation for future research that combines data from multiple firms across various locations, GVCs and industries globally. Our method meant that we were unable to unravel the types of knowledge generated via the various linkages. Future researchers could examine the types of knowledge available from the four types of horizontal linkages, which appear to be more important to SMEs compared with vertical linkages.

Further, instead of a retrospective study like ours, a longitudinal study of the upgrading phenomenon of firms in emerging markets should help to better identify the development of vertical and horizontal linkages and their influence on upgrading over time.

A multiple case study comparing firms with different levels of embeddedness in GVCs and clusters would be valuable for understanding emerging market firms' upgrading processes and success. The study of exemplar firms reliant on specific combinations of vertical and horizontal relationships could deepen the understanding of upgrading dynamics.

## Appendices

### Appendix 1: Interview questions

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1	Introduction
1.1	Introduction of the project and interview.
1.2	Introduction of the interviewee.
1.3	Introduction of the interviewee's organization or firm. Can you tell me more about how your organization is involved in the Taiwan cycle industry?
2	The Taiwan cycle industry cluster
2.1	Can you describe typical characteristics and success factors of the Taiwanese cycling industry?
2.2	If your organization or firm were to move to another place/location, e.g., to China mainland, would that be possible? What difference would that make for your organization?
2.3	Can you describe the relationships (links between two organizations) and networks (links between more than two organizations) between your organization and others in the Taiwan cycling industry? Can you describe some of those? What are the reasons for creating those linkages?
2.4	Can you describe attitudes and behaviors between organizations in the Taiwanese cycling industry (e.g., hostile, friendly, cooperative)?
2.5	Do you regularly go beyond contractual agreements when interacting with organizations or firm from the Taiwanese cycling cluster as <u>compared to</u> overseas business partners?
2.6	Do you feel like a "citizen" of the cycling industry so that your organization takes actions that are <u>beneficial for several firms</u> or the overall local cycling industry but <u>not only for one</u>

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single firm? (e.g., developing products together, representing the industry collectively, being cooperative, loyal, tolerant, or altruistic towards other organizations in the industry)

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3 Innovation in the Taiwanese cycling industry

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3.1 Can you speak about examples of new developments in the cycling industry in terms of products, processes, or organizational structure (e.g. lighter material for bike frames, aerodynamic design of helmets, new brake technologies)?

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3.2 What are the drivers and motivations for innovation in your organization or in the cycling industry in general?

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3.3 Imagine the innovation process consists of three phases: 1. idea generation, 2. prototype development and testing and 3. industrialized manufacturing and commercialization.

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3.3.1 Where do new ideas typically come from in your organization or in the cycling industry in general (e.g. suppliers, consumers, athletes, employees, R&D team)?

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3.3.2 How are ideas for improvement or new developments usually realised (step 2 and 3) in your organization?

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3.4 Imagine you could pick another organization from the Taiwan cycle industry to collaborate in order to improve or develop a new product, which one would you choose and why?

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3.5 Do your (business) partners generally go beyond what is required in contractual agreements and does that help you in developing or improving products or processes?

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Questions to summarize: What else would like to add to increase my understanding of how your organization or firm interacts with others and how this contributes to innovation?

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## Appendix 2: Principal secondary data sources

Source	Type	Author
Bike Market Update - Taiwan Bicycle Exports  Drop Again	CD rom	Wheel Giant
Taiwan Bicycle Source E-Book User Guide	CD rom	Wheel Giant
Taiwan Bicycle Association Introduction/  Market Statistics/ Global Import Tariff/ ...	CD rom	Taiwan Bicycle Association
Taiwan bicycle industry export statistics (1990– 2020)	Website- data tables	Bureau of Foreign Trade, Taiwan
The Statistics of Taiwan Bicycle Industry	Paper book	Taiwan Bicycle Association
Bike Market Update magazine– various editions	Paper journal	Wheel Giant
Taipei International Cycle Show Visitor’s Guide	Paper leaflet	Taipei Cycle Show
Product leaflets of different products	Paper leaflets	Various trade show exhibitors
Annual reports (e.g., Giant; Kenda)	Annual report	Various firms

### Appendix 3: Primary data collection through observations

Name of event / destination	Type of event / destination	Type of data
Taipei International Cycle Show	Trade show	Photos, videos, and notes
Taipei International Sporting Goods Show	Trade show	Photos and notes
Cycle competition: Bike Fun Lan Yang	Sport event	Photos and notes
Cycle pathways in Taipei and the users	Infrastructure	Photos, videos, and field trip report
Youbike bicycle rental system in Taipei	Infrastructure	Photos and notes
Sport Museum National Taiwan Sport University	Museum	Photos and audio recording

