



Introduction



If you haven't experienced it before, Thermoplastic Polyurethane 3D printing is surprising. It leaves behind a fine white powder as it turns a mostly-recycled stock material into a finished, environmentally sustainable, and aesthetically remarkable product. It's even more surprising to see that powder dusting a historic brick masonry wall, and collecting at the base of old-growth Oregon timber columns, in a building that is over a century old, right in the center of Portland's Old Town Chinatown neighborhood.

This is the scene you'll find when you walk into the production lab at HILOS, a technology company that has retooled the design-to-product workflow for the footwear industry. HILOS offers "design at the speed of thought" to incumbent footwear brands, enabling them to reduce the time between *design concept* and *functional sample product* by orders of magnitude.

Because HILOS is essentially a production-lab-as-design-studio, the late-2010s startup office trope—co-working desks at WeWork—wouldn't be sufficient. During the height of the COVID-19 pandemic, the fledgling startup moved into Portland's historic Povey Glassworks building. Like most of the buildings around it, the Povey building had been converted to offices for knowledge workers during the "creative class" boom of the early 2000s and 2010s. And in 2020, almost overnight, it emptied out. When HILOS found it, the space was empty, and the price was right.

HILOS leveraged that opportunity to create a new kind of work space. The former creative office, the generic kind of real estate that remains impossible to fill in the aftermath of the pandemic, became a hotspot for both designing and producing the next generation of sustainable footwear. Today, it is thriving. It has attracted a cluster of businesses nearby—and inspired a full innovation campus development called Made in Old Town (see Chapter XX). The Povey Building is productive, in all senses of the word.

The story of HILOS—its market positioning, its techno-

logical approach, and its location—is a signal that three generational trends are converging. Urban cores are hollowing out, supply chains are in flux, and breakthroughs in manufacturing technology are bringing the next generation of products into sharper focus... and bringing them to the urban core of American cities. This is a new urban industrial economy.

Is it simply reshoring? Patriotic "Made in America" industrial rhetoric? Yes and no. To this day, most reshoring attempts have failed, and they will continue to fail if they attempt to replicate outdated manufacturing models that were built in a very different context. Modern manufacturing is synonymous with astonishingly low wages, inhumane work conditions, and environmental degradation. Domestic production is viable if and only if the fundamentals of production are reimaged. This book makes the case that success requires a radical transformation—of the product itself, where it is made, how it is made, and how the public sector creates the conditions for its making—to meet today's market realities, technological possibilities, and real estate opportunities.

What are those market realities? Rapid consumer demand cycles, a strong sustainability mandate, and unpredictable but increasingly protectionist and isolationist tariff regimes. Decades of optimizing supply chains, squeezing suppliers, and labor arbitrage created an intricate, efficient, and shockingly fragile global system. The pandemic showed just how brittle it was. In its aftermath, resilience is the new efficiency; redundancy is a feature, not a bug.

Technology is maturing. For decades, 3D printers have been an interesting novelty at the periphery of production; the primary use cases were prototyping and hobbyist open sourcing. Recent advancements in material science, production equipment, and automation are making it possible to efficiently integrate advanced manufacturing into supply chains for full-scale production. Crucially, this will only be viable if designers effectively leverage these new technologies, which



will, necessarily, result in a new aesthetic. This new mode of production stands to reshape the relationship between companies, their customers, and their employees—and, perhaps, the meaning of work.

And real estate? Office vacancy remains stubbornly high, while the housing crisis only grows more severe. The idea of solving both crises through office to housing conversion is popular, but architectural analyses have repeatedly proven that it is only feasible in a narrow subset of the building stock. And even then, conversion requires significant public subsidy and yields market-rate units. Office to housing is not a solution; it is neither scalable nor financially viable. Office to production, however, is absent from the architectural, political, and popular discourse.

Three trends; three motive forces for the next urban economy. This book is a call to action for entrepreneurs, architects, neighborhood residents, urban planners, culture-creators, workers and labor leaders, real estate developers, economists, and elected officials: now is the time to leverage a generational opportunity and define a new production paradigm.

A chorus of voices are making this call—in Production Potential, we hear from leading scholars and practitioners. Elisabeth B Reynolds scaffolds a digital, resilient, and sustainable framework for industrial transformation. Mariana Mazzucato offers a mission-oriented innovation policy framework built to foster that kind of transformation. She advocates for an active government that creates value through public-private partnerships beyond traditional subsidies. Her question is not *whether* the government should intervene in the industrial economy, but rather, *how to structure government interventions* that build capacity not dependency. In her eyes, the role of the public sector is ultimately to shape markets for public benefit.

Matt Shafer shows what kind of political economy might emerge from a new industrial and technical paradigm that reunites design with production, mind with hand. Old questions—*who makes, and who owns the means of production?*—are newly relevant as advanced manufacturing equipment enters the supply chain. And how might policymakers choose a path forward into a new political economy? Dan Breznitz disentangles four stages of innovation and shows how regions can strategically build production capacity to create shared prosperity.

Industrial transformation is at the heart of this book; it is impossible to articulate production potential without a deep understanding of corporate pathologies. James Carnes describes his experience with the Adidas Speed Factory, one of the most ambitious domestic manufacturing projects in U.S. history. After only 5 years, the Speed Factory unraveled,

leaving behind lessons for the integration of design, automation, and advanced manufacturing in the context of existing, high-pressure product line requirements. Labor—labor cost, labor rights, worker-ownership, training, upskilling, and workforce development—cast a long shadow over every discussion of domestic production. Guarino brings to bear her experience of creating the Industrial Sewing and Innovation Center in Detroit as she articulates a fresh approach to models of production innovation that work for workers.

Dan Hill—a systems theorist, technologist, strategic designer, and architect—resists a pat ending to the book. His essay *The Backend of Production* makes visible the complex systems of adaptation, reuse and repair that exist at the most radical extremes of top-down and bottom-up production contexts—systems that are largely absent from the middle band of North American, European, and Australian economies. Hill poses a series of questions that will serve as guideposts on the path toward regional circular economies that operate sustainably within planetary boundaries, under the control of their end users and their workforce.

This book offers a glimpse into a future when feedback loops between the innovation-design cycle and the production engineering-manufacturing cycle propel the next chapter of products, and distributed domestic manufacturing is integrated within urban cores. This future is neither speculative nor theoretical. A new economics of production is emerging at a time when the financial infrastructure of American cities is strained to the edge of collapse. The fundamentals have changed. There is no going back to a pre-pandemic time; the only way out is through.

