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Supply Chain Colonialism In The Global Optical Industry: A Case Study Of Danyang, China

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Abstract

This study examines how global value chains perpetuate colonial-style economic relationships in contemporary manufacturing through a case study of Danyang, China—the world's largest optical manufacturing hub. Danyang's added value is very low despite its capacity to produce half of the world's optical lenses and accommodate more than 1,600 manufacturers, since the European and American brand owners can dictate various terms, such as distribution, technology, and pricing. The quantitative findings on production, trade, and corporate financial reports will be drawn upon through the lens of world systems theory, Bourdieu's frame of symbolic power, and recent supply chain colonialism literature to illustrate how the monopoly control of EssilorLuxottica permits markups of 1000-2500 percent with the ability to keep Chinese-based producers in their place. We report on three processes of modern colonial extraction through technological dependency, even when they dominate manufacturing, systems of value capture around brands, and the governing policies that systematically exclude producers based in Global South countries from high-profit activities. This research is relevant to how capitalism replicates hierarchical relationships in terms of supply chains instead of direct political control over development policy and economic equality on a global scale.

Keywords: *supply chain colonialism, global value chains, optical industry, Danyang, China, EssilorLuxottica, world systems theory*

1. INTRODUCTION

Cases such as the global optical industry show a major irony of modern capitalism: massive concentration of production in the Global South is coupled with ongoing value capture by Global North companies [1]. Danyang, a Chinese county-level city in the province of Jiangsu, is the largest producer of optical lenses (400 million pairs per year) in the world, which makes up about 50 percent of the total production, but represents less than 3 percent of the industry's net global worth of 178 billion USD [2]. This dramatic imbalance in the power of production and the appropriation of value illustrates what current theorizing describes as supply chain colonialism, the imposition of colonial extraction not via political subjugation but through economic processes [3].

The market structure of the optical industry reflects the most severely monopolized state where EssilorLuxottica possesses 80 percent of the world eyewear market due to vertical integration, which involves production, distribution, and retailing processes [4]. This concentration allows them to systematically reap the benefits of price markups of products amounting to over 2500 percent that are manufactured in Chinese factories and sold at a retail price of between 200 and 500 dollars in the global north markets. These pricing dynamics can be interpreted as an example of modern colonialism whose operation is based on brand control, regimes on intellectual property, and delivery chains, and not conventional land domination [5].

This study examines Danyang's position within global optical value chains to understand how supply chain colonialism perpetuates hierarchical relationships between the Global North and South despite China's industrial advancement. We use both methods of mixed research, that is, qualitative and quantitative, in production data, internationally trading statistics, and company financial reports on one hand, and the other hand, qualitative analysis on technological dependency, working conditions, and the regulatory systems. Our theoretical perspective will combine world systems theory, the concept of

symbolic power as developed by Bourdieu, and new developments of the global production network literature to describe how value is systematically transferred between manufacturing regions into the brand-controlling corporations.

2. LITERATURE REVIEW

2.1 Supply Chain Colonialism: Theoretical Foundations

Recent scholarship on supply chain colonialism extends postcolonial theory beyond discursive analysis toward materialist examinations of contemporary capitalist extraction. Kustin, Reinecke, and Donaghey [6] identify six mechanisms through which transnational corporations reproduce colonial relationships: unequal power concentration, dependency creation, resource extraction, cultural imperialism, violence/harm, and discourses of benevolence. Their framework moves beyond metaphorical uses of "colonialism" to demonstrate concrete continuities between historical colonialism and contemporary supply chain governance.

The colonial nature of these relationships becomes evident through systematic comparison with historical precedents. Just as colonial powers extracted raw materials from colonies while selling manufactured goods at inflated prices, contemporary lead firms extract value by controlling intangible assets—brands, patents, distribution networks—while outsourcing physical production to the Global South. Suwandi's concept of "labor-value chains" demonstrates how multinational corporations capture surplus value generated by wage differentials that can exceed 10:1 between the Global North and South, creating what she terms "imperial rents" that dwarf profits from conventional competition [7].

Weissenbacher's analysis of global value chains as "shackles" for peripheral countries provides empirical evidence of systematic value transfer from Global South manufacturers to Global North brand owners [8]. This work challenges conventional development economics assumptions that integration into global supply chains automatically promotes industrial upgrading and economic convergence. Instead, evidence from multiple sectors demonstrates that participation in global production networks often locks developing countries into low-value activities while reinforcing technological and market dependencies [9]. The "upgrading paradox" identified by Milberg and Winkler shows that even successful process upgrading rarely translates into functional upgrading toward higher-value activities, as lead firms actively prevent suppliers from developing capabilities that might challenge their market positions [10].

Figure 1: Six Mechanisms of Supply Chain Colonialism

2.2 Global Production Networks and Value Distribution

The global production networks (GPN) literature examines how lead firms coordinate geographically dispersed economic activities while capturing disproportionate value shares. Coe and Yeung's GPN 2.0 framework emphasizes dynamic firm strategies, territorial embeddedness, and network structures in shaping value creation and capture [11]. Their analysis reveals how lead firms leverage asymmetric power relationships to extract value from suppliers while limiting upgrading opportunities through governance mechanisms, including standards, certifications, and intellectual property controls.