## Tables

**Table 1: Organisational definitions**

<b>Organisation type</b>	<b>Definition</b>
Core equipment manufacturer	Firms concerned with the construction of bike frames and wheels
Systems supplier	Firms concerned with the design and/or manufacture of head parts, cranksets, axles, saddles, paddles, cables, brakes
Accessories supplier	Firms concerned with the design and/or manufacture of bells, water holders, helmets, baggage porters, lamps, etc.
Designer	Firms concerned with the conception and design of bicycles
Services/consulting	Firms concerned with services related to the bicycle industry
Media/ communications	Firms concerned with media and communication related to the bicycle industry
Education/ research	Profit or nonprofit organisations concerned with education or research related to the bicycle industry
Governing body	Government agencies or nonprofit organisations that control, influence, or regulate the industry (cluster) or parts of it
Professional sport	Profit or nonprofit-organisations concerned with managing professional sport teams in bicycling
Amateur organisation	Profit or nonprofit organisations concerned with bicycling at amateur level

**Table 2: List of interviews**

#	Organisation type	Code	No of Employees*	Interviewee's position	Location	Duration (minutes)
1	Core equipment manufacturer	CE1	Large	R&D Manager	Taichung	25
2	Core equipment manufacturer	CE2	Micro	Owner/ Director	Taichung	32
3	Core equipment manufacturer	CE3	N/A	Chairman	Chang Hua	20
4	Core equipment manufacturer	CE4	Large	Owner/ Director	Taichung	48
5	Designer	D1	Small	Marketing Manager	Taipei	28
6	Designer	D2	Micro	Head of design/ Founder	Taipei	26
7	Accessories supplier	AS1	N/A	Senior Manager	Chang Hua	30
8	Accessories supplier	AS2	Micro	Manager Sales & Marketing	Taichung	15
9	Systems supplier	SS1	Small	General Manager	Taichung	35
10	Systems supplier	SS2	Medium	Managing Director	Taichung	20
11	Systems supplier	SS3	N/A	General Manager*	Chang Hua	43
	Systems supplier	SS3	N/A	President*	Chang Hua	

12	Systems supplier	SS4	N/A	Marketing Manager	Taichung	20
13	Systems supplier	SS5	Large	Sales Team Leader	Yuanlin	37
14	Services/ consulting	SC1	Micro	Manager	Taichung	20
15	Services/ consulting	SC2	Small	General Manager	Taichung	50
16	Services/ consulting	SC3	Micro	Founder	Taipei	20
17	Media/ communications	MC1	Small	President	Chang Hua	40
18	Education/ research	ER1	Medium	General Manager	Taichung	48
19	Governing body	GB1	N/A	Secretary General	Kaohsiung	62
20	Governing body	GB2	N/A	President*	Taipei	83
	Governing body	GB2	N/A	Vice-President*	Taipei	
21	Professional sport	PS1	N/A	Owner/ Director	Taichung	20
22	Amateur organisation	AO1	Micro	Managing Director	Taichung	40
23	Amateur organisation	AO2	Micro	Team member	N/A	20
TOTAL						782