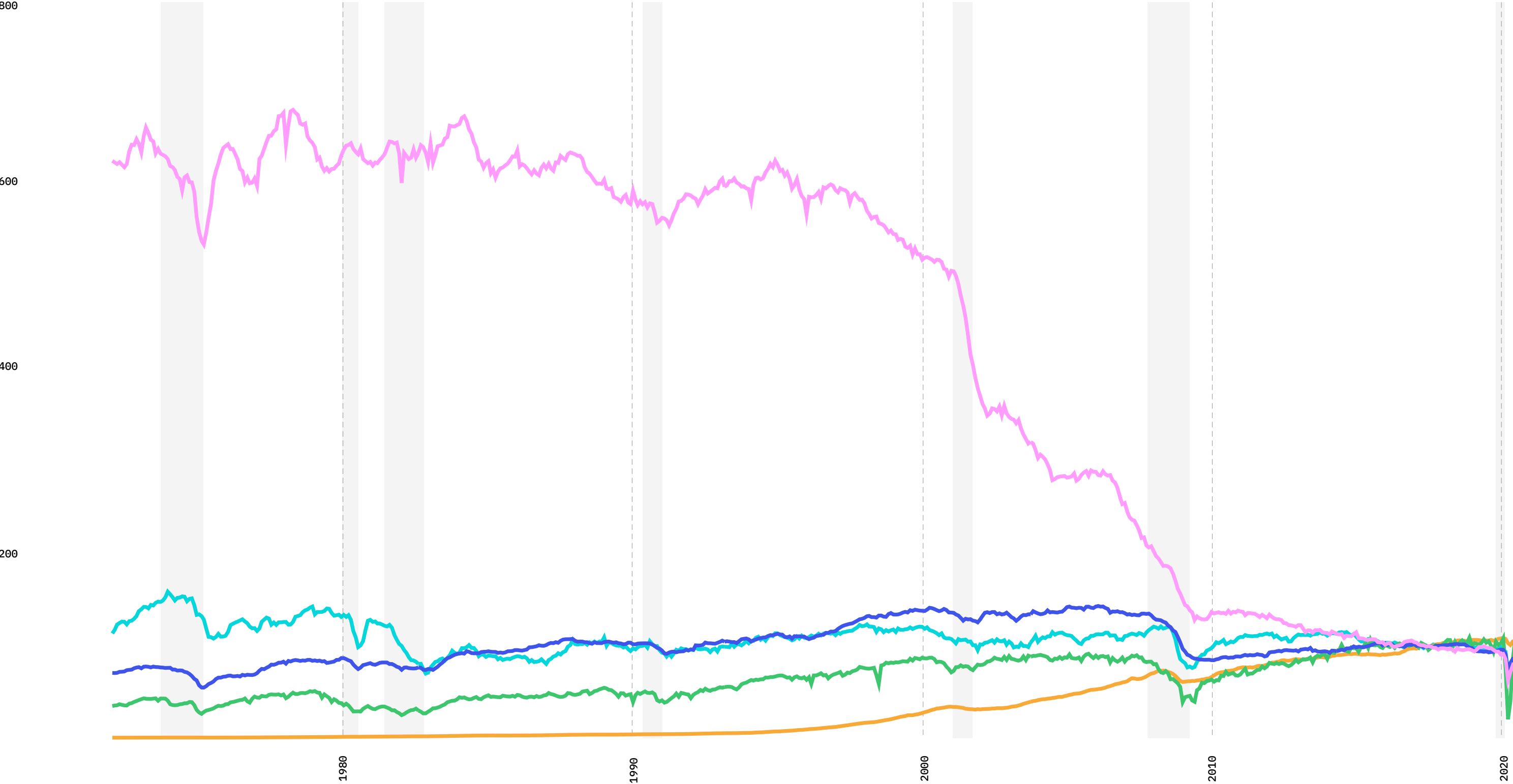
The next urban economy will leverage an abundant resource—vacant building stock—into a new value-driver for cities and their residents, companies and their employees.

This is Production Potential.



INDUSTRIAL PRODUCTION MANUFACTURING BY TYPE

- Apparel and Leather Goods
- Furniture and Related Products
- Motor Vehicles and Parts
- Computer and Electronic Products
- Primary Metal



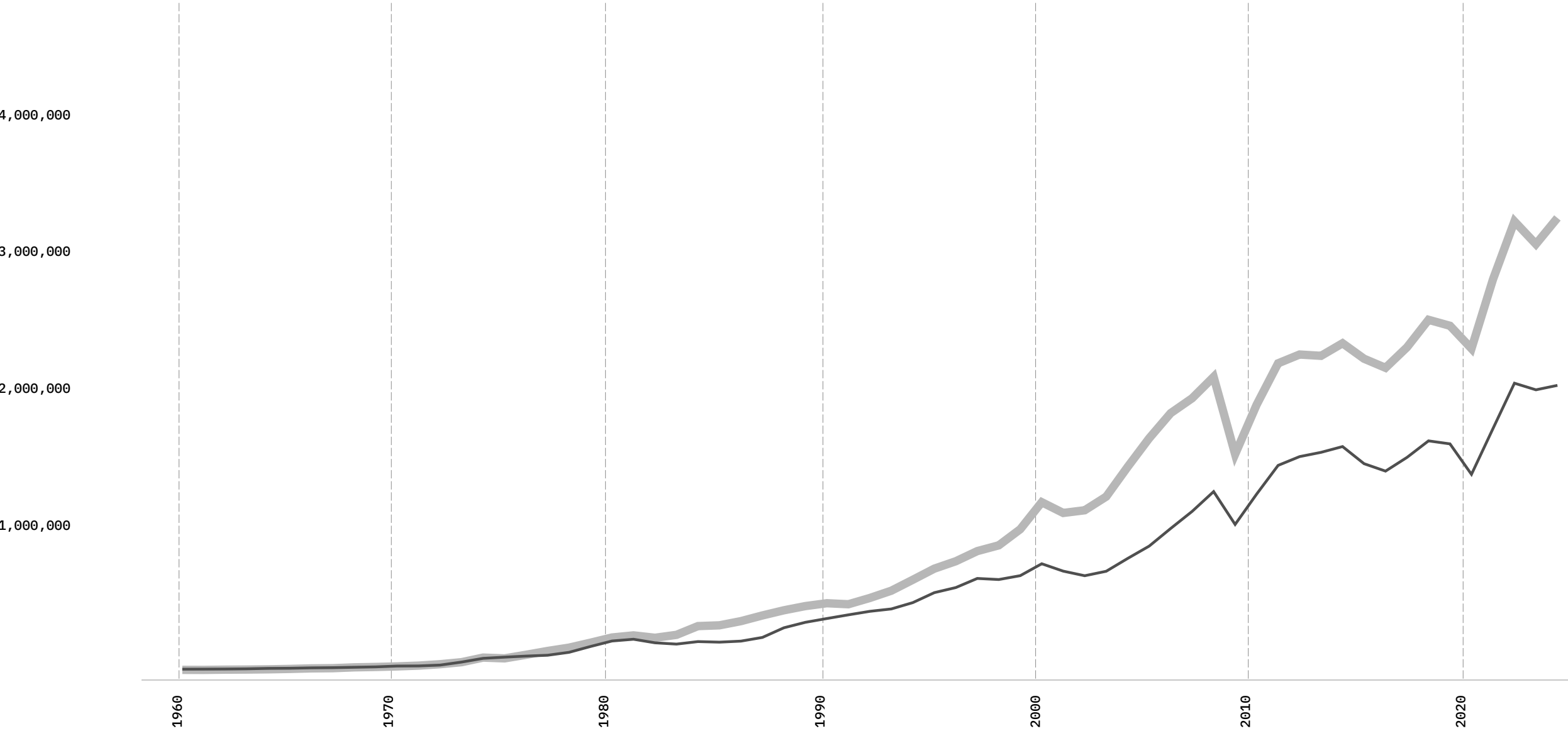
What does America make? During the 1970s, this was a country of apparel and leather goods. With a decline beginning in the 1990s, domestic apparel production experienced a precipitous decline during the 2000s. The only manufacturing sector category to experience growth has been computers and electronics.