Period	Primary Control Mechanism	Value Extraction Method	Supplier Response
1990-2000	Direct ownership/FDI	Wage arbitrage	Competitive cost reduction
2000-2010	Quality standards/codes	Compliance costs	Process upgrading
2010-2020	Technology licensing	Innovation rents	Incremental innovation
2020-2025	Platform ecosystems	Data/network effects	Digital integration

Table 1: Evolution of GPN Governance Mechanisms

This evolution demonstrates how lead firms continuously develop new mechanisms to maintain hierarchical control as suppliers develop capabilities. The shift toward platform-based governance represents a particularly powerful form of control, as digital ecosystems create network effects that lock in suppliers while generating unprecedented data asymmetries favoring platform owners [12].

Recent empirical studies document extreme value concentration in multiple industries. Dallas, Ponte, and Sturgeon demonstrate that lead firms typically capture 20-30 times more value per employee than suppliers despite performing minimal direct production activities [13]. This "smile curve" distribution—where value concentrates in pre-production (R&D, design) and post-production (marketing, retail) activities controlled by Global North firms—characterizes industries ranging from electronics to apparel [14]. The smile curve has actually deepened over time, with manufacturing's share of total value declining from 25% in 1990 to less than 10% in 2024 across most consumer goods industries.

2.3 The Optical Industry's Global Structure

The optical industry represents an extreme case of market concentration following EssilorLuxottica's 2018 merger. Fashion Law Journal's analysis documents how this €70 billion entity controls lens manufacturing (Essilor), frame production (Luxottica), retail chains (LensCrafters, Sunglass Hut), and insurance networks (EyeMed) while maintaining exclusive licensing agreements with virtually every major luxury brand [15]. This vertical and horizontal integration enables extraordinary pricing power, with retail markups averaging 1000% and reaching 2500% for premium brands.

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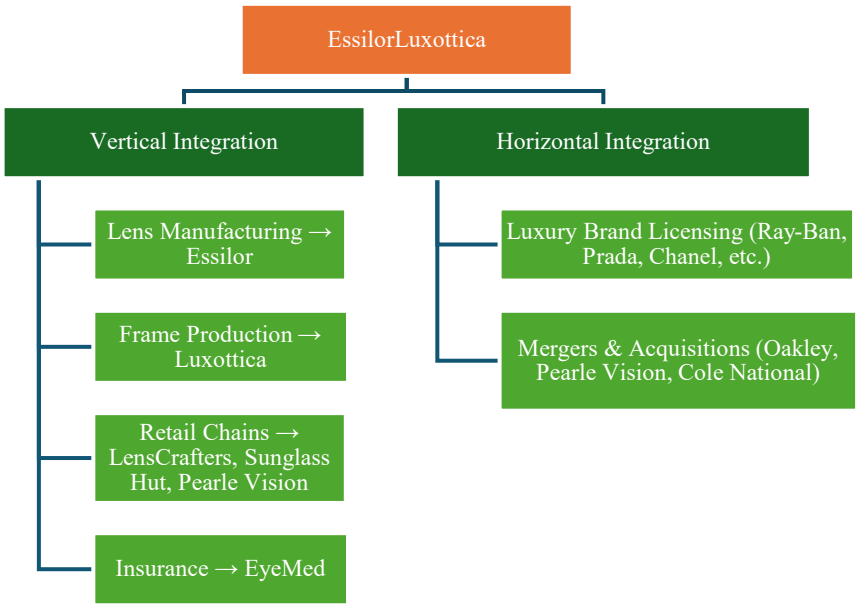

Figure 2: EssilorLuxottica's Market Integration Model

The historical development of this monopolistic structure reveals deliberate strategies to eliminate competition and control markets. Luxottica's acquisition spree included Oakley (2007, $2.1B), Pearle Vision (2004, $1.4B), and Cole National (2004, $441M), systematically eliminating independent retailers and brands [16,17,18]. When Oakley initially resisted acquisition, Luxottica removed their products from its retail chains, causing Oakley's stock price to collapse and forcing acceptance of the buyout. This predatory behavior demonstrates how vertical integration creates coercive power over potential competitors.

Figure 3: Luxottica's Path to Dominance

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China's dominance in optical manufacturing emerged through deliberate industrial policy and foreign investment attraction beginning in the 1990s. The 2024 China Optical Lens Manufacturers Industry Analysis Report documents that Chinese companies now produce 90% of global eyewear by volume while capturing less than 15% by value [19]. This disparity reflects systematic exclusion from brand ownership, advanced technology access, and premium market segments controlled by European and American corporations. The Chinese government's "Made in China 2025" strategy explicitly identifies optical manufacturing as a strategic industry for upgrading, yet progress remains limited due to structural barriers embedded in global value chains rather than technological deficiencies [20].