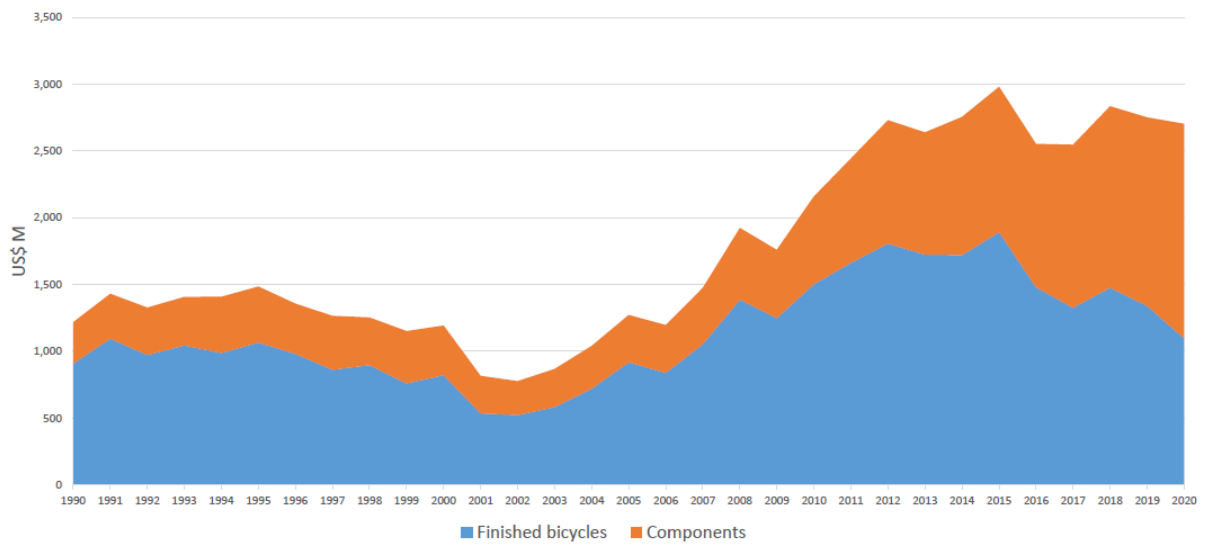
*\* joint interview*

\*Range of number of employees: micro = <10 ; small < 50; medium < 250; large > 250 (European Commission, 2021)

**Table 3: Formal interorganisational networks**

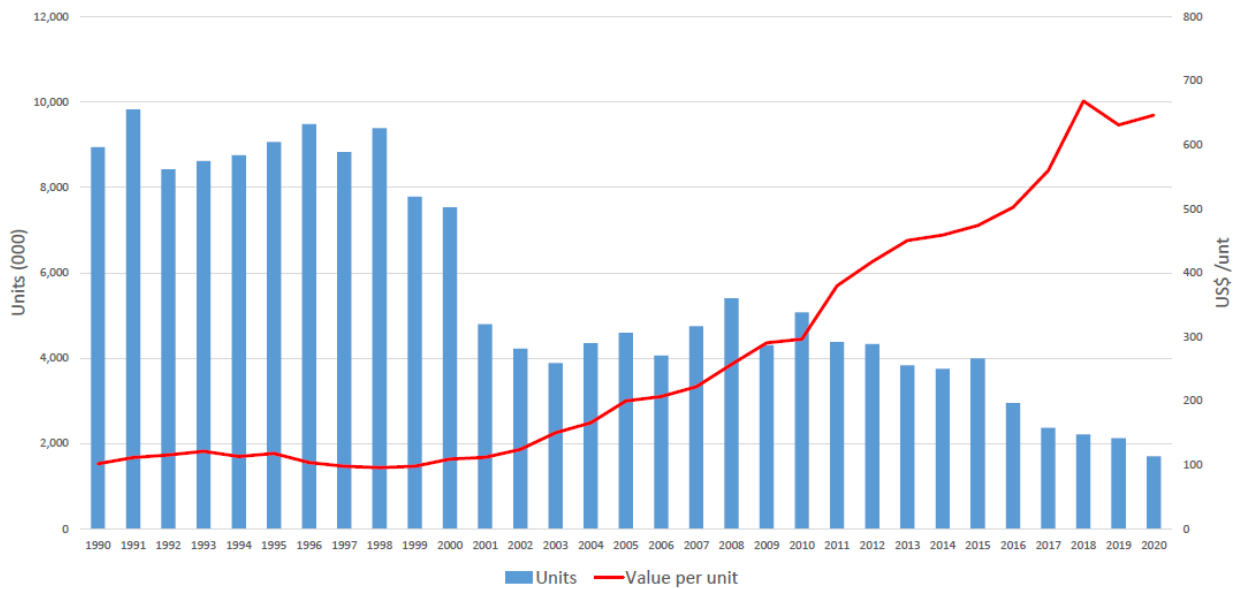
<b>Acronym</b>	<b>Name of network</b>	<b>Founded</b>	<b>Members</b>	<b>Purpose</b>
TBA	Taiwan Bicycle Association	1992	200	Promote cycling
TBEA	Taiwan Bicycle Exporters Association	N/A	N/A	Promote bicycle exports
A-Team	A-Team	2003	20	Exchange best practices
CTCA	Chinese Taipei Cycling Association	1964	N/A	Organise cycle racing

Figure 1: Taiwan finished bicycle & components export value in US\$ M (1990-2020)



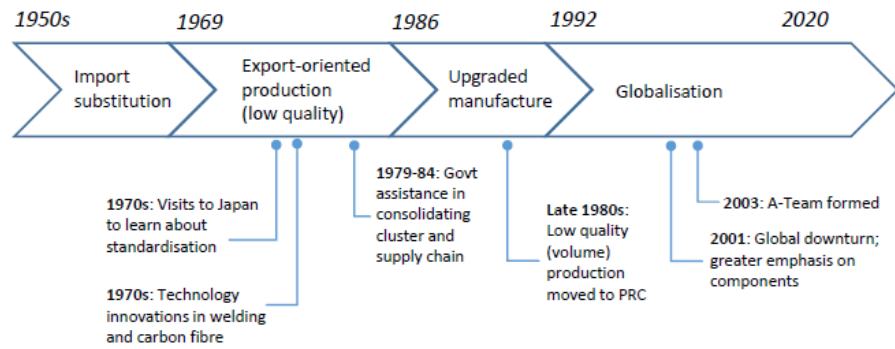
Source: Bureau of Foreign Trade, Taiwan (2021)