IMPORT VS. EXPORT OF GOODS

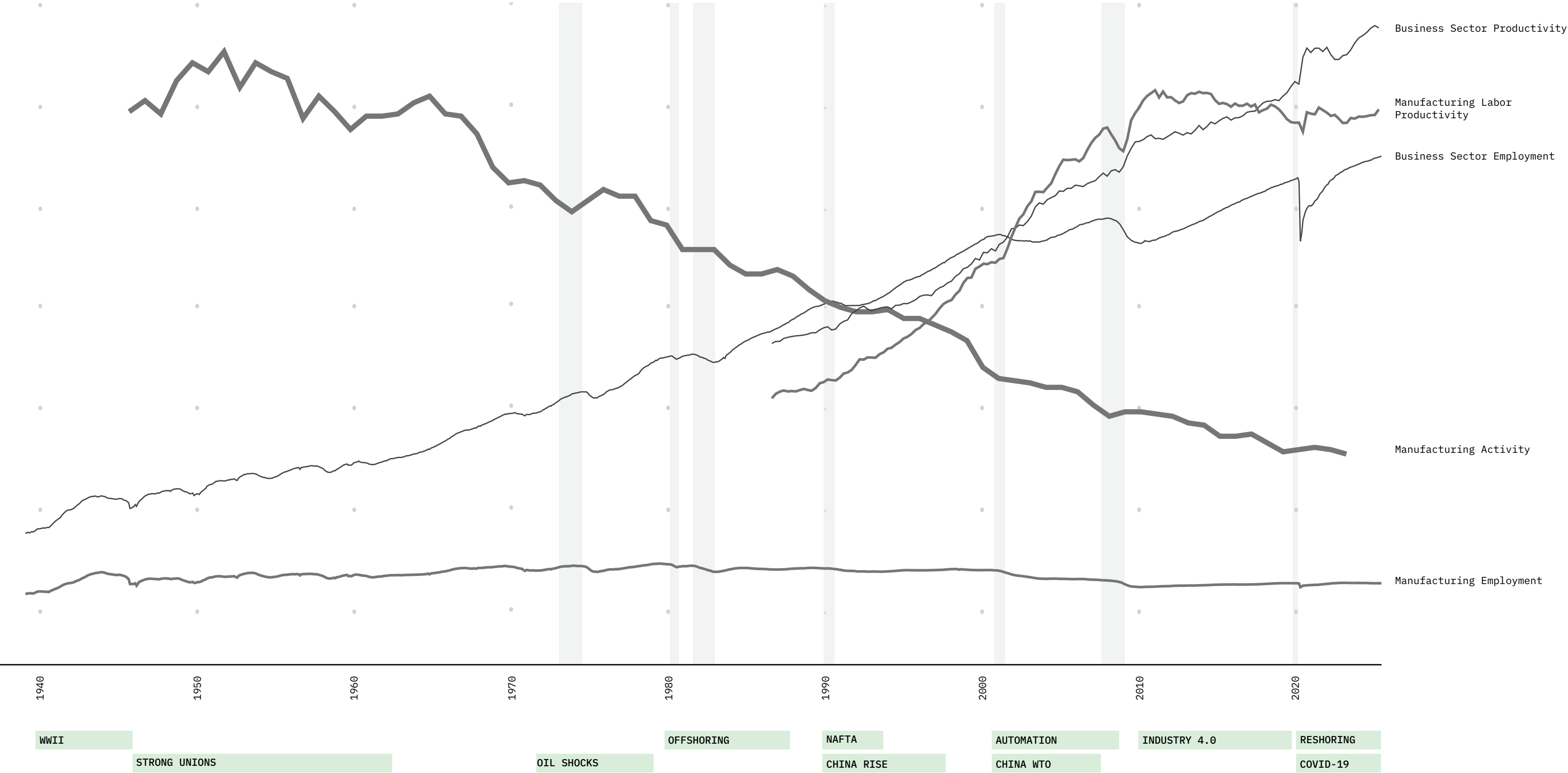
(Millions USD, months seasonally adjusted)

Import

Export



US MANUFACTURING TIMELINE



Imports and exports have been diverging since the 1960s, as the US slowly shifts to an export-focused economy.

WHERE YOU MAKE IS WHERE YOU INNOVATE

Under the Washington Consensus, U.S. firms spent half a century outsourcing manufacturing to specific regions in countries like China and Vietnam, where manufacturing capacity evolved from simply executing designs to developing ground-breaking innovation at the cutting edge of production. During the 1970s and 1980s, American firms brought manufacturing equipment, quality control systems, and production methods to overseas factories that supplied their products. Throughout the decades that followed, brands put continuous pressure on suppliers to hit sustainability, performance, and cost targets—which, by and large, suppliers achieved through local innovation in materials and processes. Dan Breznitz documents this as a fundamental *kind* of innovation. It sits in the middle of the value chain, and spans the course of a product’s maturation in the market. This kind of innovation is very different from the much-celebrated early invention stage associated with Silicon Valley startups, but it is crucial to continued performance, quality, and cost reduction. It is what makes multinationals competitive.

The concentration of global supply chains in specific regions spurred this kind of process innovation. Chinese regions could offer a competitive edge to U.S. companies that worked within their dense manufacturing ecosystems, and they leveraged that benefit, negotiating for technology transfer as a condition of market access, and investing heavily in absorbing and improving upon American manufacturing processes.¹¹

Supply chains thrive on proximity. This has been true since the textile mills of Manchester and continues to define the factory cities of China’s South Fujian Province. In 1890, Marshall defined three ecosystem effects—what he called *agglomeration forces*—that cause manufacturing industries to cluster geographically: labor market pooling, input-output linkages, and knowledge spillovers.¹² In more recent years, economist Michael Porter extended the Marshallian district model to show how manufacturing combines with R&D, financial infrastructure, training institutions, and specialized services to

create self-reinforcing “sustainable competitive advantages” at a regional scale.¹³

The cluster effect of innovation and production is a fundamental principle that recurs around the world and across time, in places like Wenzhou, China, or León, Mexico, or Ho Chi Minh City, Vietnam. “For those firms engaged in new product introduction, the ability to source parts and iterate with suppliers is key,” according to Elisabeth Reynolds. Dense networks of suppliers, brands, manufacturers, and logistics providers, all located within a two-hour driving radius, make it easy to fluently source materials, create, test, and iterate on product designs, then seamlessly scale up production. Firms in these ecosystems collaborate and compete at a rapid pace, using readily available industrial infrastructure and drawing on deep pools of talent.¹⁴

In the early 2000s the cost of labor grew quickly in China, and factory owners turned to automation to hedge against it, boosted by China’s national plan for automation, which included cheap state loans and subsidies. Suppliers, manufacturers, and production engineers rapidly iterated and innovated, and over time achieved a sustainable rate of product development and improvement that was impossible in the United States.

In short, *where you make is where you innovate*. The expansion of China’s innovation capacity in just a few decades has been dramatic: the country evolved from manufacturing simple, labor-intensive goods to becoming a leader in advanced manufacturing, robotics, and production innovation.

Conversely, American firms that outsourced manufacturing lost the ability to fundamentally reimagine products and production methods. When a looping journey of design iterations, global travel, material supply, and logistics management separates designers from manufacturing, they miss performance and aesthetic opportunities that arise from materials, equipment, and methods of assembly—and are therefore unable to fundamentally reimagine how products are actually made. Instead, they default to supply chain inertia.

For a multinational with a globalized production process, each element of the supply chain is increasingly burdened. This has a chilling effect on product innovation. When a sprawling process is both interdependent and optimized, the whole system has to operate on razor thin margins, rigid timetables, and low-to-no redundancies. *Risk* becomes the most important decision-driver. Every actor in the value chain seeks to minimize risk, lest the house of cards topple. That means working with the same material provider season after season, for example, or offering a “new” product by simply swapping one component for a functionally identical one, rather than reimagining its fundamentals.

¹¹ And, in some cases, infringed on protected intellectual property (IP).

¹² Belussi, F; Caldari, K. (2009). “At the Origin of the Industrial District: Alfred Marshall and the Cambridge School,” *Cambridge Journal of Economics*, 33(2), 335-355.

¹³ Porter, M. (1998). Clusters and the new economics of competition. *Harvard Business Review*, 76(6), 77-90.

¹⁴ As we will see later in this chapter, Alfred Marshall first described the underlying dynamics of industrial districts in 1890. Firms remain competitive, but specific agglomeration effects lead to collective efficiencies and increasing returns for all firms in the region.

A FUTURE FACTORY NEEDS A FUTURE PRODUCT

In the early 2010s Adidas attempted to realign design and production. The global footwear giant filled two facilities—one in Atlanta, Georgia, and the other in Ansbach, Germany—with cutting edge manufacturing technologies. Robotic arms passed componentry to advanced knitting machines that could self-correct using computer vision. The facility was equipped to make the world’s most unconventional and sophisticated shoes. The promise of the Speed Factory was to serve as a zone for experimentation, where designers and manufacturing experts could collaboratively reimagine aesthetics and fabrication processes for an era defined by advanced manufacturing technologies.

But in spite of—and, perhaps *because of*—its technical sophistication, the Speed Factory closed its doors for the last time in 2020. Sheer business inertia at Adidas created pressure to use the factory for making the company’s most successful products. These products were already optimized for conventional production methods in Asia: high-labor, high-volume, high-waste shoes composed of dozens of parts, assembled in hundreds of labor-intensive steps.¹⁵ 3D printers are inefficient tools for making conventional shoe parts. Computer vision is unnecessary. Manufacturing in the United States and Germany, where labor is expensive, is not viable. The Speed Factory didn’t fail because advanced manufacturing is impossible in the United States; it failed because it was contorted to manufacture conventional products.