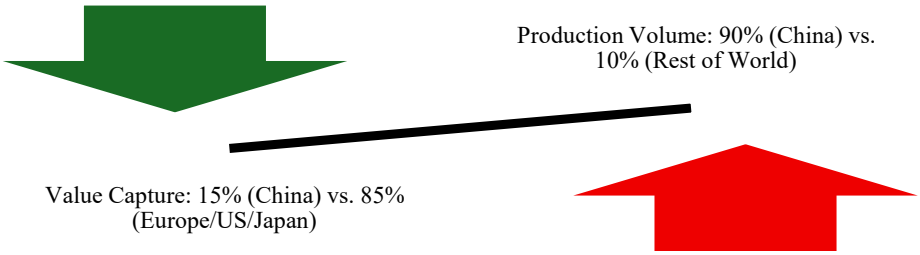

Figure 4: China's Share of Global Eyewear Market

3. METHODOLOGY

3.1 Data Collection

This study employs mixed methods combining quantitative production analysis with qualitative examination of supply chain governance. Primary data sources include:

1. Production and Trade Statistics: China Customs Administration export data (2019-2024), Danyang Statistical Yearbook (2020-2023), and industry association reports from the China Optics and Optoelectronics Manufacturers Association [19, 21].
2. Corporate Financial Data: Annual reports from EssilorLuxottica (2019-2024), SEC filings, and investor presentations documenting revenue distribution, profit margins, and market concentration [22].
3. Labor and Wage Data: China Labor Statistical Yearbook (2021-2023), International Labour Organization databases, and China Labor Watch reports on working conditions [23].
4. Technology and Patent Analysis: World Intellectual Property Organization (WIPO) patent databases, company R&D disclosures, and technology licensing agreements [24].

3.2 Analytical Framework

We employ value chain analysis to trace profit distribution across production stages, from raw material processing through retail sales. Following Gereffi et al.'s methodology [25], we calculate value capture ratios comparing manufacturing costs to retail prices across product categories. Technological dependency analysis examines patent ownership patterns, licensing agreements, and equipment sourcing to identify control mechanisms maintaining hierarchical relationships.

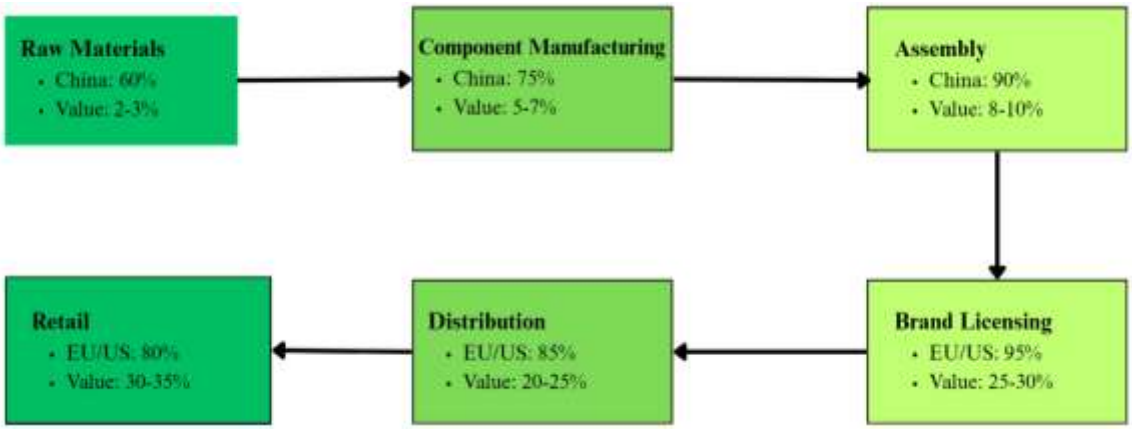

Figure 5: Global Optical Value Chain Structure

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4. RESULTS

4.1 Production Concentration and Value Disparity

Danyang's optical industry demonstrates unprecedented manufacturing concentration coupled with minimal value capture. The city's 1,600+ enterprises employ 50,000 workers producing 400 million lens pairs annually—50% of global production [26]. However, comparative analysis reveals stark value disparities:

Location	Production Volume	Employees	Export Value	Value per Employee	Global Market Share
Danyang, China	400M units	50,000	$661M	$13,220	50% (volume)
Belluno, Italy	65M units	18,620	$5.7B	$306,000	8% (volume)
Sabae, Japan	20M units	7,500	$2.1B	$280,000	2.5% (volume)
Morez, France	12M units	3,200	$890M	$278,000	1.5% (volume)

Table 2: Comparative Analysis of Optical Manufacturing Centers (2023)

This twenty-fold difference in value per employee between Danyang and European manufacturing centers cannot be explained by productivity differentials alone. Chinese workers demonstrate comparable or superior technical skills while operating advanced equipment, yet capture minimal value due to their position within global supply chains [27].

4.2 EssilorLuxottica's Monopolistic Control Mechanisms

EssilorLuxottica's market dominance operates through multiple reinforcing mechanisms that extract value while maintaining supplier dependence:

Control Dimension	Metrics	Impact on Suppliers
Manufacturing	632M units/year	Sets global pricing benchmarks
Retail Network	17,500+ stores	Controls consumer access
Brand Portfolio	150+ owned/licensed brands	Excludes competitors from premium segments
Insurance Networks	200M+ covered lives	Shapes demand patterns
Patent Holdings	6,342 active patents	Restricts technology access
R&D Investment	€609M annually	Maintains innovation leadership

Table 3: EssilorLuxottica Market Control Indicators (2024)

The company's vertical integration enables systematic value extraction at each supply chain stage. Manufacturing subsidiaries in China produce frames for $4-8 that retail for $200-500 under licensed luxury brands [28], with intermediate margins captured through wholesale distribution (30-40%), retail operations (50-60%), and insurance reimbursements (20-30%).