Figure 2: Taiwan finished bicycle exports units (1990-2020)



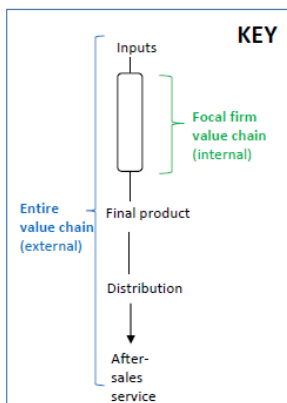
Source: Bureau of Foreign Trade, Taiwan (2021)

Figure 3: Development timeline of Taiwan's bicycle industry



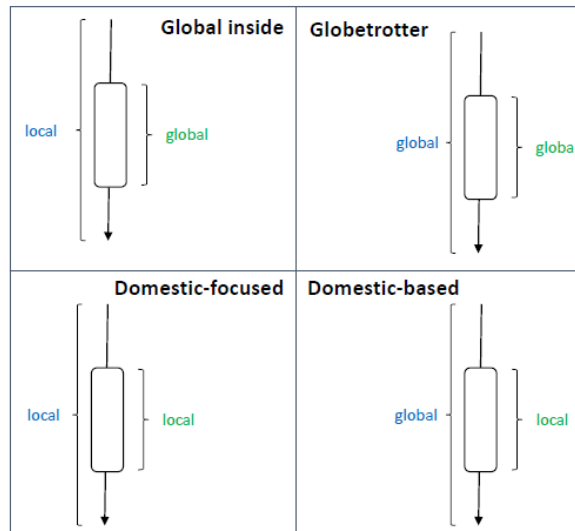
Sources: Bureau of Foreign Trade, Taiwan (2021); Chen et al. (2009); Chu et al. (1996)

Figure 4: Vertical Linkage Types



*Focal firm value chain (internal)*

*Global*



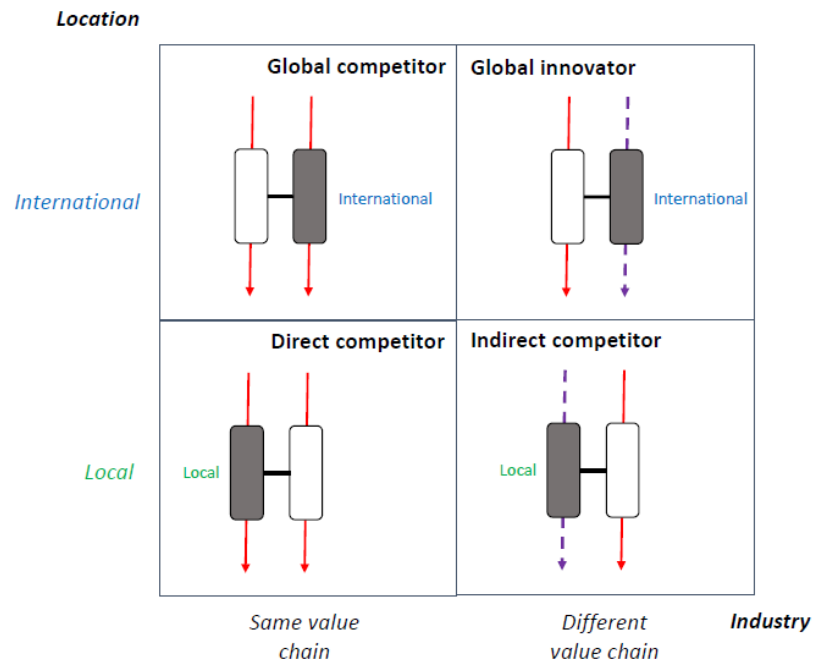
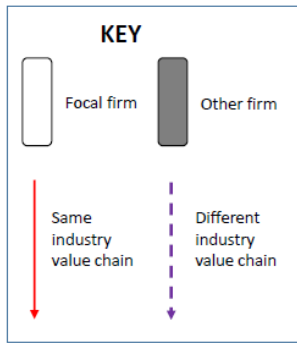
*Local Value Chain*

*Global Value Chain*

*Entire value chain (external)*



**Figure 5: Horizontal Linkage Types**



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