The Speed Factory’s lesson is not that domestic production is impossible, but that production economics work only when the product and the manufacturing capabilities align. Advanced manufacturing equipment is best suited to create components with complex geometries and attachments that require minimal human labor to assemble. And when those components are finally assembled, the result looks very different from a conventional shoe. In short: the aesthetics, the cost-viability, and the production process are all fundamentally interrelated. We are all used to the aesthetics of mass

production, but that aesthetic is not a given. In fact, it’s an extremely narrow pigeonhole! When *location becomes identity and process becomes product*, a whole spectrum of design outcomes can emerge.

So, do advanced manufacturing technologies make domestic production viable? No, not in and of themselves. The Speed Factory shows that advanced equipment only works if it is used to create fundamentally new products in small production runs (“batch on-demand”). And the history of product and process innovation shows that sustained competitiveness depends on dense supplier networks.

¹⁵ For an introduction to the complexity of footwear as a product, see the Footwear Manifesto. Footwear Collective at MIT. (2022). *The footwear manifesto*.



THE LOCALIZATION CONSENSUS

Is there reason to believe that domestic manufacturing can work today—especially when well-funded, high-profile attempts like the Speed Factory have failed?

Conventional wisdom reduces the choice of manufacturing location to two factors: tariffs and labor cost. Those were, in fact, the most important decision criteria under the Washington Consensus, and for decades they pointed decisively *away* from the U.S. as a sensible manufacturing location.

But tariffs and labor costs have risen dramatically since China entered the World Trade Organization. In the half decade since the Speed Factory closed, the global pandemic recalibrated wages internationally, and political tides have turned in countries around the world, leading to higher and less predictable tariffs.¹⁶ And these are no longer the two most important determinants of a strategic manufacturing location decision. Key factors are coming into sharper focus: protectionist policy, new consumer demand patterns, a shift from volume to speed in manufacturing, advanced manufacturing equipment and processes, and supply chain resilience.¹⁷ The United Nations’ Trade and Development agency called these macro trends a “perfect storm,”¹⁸ that is buffeting international manufacturing.

During the 1990s peak of globalization, companies attempted to reduce production time and cost by designing dizzyingly complex global supply chains that operated with razor thin margins, and without buffers or redundancies. Efficiency gains came at the cost of resilience. The COVID-19 pandemic was proof. Broken links in the chain had ripple effects, causing transportation costs to spike up to 700%, with a persistent increase of 300%.¹⁹ More recent tariff hikes not only increase cost, but introduce dangerous degrees of uncertainty in global trade.²⁰ In this environment, multinational companies are redesigning their production networks for resilience. How? Introducing redundancy (capacity to make a certain product in several factories simultaneously), diversity (maintaining a manufacturing footprint in several countries),²¹ new risk as-

sessments (prioritizing suppliers and logistics in countries perceived as politically and economically safe or low-risk”),²² and proximity (making in-market or near-market).²³ Following recent disruptions, supply chain resilience is cited as the most important justification for location and proximity.²⁴

International trade politics have grown unpredictable. After decades of liberalization—an era when the U.S. led a global agenda of non-interventionist policies and multilateral cooperation in the name of the “free market”—national governments are now embracing selective regional, bilateral, and ad hoc economic integration.²⁵ Over half of the countries in the world have adopted measures that restrict foreign direct investment, alongside domestic industrial policies and tariffs. This is especially true in the United States, where the Trump administration has taken an unprecedentedly aggressive approach to protectionism,²⁶ with the stated goal of bolstering domestic manufacturing.²⁷ It is important to note that this emphasis is not unique to a single politician, party, or political ideology. In March of 2022, U.S. President Joe Biden touted a “buy American” rule that would require 75% of all goods purchased with American tax dollars to be sourced domestically, stating that “we also need a resilient supply chains of our own so that we’re never at the mercy of other countries for critical goods ever again.”²⁸ Across the aisle and around the world, governments are intervening in the market in new ways.²⁹

If local production is important to governments; local *consumption* is increasingly important to the general population. A comprehensive report found that 47% of U.S. consumers surveyed prioritize local provenance in their buying decisions, both to support domestic companies and because local products “better suit their needs.”³⁰ Consumers see locally produced goods as higher quality, and perceive local goods to be more environmentally sustainable.³¹

The legacy factory competed by offering high production volume and a low product mix—in other words, driving down cost by producing huge runs of a single product. Because it is

¹⁶ “The same factors that propelled the early growth of international production, namely policies (a wave of liberalization and export-led growth policies), economics (e.g. declining costs of trade) and technology (advances allowing the fine-slicing of production processes and coordination in complex cross-border supply chains) [have] started pushing in the opposite direction.” United Nations Conference on Trade and Development. (2020). *International production: A decade of transformation ahead* (World Investment Report 2020, Chapter 4).

¹⁷ McKinsey & Company. (2022). *To regionalize or not? Optimizing North American supply chains*.

¹⁸ “At the start of a new decade [2020], the global system of international production is experiencing a perfect storm, with the crisis caused by the COVID-19 pandemic arriving on top of existing challenges arising from the new industrial revolution (NIR), growing economic nationalism and the sustainability imperative.” United Nations Conference on Trade and Development. (2020). *International production: A decade of transformation ahead* (World Investment Report 2020, Chapter 4).

¹⁹ McKinsey & Company. (2020). *Risk, resilience, and rebalancing in global value chains*.

²⁰ McKinsey & Company. (2025) *Tariffs and global trade: The economic impact on business*.

²¹ According to the United Nations Trade & Development 2025 Report, “multinationals are restructuring supply chains towards South-East Asia, Eastern Europe and Central America – a shift that began during the pandemic and is accelerating.” United Nations Conference on Trade and Development. (2025). *World investment report 2025*. The Federal Reserve found that US-China tariffs, specifically, have led to diversification in suppliers and trade partners “the increased tariffs have led to a shift in U.S. imports from China to U.S. imports from other trading partners.” U.S. Federal Reserve. (2024). *Global trade patterns in the wake of the 2018-2019 U.S.-China tariff hikes* (FEDS Notes).

²² The World Economic Forum consolidates data into three strong trends: on-shoring, near-shoring, and friend-shoring. World Economic Forum. (2023). *Friendshoring: Global trade buzzwords*.

²³ Akinbolajo, O. (2022). Reshoring strategies and nearshoring in post-pandemic US supply chain resilience. *International Journal of Scientific Research and Advancement*, 2(4).

²⁴ “Supply chain disruption risk has become the dominant reshoring motivation, cited by 87% of manufacturers in 2022 versus 42% in 2019.” McKinsey & Company. (2022). *Future-proofing the supply chain*.

²⁵ Regional, bilateral, and ad hoc agreements are referred to as “near-shoring” and, somewhat comically, “friend-shoring.”

²⁶ See a list of Presidential Tariff Actions here. U.S. Trade Representative. (n.d.). Presidential tariff actions.

²⁷ On April 02, 2025, the US White House issued a statement that described its trade strategy. The document makes the case for manipulating import duties to spur domestic production, noting that “the need to maintain robust and resilient domestic manufacturing capacity is particularly acute in certain advanced industrial sectors.” White House. (2025, April 2). *Regulating imports with a reciprocal tariff to rectify trade practices that contribute to large and persistent annual United States goods trade deficits* [Presidential action].

²⁸ White House. (2022, March 4). *Remarks on manufacturing* (Administration of Joseph R. Biden, Jr.).

²⁹ More precisely: governments are intervening in some old ways that were thought obsolete, and are unexpected today.

³⁰ McKinsey & Company. (2025). *State of the consumer 2025*.