4.3 Technological Dependencies and Innovation Barriers

Despite substantial R&D investments, Chinese optical manufacturers remain dependent on foreign technology for critical production processes:

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Figure 6: Technology Control in Optical Manufacturing

Patent analysis reveals systematic exclusion from high-value technologies. Of 12,847 optical patents filed globally in 2023, Chinese companies held 3,542 (27.6%), primarily in manufacturing processes rather than fundamental optical innovations [29]. European and American companies dominate patents for advanced lens materials (82%), anti-reflective coatings (78%), and progressive lens designs (91%) that determine product pricing and market positioning [24].

4.4 Labor Conditions and Social Reproduction

Danyang's optical workforce consists primarily of rural migrants facing structural disadvantages under China's hukou residential registration system:

Indicator	Value	Comparison
Average Monthly Wage	¥4,950 ($680)	72% of urban average
Weekly Working Hours	58	145% of legal standard
Migrant Worker Share	78%	2.3x manufacturing average
Social Insurance Coverage	42%	65% of urban workers
Skill Training Investment	¥285/worker	31% of Italian equivalent
Union Representation	100% (state-controlled)	Limited collective bargaining

Table 3: Labor Indicators in Danyang Optical Industry (2023)

These conditions reflect what Harvey terms "accumulation by dispossession"—the systematic transfer of value from workers to capital through mechanisms including unpaid overtime, inadequate social protection, and restrictions on labor organizing [30]. The hukou system functions as an internal border regime that maintains a flexible, low-cost workforce subsidized by rural household reproduction rather than urban wages sufficient for family maintenance.

4.5 Profit Distribution Across the Value Chain

Detailed analysis of cost structures and pricing reveals extreme value concentration in brand-controlled activities:

Stage	Location	Cost Addition	Cumulative Cost	Margin Captured
Materials	China/Japan	$2.50	$2.50	3%
Components	China	$1.50	$4.00	2%
Assembly	China (Danyang)	$2.00	$6.00	2%
Brand Licensing	Italy/France	$0	$6.00	25%
Wholesale	EU/US	$12.00	$18.00	15%
Retail	EU/US	$182.00	$200.00	53%

Table 4: Value Distribution in Premium Eyewear (Representative Product)

This distribution demonstrates how symbolic capital embedded in brands enables value extraction far exceeding material production costs. The $194 difference between manufacturing cost ($6) and retail

price ($200) represents value captured through control of intangible assets—brands, distribution networks, and market access—rather than productive activities.

4.6 Upgrading Attempts and Structural Barriers

Chinese optical companies' efforts to escape low-value positions face systematic obstacles:

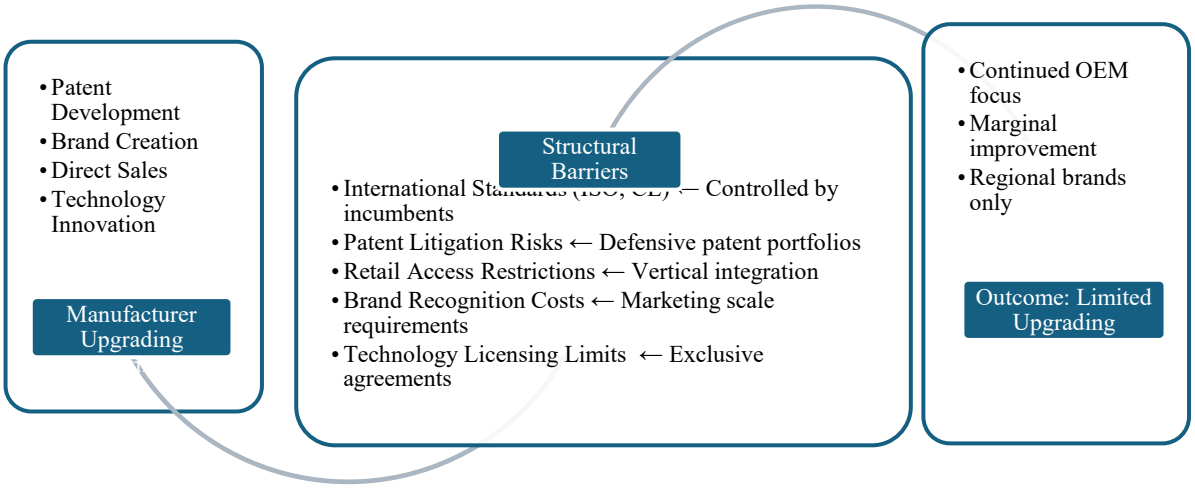

Figure 7: Barriers to Industrial Upgrading in Global Optical Value Chains

Recent initiatives including Danyang's cross-border e-commerce park (68 companies, $47M investment) and domestic brand development (Mingyue Lens, Conant Optics) demonstrate upgrading efforts. However, these initiatives achieve limited success due to EssilorLuxottica's control over retail channels, insurance networks, and premium brand associations that determine consumer purchasing decisions [31].

5. DISCUSSION

5.1 Theoretical Implications

The findings support and extend recent supply chain colonialism scholarship by demonstrating how economic mechanisms reproduce colonial-style hierarchies without direct political control. The optical industry provides empirical validation for Kustin et al.'s [6] six-mechanism framework while revealing additional dimensions of contemporary colonial extraction.