³¹ The Retail Insight Network collects market studies to maintain an up-to-date understanding of consumer sentiment. A 2023 research summary describes a predilection for domestically produced goods. *Retail Insight Network*. (2023). Consumers keen to buy local, despite cost-of-living crisis.

impossible to predict demand, it is impossible to avoid over-production; an estimated 30% of apparel products that are made are never sold.³² Rather than undermine brand image with discount sales or second-market retailers,³³ many companies incinerate their dead stock,³⁴ and enjoy tax benefits for doing so.³⁵ As it worsens, this environmentally damaging practice is coming under greater scrutiny.³⁶ More and more companies disclose their manufacturing practices, and the consumer rewards their transparency and choice of locations or partners, especially when those locations and partners are domestic.

Increasing speed to market has long been a priority, but there are upper limits. For decades, companies dealt with an 18 to 24-month production cycle by deploying immense marketing and advertising budgets to actively shape consumer trends (rather than predict them). In the era of TikTok and fickle celebrity collaborations, the calculus is changing.³⁷ Today, speed and agility are more effective than brute force market manipulation, and as speed reaches the upper limits of supply chain complexity, the only option is proximity. Companies now focus on making quickly, iteratively, and locally.

All told, the Washington Consensus—an era when companies and governments focused on efficiency and cost optimization through offshoring and global trade—is giving way to the localization consensus.

The new regime is defined by supply chain resilience, protectionism, advanced manufacturing, environmental sustainability, and the capacity to “read and react” to local markets as primary drivers of decisions about *where to make*. Data proves out the localization consensus: there has already been a significant increase in the share of direct investment dedicated to manufacturing in the U.S.

This is the context in which HILOS makes sense. Legacy companies like Vans, Nike, and Steve Madden manufacture overseas. They are experiencing intense pressure to deliver new, customer-centric products faster than ever, while reducing environmental impact and lowering cost, all without the efficient supply chains they have come to rely on. The answer cannot be a change of *degree* (incremental gains in speed, or substituting in a new bio-based leather), it must be a change of *kind*.

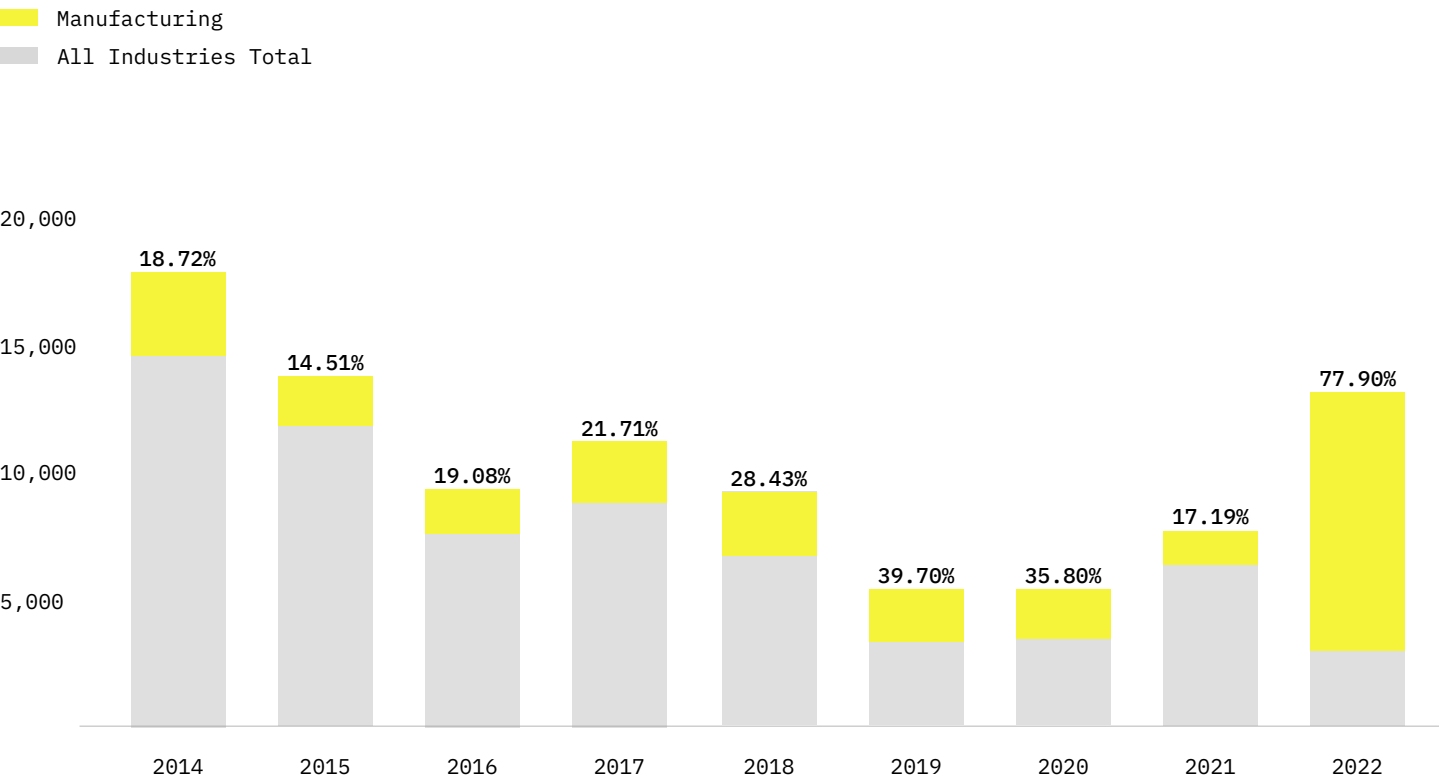
HILOS offers a wholly alternative model, with integrated design, sample making, and on-shore or near-shore production in limited, batch-on-demand quantities. Production is proximal to the consumer market. When the company’s founder was searching for a place to locate his company in 2020, he made the same choice as Charles Danner did nearly a century earlier. It had to be Portland, Oregon. Here, HILOS has benefited from the talent pool, suppliers, investor networks, and creative identity of a footwear town. It is an early example of the localization consensus.

“The most visible impact of the deglobalization trend will be the urgency to exploit local markets, build proximity to customers, and re-shore and near-shore material suppliers, talent, and operations... most importantly, reshoring and nearshoring will win them social and governmental approval while simplifying compliance.”

SRINIVASAN SESHADRI ³ ⁸

NEW FOREIGN DIRECT INVESTMENT IN THE UNITED STATES

(Businesses expanded, businesses established; Millions of dollars)



³² In an article provocatively titled ‘It’s the industry’s dirty secret’: why fashion’s oversupply problem is an environmental disaster, *The Guardian* describes a shocking lack of data on oversupply in the fashion and footwear industry. “No one knows exactly how many coats, jeans, T-shirts and trainers are produced every year, which means no one knows how many garments remain unsold in warehouses, destined for landfill or destruction...The available statistics suggest that between 80 billion and 150 billion garments are made every year and that between 10% and 40% of these are not sold.” *The Guardian*. (2024, January 18). ‘It’s the industry’s dirty secret’: Why fashion’s oversupply problem is an environmental disaster.

³³ These include, for example, Marshalls, TJ Maxx, and Ross.

³⁴ “Deadstock,” refers to product that doesn’t sell and is too expensive to store, and is a huge liability for brands, according to Vogue. Vogue Business. (2021). *Why destroying products is still an Everest of a problem for fashion*.

³⁵ Under U.S. Customs and Border Protection program (and 19 USC § 1313, the section of U.S. Code, which centers on “drawback and refunds”), “If imported merchandise is unused and exported or destroyed under Customs supervision, 99 percent of the duties, taxes or fees paid on the merchandise by reason of importation may be recovered as drawback.”

³⁶ BBC Earth. (n.d.). *Will fashion firms stop burning clothes?*

³⁷ According to McKinsey’s 2025 State of the Consumer report, “high-velocity trends and unpredictable consumers continue to define the [consumer goods] sector.”

THE NEXT PRODUCTION PARADIGM

The Speed Factory was, perhaps, ahead of its time. Had it started a decade later, in 2025, its fate may have been dramatically different. The new economics of production, the localization consensus, are making a new kind of factory possible. HILOS is early proof. The next production paradigm will be defined by new manufacturing technologies, a new design process, a new supplier ecosystem, a new relationship with consumers, and a new product aesthetic.

Advanced Manufacturing Technologies

Videos of advanced manufacturing technology are common today: robotic arms that articulate along six axes, intricate three-dimensional patterns knit from ordinary thread, and machines that pack, place, or sort with otherworldly speed and precision. The term “advanced manufacturing” refers to *a category of digitally-enabled fabrication technologies and the tracking, computer vision, and control systems that are often associated with them*. 3D printing is the most prominent of these, but it is certainly not the only one; additive metal production and suspension gel printing draw astonishing new forms from powders, filaments, or liquid baths. New equipment can apply multiple materials simultaneously, and hybrid machining can blend additive and subtractive processes, yielding previously impossible geometries. A generation of smart materials (like shape memory alloys and ceramic matrix composites) and bio-based materials (including agricultural waste repurposing) offer unprecedented performance while reducing environmental impact.

3D printers were initially used as prototyping tools; the term “advanced manufacturing” indicates a shift to full-scale production,³⁹ where these tools increase speed and quality and decrease supply chain dependencies when they are used for finished products.⁴⁰ The advanced manufacturing sector is projected to expand at a compound annual growth rate of 11.4% between 2025 and 2033.⁴¹

Industrial Autonomization

Factories themselves are becoming more advanced. Reynolds calls this a shift from “automation to autonomization,” where machines don’t just execute programmed tasks but communicate with each other, as a cyber-physical system.⁴² Industrial “Internet of Things” (IoT) systems manage connected devices to enable machine learning for predictive maintenance, quality control, and process optimization.⁴³

Since Adam Smith’s pin factory, the objective of manufacturing has been to maximize throughput by increasing the efficiency of a specific equipment and personnel configuration, then make as many units as possible to recoup the setup costs. Because advanced manufacturing equipment can produce one product type just as easily as another with minimal human involvement, it is possible to run a multi-product line efficiently. That means there are virtually no economies of scale—the cost of a product is the same whether it’s part of a 100,000 unit production run, or a run of 10.⁴⁴ When compared to mass production, each individual unit may be more expensive, but the overall reduction in dead stock can reduce or even eliminate the cost difference. With the shift to a new generation of production equipment, the “tyranny of bulk” is giving way to the nimbleness of speed and adaptability.

Product Design & Componentry

The integration of advanced manufacturing has dramatic implications for the product itself. A part made with conventional materials and processes—like a leather flap or simple casing—can only do so much. A part made with additive technologies, six-axis tools, computer vision, and a barrage of new materials can perform many functions. In the footwear industry, for example, a midsole can serve as cushioning while also mechanically attaching the outsole to the upper part of the shoe. And in electronics, the Apple Macbook Pro’s “unibody” design is

precision-milled to serve as a structural casing and heat sink, to which many sub-components are attached, allowing for a thinner, lighter, and higher-performance product.

As designers gain exposure to manufacturing processes and technologies, they can shift from products that require labor-intensive, many-step manufacturing processes to products that are made through low-labor, technology-integrated workflows with complex individual parts and fewer steps.

The Value of Proximity

When factories no longer compete on low labor cost and massive throughput overseas, it is much easier to site them close to design and retail. In the distinctive jargon of product industries, this tightly integrated design, development, and sales cycle is called a “read and react” paradigm. Designers can release a product into the market and, if it flops, change it quickly, eliminating the overproduction and long lead-times that are built into conventional product economics.

Ecosystem effects will continue to provide localized advantage in a world of increasingly advanced production.⁴⁵ Labor markets, input-output linkages, and knowledge spillovers are ever more important today, at a time when companies compete for globally mobile talent, when design, production, retail, and recycling happen in-market, when training includes digital literacy alongside tacit manual know-how, and when R&D moves as fast as seasonal trends. These kinds of ecosystems are poised to emerge in urban areas across the United States.

³⁹ WellsOnyx. (n.d.). *The future of additive manufacturing: From prototyping to production*.

⁴⁰ Deloitte. (2022). *Manufacturing ecosystems: Exploring world connected enterprises*.

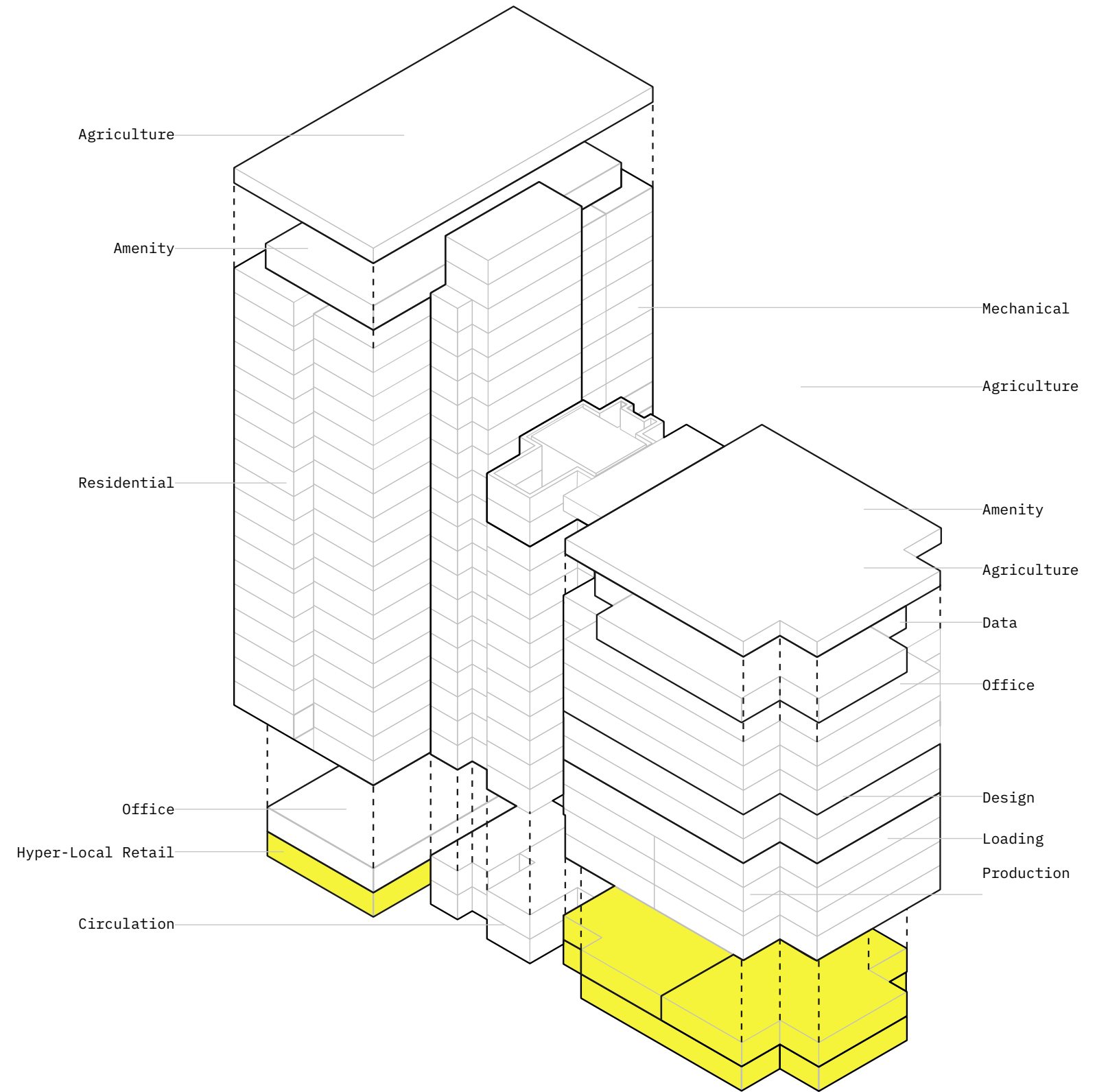
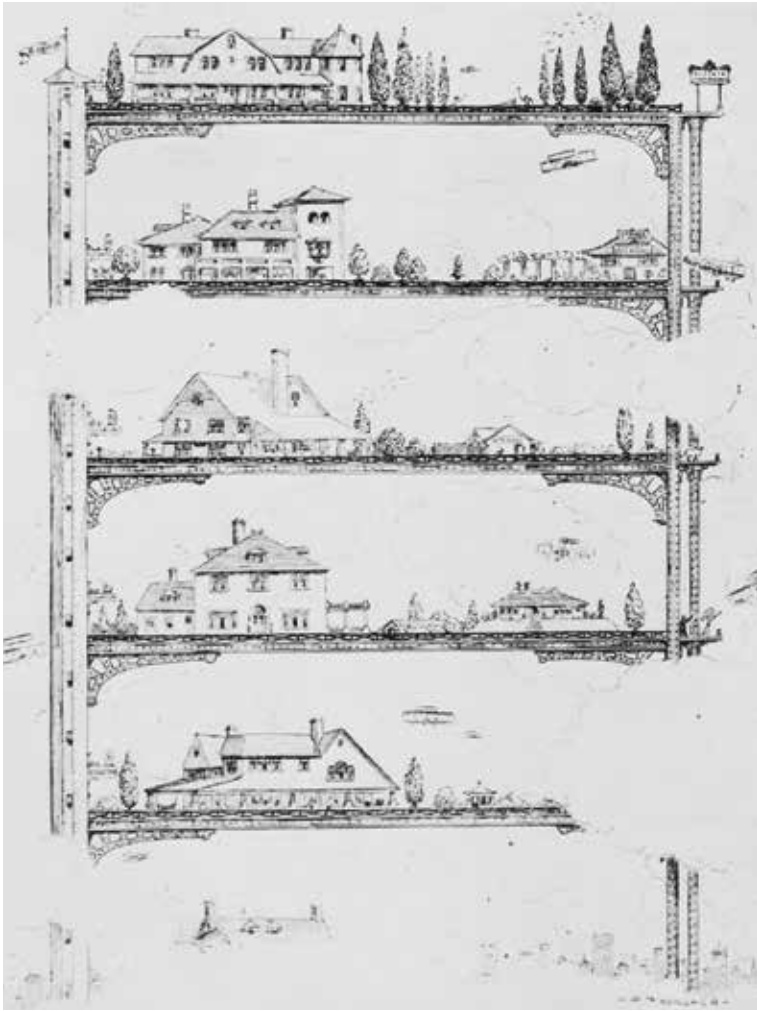
⁴¹ The United States Industry 4.0 market size was valued at \$19.2 billion in 2024 and is projected to grow from \$21.4 billion in 2025 to \$50.8 billion by 2033. Straits Research. (2025). *Industry 4.0 market: United States*.