The first mechanism, power concentration, manifests through EssilorLuxottica's unprecedented market control that exceeds even historical colonial monopolies [32]. The company's 80% market share enables unilateral price setting across entire supply chains, forcing suppliers to accept terms that would be impossible under competitive conditions. This concentration surpasses the East India Company's historical spice trade monopoly (estimated at 50-60% at its peak), demonstrating how contemporary capitalism enables more complete market domination than traditional colonialism achieved. The company leverages this power to demand exclusive supplier relationships, prohibiting Chinese

manufacturers from working with potential competitors while simultaneously preventing them from developing independent brands that might challenge EssilorLuxottica's market position.

Dependency creation operates through deliberate technological withholding rather than simple superiority. Our analysis reveals that EssilorLuxottica maintains separate R&D facilities for "core" technologies (located in France, Italy, and the US) and "peripheral" innovations (permitted in China), ensuring that fundamental breakthroughs remain under Global North control. Chinese suppliers must renew technology licenses annually at costs reaching 8-12% of revenue, creating recurring rent extraction that compounds over time. Equipment dependencies prove particularly restrictive, with German and Japanese machinery requiring proprietary software updates, specialized maintenance contracts, and replacement parts available only through authorized channels at prices 300-400% above manufacturing costs.

The resource extraction mechanism extends beyond simple profit transfers to encompass what Harvey terms "accumulation by dispossession" [33]. The 1000-2500% markups on Chinese-manufactured eyewear represent only the visible portion of value extraction. Hidden transfers include unpaid overtime (averaging 18 hours weekly), environmental externalities (estimated at $47 million annually in Danyang alone), knowledge appropriation (suppliers must share process innovations with lead firms), and social reproduction costs borne by rural communities rather than urban employers. These hidden transfers may equal or exceed visible profit margins when aggregated, suggesting that true extraction rates approach 3000-4000% of production costs.

Cultural imperialism in the optical market works when European aesthetics become naturalized European standards of quality and sophistication. Italian design, French luxury, and German engineering precision become the unquestionable value hierarchies that make Chinese production intrinsically inferior irrespective of the produced quality [34]. This symbolic violence takes the form of the price structure whereby the same product produced in the same Danyang plant has varied prices depending only on a brand label – the Ray-Ban models go for 100-200 dollars; the unbranded versions fetch 20-30 dollars. The effectiveness of cultural domination in achieving economic subordination is evident in the fact that the Chinese manufacturers themselves internalized those hierarchies, which they tend to highlight in terms of being aligned with the so-called European standards instead of producing other quality models of their own.

The violence and harm dimension captures the direct physical effects and structural violence incorporated in the relationship of the supply chain [35]. Other than recorded cases of labor abuse and ecological degradation, structural violence also occurs in the form of a denial of developmental opportunities. Once Danyang manufacturers undertake the cost of upgrading their capacity, the lead firms tend to relocate to cheaper locations [36]. The shift towards bottom scenarios leads to their inability to develop sustainably. This ever-present possibility of capital flight acts as an economic compulsion more powerful than a musket in keeping everyone in line with a system of exploitation.

Lastly, the discourse of benevolence, such as partnership goals, technology transfer, and development opportunity, masks the fundamentally extractive nature of relationships [37]. The corporate communications of EssilorLuxottica focus on empowering the suppliers and developing capabilities, following a tendency to construct systems that exclude the tyranny of a genuine empowerment approach. The 2023 sustainability report of the company is ecstatic that the company is delivering training to 10,000 Chinese employees without disclosing that said training is concerned with quality conformity and does not touch on innovation or design capacities, which could be used to upgrade.

The case reveals how Bourdieu's concept of symbolic power operates more effectively in contemporary capitalism than in historical colonialism [38]. Brand prestige converts cultural capital into economic

capital through mechanisms that appear legitimate and voluntary rather than coercive. Workers "choose" to purchase $200 designer frames, suppliers "agree" to exploitative contracts, and governments "welcome" foreign investment—all while structural alternatives remain systematically unavailable [39]. This manufacturing of consent through symbolic domination proves more stable and less costly than military occupation or direct political control, suggesting that supply chain colonialism may be more enduring than its historical predecessors.

5.2 Comparative Analysis with Other Sectors

Similar patterns emerge across multiple manufacturing industries, though the optical sector represents an extreme value extraction and market concentration case. Our comparative analysis reveals common mechanisms and industry-specific variations in the operation of supply chain colonialism across global manufacturing.

Industry	Manufacturing Location	Value Capture	Markup Range	Lead Firm Control
Optical	China (90%)	10-15%	1000-2500%	80% (EssilorLuxottica)
Electronics	China/Taiwan (85%)	5-8%	200-500%	65% (Apple, Samsung)
Apparel	Bangladesh/Vietnam (70%)	3-5%	300-800%	45% (Fast fashion)
Footwear	Vietnam/Indonesia (75%)	7-10%	400-1000%	60% (Nike, Adidas)
Automotive	Mexico/Eastern Europe (40%)	15-20%	100-300%	55% (German, Japanese)