⁴² “With its Plant Floor Controls Network, General Motors uses sensors to measure humidity levels in its plants and direct physical action on the shop floor based on this physical-to-digital information cycle. Should levels in one area rise too high, vehicle bodies are automatically re-routed to less-affected areas, reducing the need for repainting and avoiding downtime.” Deloitte. (2022). *Manufacturing ecosystems: Exploring world connected enterprises*.

⁴³ Results from a 2022 questionnaire survey including 152 offshoring manufacturing firms show that reshoring and reshoring intentions are associated positively with investments in automation in manufacturing, and with employee made-in. Stentoft, J. et. al. (2024). *Reshoring and automation in manufacturing. Journal of Business Economics*, 94, 1007-1042.

⁴⁴ Elisabeth Reynolds

⁴⁵ Companies that transition to advanced manufacturing consistently emphasize co-located technical teams, local supplier networks, and regional expertise clusters as persistent competitive advantages, Deloitte 2022.



ABOVE: "The 1909 Theorem" diagram from *Delirious New York* by Rem Koolhaas. The 1909 Theorem is the proposition that new structural capabilities, combined with the elevator, disconnected one floor from the next, allowing each to become its own world—while also unlocking new building finance potential as Floor Area Ratio dramatically increased.

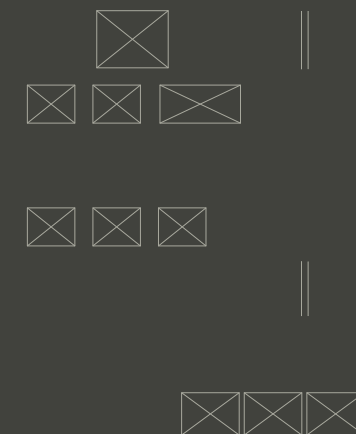
OPPOSITE: A conceptual diagram of the contemporary office conversion, with adjacencies from floor to floor.



"In terms of urbanism, this indeterminacy [of the program from one floor to the next] means that a particular site can no longer be matched with any single predetermined purpose. From now on each metropolitan lot accommodates—in theory at least—an unforeseeable and unstable combination of simultaneous activities, which makes architecture less an act of foresight than before and planning an act of only limited prediction. It has become impossible to 'plot' culture.

Each 'plan' is an abstract composition of activities that describes, on each of the synthetic platforms, a different 'performance' that is only a fragment of the larger spectacle of the Metropolis."

Koolhaas, Rem. *Delirious New York*. 1978



THE CIVIC METHOD

ELSEVIER¹

*Elsevier is a large academic publisher and mediator of information that “helps institutions and professionals advance healthcare, open science and improve performance for the benefit of humanity.”*²



Jonathan pushed the final few lines of code up to the project repo, commenting “Fixed stability bug on plant-to-plant nitrate trades. BlockGarden ready to test.” Hitting the *return* key felt wonderful; he relished the clack. It punctuated the electric tingle that courses through something truly new. He had been pitching BlockGarden to colleagues in his Neighbourhood Unit as an “enviro computer”—and the pitch is essential. You never know who is going to be peer-reviewing your tech after you submit it to a Corp.

BlockGarden felt *right*, though, he somehow knew it would be accepted. The idea was simple: tokenized environment credits are scripted in an

1 The following speculative fiction is a thought experiment and satire. It imagines a city being run on a model derived from extrapolating academic publishing. Such a thought experiment could equally apply if the city were run by other academic publishers such as Springer, Taylor and Francis, or Wiley Blackwell. Product or corporate names may be trademarks or registered trademarks, and are used only for

the purpose of conducting a thought experiment without intent to infringe.

2 Elsevier (2019). ‘This is Elsevier: A digital business.’ Link: <https://www.elsevier.com/en-gb/about>

algorithmic smart contract. Hyper-local environmental sensors create data about each plant, and the contract optimizes both plant growth and overall environmental benefit through autonomously trading micro-resources like water, fertilizer, solar exposure. It was a marketplace for resources across the ecosystem, garden, planter-bed, and even down to the individual plant scale. Net positives (the excess of both food and carbon sequestration credits) would be distributed to whatever group of investors had pre-funded the garden—what Jonathan playfully called an ‘initial seed offering.’ The whole thing had the nostalgia of “CSA boxes” that farmers used to sell for pre-funding a season. Before the first collapse, anyway.

He stood up, stretched, craned his neck up to look out the grimy window. Sweltering. Dusty. Another few hours, probably, before it would be safe to go outside. He still wanted to live-test the BlockGarden code with plant sensors in the growing unit before submitting it to a Corp—probably the Heliyon³ Corporation or the Total Environment⁴ Corporation. Anyway, he’d have to wait until well after nightfall to go outside and update the firmware. There was time to kill.

Jonathan looked down at his forearm, where top⁵ notifications glowed under his skin. One of them was a civStat push: peer-reviewing a coastal resilience system called Level Sea. Hardware was uncommon—this would be a good distraction—and it might actually be interesting tech. Hard to guess with peer reviews, though. He tapped his wrist to accept.