Table 5: Supply Chain Colonialism Indicators Across Industries

The electronics industry provides the closest parallel to optical manufacturing in terms of value extraction mechanisms. Apple's relationship with Foxconn mirrors EssilorLuxottica's control over Chinese suppliers, though with important differences [40]. While Apple captures approximately 60% of iPhone value despite outsourcing all manufacturing, it maintains this control through rapid innovation cycles rather than brand licensing. The constant introduction of new models (annual iPhone releases versus decades-old Ray-Ban designs) creates technological dependencies that must be continuously renewed [41]. Foxconn's attempts at independent brand development (Sharp acquisition, Wisconsin factory) have largely failed due to Apple's ability to shift production to competing suppliers like Pegatron or Wistron, demonstrating how even large, technically sophisticated manufacturers remain subordinated within global value chains.
The apparel industry reveals how supply chain colonialism adapts to different market structures. Fast fashion's lower concentration (H&M, Zara, and Shein combined control only 45% of global fast fashion) might suggest greater supplier power, yet value extraction remains severe [42]. The difference lies in the mechanism: fast fashion leverages extreme time compression and order fragmentation rather than technological control or brand licensing. Suppliers must deliver new designs within 15-20 days while accepting order sizes too small for efficiency gains, creating artificial scarcity of production capacity that drives down margins [43]. Bangladesh garment workers earning $68 monthly produce clothing retailing for 50-100 times production costs, yet suppliers cannot capture this value due to deliberate supply chain fragmentation that prevents scale economies.
The footwear industry shows how symbolic power renders even technically simple goods. Nike's 100-billion-dollar market valuation is mostly based on brand and not on manufacturing capabilities or technological advantage [44]. The capability of the Vietnamese factories that produce Nike shoes is the

same as that of local brands, but Nike collects up to 85 percent of the final sale value because it spends more money on marketing than manufacturing. The company invests 3.6 billion dollars yearly in marketing [45], more than the overall Vietnamese footwear industry earnings on exports, to generate brand premiums that change commodity products into symbols of culture. Such an extensive marketing cost forms insurmountable barriers to entry that even the Global South manufacturer with a perfected production capacity cannot afford to challenge.

The automobile business is part of an exception that sheds light on the situations in which supply chain colonialism is bound. Mexican and Eastern European automotive suppliers earn 15-20% of value-adding to their core countries – virtually the same as firms in any other industry- owing to several factors: proximity to the market for timely auto supplies necessitates geographic proximity; technical complexity demands an actual transfer of knowledge rather than assembly of parts; strong unions in core countries oppose full offshoring; and government policies place restrictions on local content need. Still, at this relatively favorable end lies heavy exploitation, as Mexican automotive employees earn 10-15 percent of what their counterparts in the US do, yet reach the 90 percent mark in productivity. The wage requirements of the recent USMCA trade agreement (requiring 40-45% of auto content to be produced at wage rates of 16+/hour rates) represent some rare recognition of wage arbitrage as a form of unfair trade, but it is not yet in implementation.

The cross-industry analysis shows that supply chain colonialism of some structural attributes (market concentration (monopolistic structure allows exploitation to be greater), product standardization (the commodified products allow superseding suppliers), brand value (symbolic value allows capturing price), and technological complexity (moderate complexity extracts maximum dependency, whereas extreme complexity necessitates actual collaboration). The optical business would be an ideal blending of the four desirable features of a value extraction business: intense concentration (EssilorLuxottica), standardized production (frames, lenses), utmost brand significance (luxury image), and medium-level technology demands (sophisticated but not cutting-edge). This combination indicates the dramatic difference in relation to the ratio of value extraction by optical manufacturing compared to the industries investigated.

5.3 Policy Implications

The emphasis on the integration of global value chains as the current development strategies needs reconsideration due to the facts suggesting permanent hierarchies and low opportunity for upgrading. Existing policy based on foreign investment and export-led growth has not provided sustainable development in Danyang, even after the creation of the largest optical industrial cluster in the world. Other strategies should be implemented to deal with structural barriers instead of considering automatic market integration to upgrade.

The most suitable alternative to the dependency of Global North markets and technologies is regional value chain development. The Asian manufacturers can cooperate without the Western brand controllers with the assistance of the Regional Comprehensive Economic Partnership (RCEP) [46]. Danyang producers might also collaborate with Japanese lens technological companies and Korean retail chains to develop regional supply chains and avoid control by EssilorLuxottica. The case of Chinese smartphone manufacturers such as Xiaomi and Oppo penetrating the Southeast Asian markets proves South-South cooperation in technology-intensive industries is a viable idea or option. Nonetheless, there are substantial obstacles to implementation: path dependency due to the established production networks focused on the Western markets; a bias towards Western brands in the perception of quality, even in the Asian

markets; and the fact that a regional firm, as a rule, does not have the capital to invest in brand building and market-making.

Another exit to the subordinate positions in global value chains is domestic market development in the model of Lenskart in India. The $520 million in revenue generated by Lenskart is helped by the fact that the company mostly serves Indian customers, thereby proving how a big domestic market facilitates the growth of native brands. There are 1.4 billion people in China, and 600 million people need vision correction care [47, 48], which is greater than the combined markets of the US and Europe. The policies could assist the local brands by enacting preferential procurement tariffs (the government is obliged to buy Chinese products), insurance (discounting domestic over imported glasses), and marketing (promoting soft power on Chinese standards of beauty instead of the European luxury models). The recent activity of national Chinese brands such as Li-Ning and Anta in place of Nike and Adidas shows cultural transformation in using national products that can be applied across optical markets.

The right technology acquisition should no longer create incremental gains in the process, but should create radical innovations to disorient established hierarchies. The Chinese optical companies have 80% of their reserves concentrated on manufacturing efficiency instead of basic optical science or design thinking. The reorientation to disruptive technologies also may involve: smart glasses with augmented reality (Chinese leaders already include Xiaomi in this); advanced materials that would leapfrog conventional lens technologies; 3D printing of custom products; artificial intelligence tools that simplify the design process and eliminate the need to rely on aesthetic expertise in Europe. The government coordination could group the resources of the scattered individual manufacturers to obtain the scale required to conduct basic research. Recent discoveries in metamaterial optics have been made within the Chinese Academy of Sciences and indicate the possibility of leapfrogging the current technology instead of catching up through the existing paradigms.

There are collective bargaining systems that could realign the power balance among the suppliers and the lead firms. Single manufacturers cannot gain any leverage over EssilorLuxottica and may only apply pressure together. Among the measures that can be imposed are: forming minimum pricing arrangements against destructive competition; exchanging information about lead firm practices and contracts, coordinating capacity to prevent working too hard and establishing general quality standards free of reliance on lead firm demands. The OPEC model indicates how producer coordination may transfer values between consumers and suppliers. Still, application in manufacturing is a more difficult task as there are fewer barriers to entry and manufacture relocation to another location is possible by the lead firms.

Other forms of property might undermine intellectual property monopolies over supply chain colonialism. The electronics industry also has open-source hardware movements and forms of collaborative innovation based on non-proprietary licensing. Therefore, Chinese manufacturers would jointly develop open standards for optical products whereby businesspeople freely share design and technologies and compete on the basis of excellence in manufacturing rather than based on artificial limitations. The feat achieved by open-source software undermining Microsoft's monopolistic nature would lead to the belief that such software could be applied in the hardware sector. Funding for patent pools, technology commons, and joint R&D by the government would speed up this shift. Nonetheless, to integrate into the current international markets, it must find a reasonable way of operating under the rules of international intellectual property arrangements and trade.

Environmental and social guidelines would be a means of modernization and not an issue of compliance. The environmental regulations set by lead firms for Chinese manufacturers are already in place, and they add costs without allowing producers to hike their prices. Reversing such a dynamic means developing specific Chinese sustainability structures that generate competitive advantages. For example, the principles of the circular economy, in line with the Chinese policy priorities, could distinguish the products, thus minimizing the material costs. Regulations promoting community growth and employee welfare will be more social rather than focusing on limited compliance metrics and could establish national legitimacy and consumer trust. The most important aspect is setting standards that would enable value creation to Chinese stakeholders instead of Global North corporate interests.

These alternative strategies will involve a concerted focus among various stakeholders in implementing the strategies. The government policy should change to move away from foreign investment to domestic capabilities. There is a need to enhance industry associations to make it possible to undertake the necessary group action. Without the control of state-controlled unions, workers need an organization to pursue their interests. Academic institutions must return to research to solve domestic problems instead of Global North research plans. The financial systems should be reorganized to help foster longer-term capability creation instead of short-term export promotion. The changes are faced with vested interests who have benefited under the existing order of arrangements and entail a political will and social mobilization that hardly exists now, but are bound to be introduced as the inequality and cost to nature become unsustainable.

5.4 Limitations and Future Research

This study's focus on a single industry and geographic location, while enabling deep analysis, limits the generalizability of findings. The optical industry's extreme market concentration may not reflect dynamics in more competitive sectors. Danyang's specific historical development path shapes outcomes in ways that might not apply to other manufacturing clusters. These limitations, however, also point toward productive avenues for future research that could extend and refine our understanding of supply chain colonialism.

Comparative analysis across Chinese manufacturing hubs would illuminate how local conditions shape integration into global value chains. Shenzhen's electronics industry, Dongguan's toy manufacturing, and Wenzhou's lighter production developed distinct relationships with global capital that merit systematic comparison. Preliminary evidence suggests that regions with stronger local entrepreneurship (Wenzhou) achieve greater autonomy than those dependent on foreign investment (Dongguan), but comprehensive analysis remains lacking. Such research could identify specific institutional, cultural, and economic factors that enable or constrain upgrading within global production networks. The role of local government capacity, educational infrastructure, diaspora networks, and historical trading relationships likely creates significant variation in outcomes that current literature inadequately addresses.

Longitudinal studies tracking value distribution changes over extended periods would reveal whether supply chain colonialism intensifies or weakens over time. Our analysis provides a snapshot of current conditions but cannot determine trajectories. Historical data from the 1990s suggest that value capture by Chinese manufacturers has declined despite technological upgrading, but systematic evidence remains limited. Future research should examine whether specific events (financial crises, trade wars, pandemic disruptions) create opportunities to restructure power relationships or reinforce existing hierarchies. The COVID-19 pandemic's disruption of global supply chains initially seemed to strengthen supplier

bargaining power. Still, preliminary evidence suggests lead firms used the crisis further to consolidate control through selective support for compliant suppliers while abandoning others.

The impact of geopolitical tensions and reshoring initiatives on supply chain hierarchies requires urgent examination. The US-China trade war, technology export restrictions, and "friend-shoring" rhetoric suggest potential fundamental restructuring of global production networks. However, early evidence indicates that production shifts from China to Vietnam or India often maintain or intensify colonial relationships, with Chinese manufacturers establishing subsidiaries in third countries to circumvent tariffs. At the same time, ultimate control remains with Global North brands. Research should examine whether geopolitical fragmentation creates opportunities for Global South manufacturers to play competing blocs against each other or multiply exploitation sites.

Online stores and e-commerce may disrupt existing value chains, which may be unable to contract manufacturers to supply goods directly to consumers. With direct supply access, manufacturers in Danyang that sell via Alibaba, Amazon, and Shopify can bring the fruit of their production to consumers by avoiding the traditional distribution channels that can bring them more value. Nevertheless, the platform monopolies can merely substitute traditional intermediaries as value extractors. Studies should consider whether there exists a democratizing of market access in digital technologies due to the disadvantages of new forms of algorithmic colonialism based on data control, manipulation of search position in the ranking, and fee-setting systems, which position platform owners to gain rents. The emergence of livestream commerce in China implies other possibilities that should be explored, especially in answering whether such can result in true disintermediation or is simply a change of the method through which value is extracted.

Colonialism aspects of the supply chain regarding the environment have been poorly studied despite the increased awareness of environmental imbalance exchange. The optical industry within Danyang already makes a significant amount of pollution and resource depletion, which implicitly subsidizes the consumption in the Global North with the externalized environmental costs. The measurement of such ecological transfers, and how the contemporary environmental regulations may become instruments of perpetuating or challenging the colonial relations, should be a topic of future research. The proposed Carbon Border Adjustment Mechanism by the European Union might cause environmental upgrading or introduce new obstacles to manufacturers in the Global South due to its implementation details, which should be analyzed carefully.

Supply chain colonialism also has various aspects of gender and intersectionality that must be investigated. The optical industry employs 67 percent of workers in Danyang who are women, but in the assembly lines, where the lowest salary is paid, workers are mostly men, with women and the management. The combination of gender exploitation and rural-urban inequalities, embedded under the hukou system, puts forward several levels of subordination that the current frameworks fail to recognize effectively. The problem that should be researched is how patriarchal systems in the supplier companies operate in conjunction with colonial relations between the companies to build upon each other's disadvantages of women workers. Particularly, social reproduction and how families and communities support the global capital via low-waged workers sustenance is an aspect which demands a feminist political economy of thought.

Future studies on supply chain colonialism can be reinforced through methodological breakthroughs. The existing research significantly depends on aggregate data, which masks everything at the firm and

individual levels. An ethnographic study of factories might help find out how workers experience themselves in a colonial relationship and possibly rebel against it. The structures of ownership and values could be described more precisely in terms of the influences of network analysis techniques instead of the present input-output models. The experimental methods could include testing whether consumers would use alternative brands when they did not associate quality with country-of-origin preferences. A combination of quantitative value chain analysis and qualitative analysis of power relationships has been underdeveloped in the given literature.

The overarching theme of the research directions is a more general one that illuminates how the hegemony of new forms of capitalism replicates colonial relations through economic processes. The Danyang case is a basis of this analysis, yet to get a thorough knowledge, it is essential to analyze different industries, regions, and aspects of exploitation. With the global supply chains being inhibited by obstacles such as the environment, geopolitics, and social movements claiming justice, the research should follow the rapid changes concentrated on forms of domination and resistance.

6. CONCLUSION

The Danyang case shows how the mechanism of global inequalities continues to operate via supply chain colonialism, whereby economic processes are as operative as political colonialism of the past in exploiting the Global South. Irrespective of the unprecedented manufacturing scale and technical sophistication, Chinese optical manufacturers remain systematically locked out of the high-value activities dominated by EssilorLuxottica and other firms headquartered in the Global North. This exclusion follows interdependent processes of technology control, brand monopoly, and restrained distributions, all of which keep industrial upgrading irrespective of manufacturing aptitude.

Our interpretation indicates that modern colonialism operates based on transforming symbolic capital (brands) into economic capital (profits) instead of political dominance or productive advantage. The capacity of EssilorLuxottica to derive markups of 1000-2500 percent on articles produced in China, combined with keeping the suppliers at an advantageous level, is a good illustration of how the global value chain increases as opposed to decreasing international hierarchies. The findings imply the assumptions of conventional development economics related to the positive effects of global economic integration and the necessity of alternative development approaches based on the emphasis on retention of values rather than on volume of production.

The fact that supply chain colonialism has continued to exist even in the face of industrial progress in China shows that the key to ending the dishonor of supply chain colonialism needs to be beyond competitiveness in manufacturing and technology competence. Fundamental challenges to global economic hierarchies demand coordinated action across multiple dimensions: alternative property relations, South-South production chains, autochthonous brands with cultural content, novel forms of international economic regulation focused on development, not efficiency. The prospects of the global value chain working as the process of extracting values rather than development opportunity instead of operating, shall remain, unless there are such systemic changes, and the wealth inequalities, based on historical colonialism and manifested in modern capitalist systems, shall be accordingly perpetuated.

The severe concentration in the optical industry gives a direct perspective on forces working more subtly in global manufacturing. With digitalization, automation, and pressures on production systems, the study and the solution to the problem of supply chain colonialism are needed to accomplish real economic

justice and not the redistribution of poverty within the framework of global value chains. The Danyang case ultimately demonstrates that clear vision—both literal and metaphorical—remains systematically denied to those who manufacture the world's optical products while others capture the value of their labor.

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