3 “Heliyon welcomes research across all disciplines. Any paper reporting original and technically sound results of primary research, which adheres to accepted ethical and scientific publishing standards, will be published regardless of its perceived impact.”—A subsidiary of Elsevier Limited, ISSN: 2405-8440

4 “Science of the Total Environment is an international journal for publication of original research on the total environment, which includes the atmosphere, hydrosphere, biosphere, lithosphere, and anthroposphere.”—A subsidiary of Elsevier Limited, ISSN: 0048-9697

5 Bloomberg.org Group (2018) “What Works Cities”

Back in 2018—back when philanthropies and governments were funding civic innovation—there had been an ethos of “what works.”⁵ Municipalities did tactical interventions and tried to learn from best practice. But it was too piecemeal, too little, too late. The environment strained to a breaking point. Billions died in a planetary shock, a cataclysmic Anthro-collapse. And billions more – maybe humanity as a whole – would have been extinguished, if not for a class of technologies operating at the municipal scale. Societal priorities were galvanized in a new regime, The Civic Method, that blended science, technology and governance under the banner of Civic Innovation. The technology of cities was no longer about “what works”—it was about *truth*, for the benefit of humanity.

Specific municipal services—from water purification to drone-ports to entertainment feeds—were run by individual, topic-specific Civic Innovation Corporations, or “Corps.” And the Corps of the city of Elsevier were a global leader.⁶ Other cities were fiercely competitive, of course; in the city of Springer, the Nature Corp produced stellar Civic Innovation, and in the twin cities of Taylor and Francis, a Corp called Routledge was growing quickly. In every city, the tech itself was developed by citizens, or, Civic Innovators, as individuals or teams, who also peer-tested innovation before it was fully deployed. Their performance was tracked in a master algorithm, civStat, which was linked to universal rights: basic housing, basic income, and access to municipal utilities. These basic services were delivered through Neighbourhood Units, which paid licensing fees to the Corps.

6 Larivière, Vincent (2015) “The Oligopoly of Academic Publishers in the Digital Era” *PLoS One*.

Over time, Civic Innovators who consistently ex- 453
celled in the quantity and performance of innovation
were granted unconditional rights. Without obligations
to submit to Corps, they were free to explore radically di-
vergent technologies, or nothing at all, or they were cho-
sen to join the municipal government itself. Elsevier's
governing body was shrouded in mystery: the only
visibility Civic Innovators had—all they needed—was
civStat, and its assurance of algorithmic impartiality.



The transport pod arced along the coastline. It wouldn't 454
be a long ride to the Level Sea test site, though Elsevier
as a whole was a sprawling megalopolis that stretched
from what used to be Washington up through Boston.
Jonathan's Neighbourhood Unit, Yale, was one of the
most desirable. Civic Innovators could get a peer as-
signment anywhere in the metro area, so being in a
central Neighbourhood made it easier to hit a quota. Not
to mention that the Yale Neighbourhood Unit had good
equipment and a reputation for producing high-quality
civic innovation. The Corps were always looking out
for new submissions, and the Neighbourhood's brand
name went a long way toward getting a project ac-
cepted and ultimately deployed. Which meant getting
credits on civStat, obviously, but most importantly, the
privilege of contributing to the city's function; to im-
proving the well-being of every Civic Innovator.

Jonathan watched the city blur past, forehead 455
resting against the window. The collective achieve-
ment was truly spectacular, he thought, and he was

honoured to be part of it. Elsevier was a pioneer among cities; it was here that breakthroughs were made after the first Anthro-collapse—innovations that saved billions of lives around the world. The city itself was thoroughly laced with technology, of course—it sustained human life in a changed climate—but what made Elsevier extraordinary was the intense devotion Jonathan and his fellow Civic Innovators had for improving the city. It was impossible not to admire the ethos of passionate action, to get caught up in it, to feel a part of it. Constantly experimenting and creating and operating civic technology was precarious—the basic rights of every citizen depended on his or her performance—*But isn't that how it should be?* he thought. *Shouldn't we all be inspired to collectively create and build our city? What could ever be more empowering?*



He scrunched up his shirt fabric and wiped dust off the lens, leaning toward the door a second time for a biometric scan to enter his housing unit. A blue light swept his iris and a voice chimed “Welcome home, Jonathan!” Before the door opened, it flashed two notifications: one about a letter and one about a pending tax payment. He had another week to pay it—that is, a week before the door to his housing unit would stop opening for him—and he was counting on the credits from BlockGarden. *It will come through. It has to.* After validating the project code on the garden sensors’ firmware earlier that night, he’d compiled and submitted to the Heliyon Corp. It was riskier, but

probably a bigger boost for his civStat, if the project was accepted.

As he walked into his unit, he leaned down to pick up a letter. A new system for paper mail was re-instituted across Elsevier a few years ago. It was one of the few Civic Innovations from another city that Elsevier had fully integrated—it's not green or efficient, he thought, but there was something nice about the whimsical romance of opening a letter. Sentimental nostalgia. The letter was from his younger sister Sophie (she was really the only person who wrote him paper mail), and it didn't say much of anything. She loved writing down little romps though ordinary life. Somehow she saw wonder in it, and she shared it joyfully with Jonathan. 457

From what he could gather, the ordinariness of her life was far from ordinary. Sophie had left Elsevier a decade before, in what seemed like a fit of teenage rebelliousness—but he hadn't seen her since. She had travelled west, ending up in the Freetowns of Medium. Her letters described a place that was nothing like Elsevier; there were no Corps; there was no peer review; there was no law of The Civic Method. Anyone could build and deploy tech without systematic validation. Municipal services weren't integrated with a single-sign on; they were ad-hoc, best-fit, built and deployed quickly. Some services were delivered by loosely defined "Channels" which seemed something like a Corp, but without structured leadership or peer validation or licensing fees. And there were no Neighbourhoods to speak of—people were free to use what they wanted, to come and go. No one had rights, 458

but they also didn't have obligations.

For some reason, his sister seemed to enjoy the wild uncertainty of it all. A few years ago she had sent a photo, grinning in front of strange, twisted technology—a knot of repurposed hardware tangled into clunky, rough-hewn shapes. Slick, glistening tech was jumbled up and wired together with mechanical cogs and gears. Nothing seemed safe or logical or legitimate. It was shocking that his letters even found their way to and from the right address. 459

He'd never admit it to Sophie, but the Freetowns of Medium genuinely scared Jonathan. And he worried about her. He would write back the same letter he always did, imploring her to apply for entry to Elsevier. *Some Neighbourhoods are looking to bring in new Civic Innovators*, he'd write, *Yale might even have a spot*. And the sooner she started building her civStat, the better. Medium might be more exciting, sure, but what if there was another collapse, a pandemic, a war? Was Medium really a place to grow old in? 460



Nine figures sat in high-backed chairs around a circular table. The room was dark; their faces illuminated by the glow of screens embedded in the table's surface. One of the figures calmly picked up the trail of a sentence, with a faint Swedish accent, "... and how much was collected this year?" 461

The screens shifted immediately, infographics gliding to show revenue, accompanied by a smooth humanoid voice that intoned, "Approximately two and 462

a half billion tokens, a 6% increase in underlying adjusted operating profit.”⁷

The man tented his fingertips together. “Disappointing.” He looked up, addressing the circle of figures. “I trust we will see increased profit by soliciting a greater number of technologies?” The room nodded in agreement. “Quality is inconsequential. Focus on the rate of submission. There are, after all, more and more Neighbourhoods, and more applications for entry to Elsevier. The city is expanding.” He gestured across the table, “Tell us, Chairman, what of the border?” 463

Another figure cleared his throat, “Unstable, sir. There is unrest in the Freetowns of Medium. Militias are aggressing Elsevier to the west, and...” he hesitated, visibly anxious, “within our borders... there is talk of self-organization among the Civic Innovators. They want to release technologies without licensing to Corporations. They’ve built a viral malware,” he paused. Every one of the figures was looking at him, tense. “All we know is that it’s called ‘Open Access.’” 464

The Swede’s fingertips were tented again. Pressed together, visibly white around the nails. His voice was low and even when he carefully broke the silence. 465

“Let them. If this ‘Open Access’ grows any larger, incorporate the source code into some of our Corporations. Consume it. And meanwhile, raise the Neighborhood service fees another 7%.” 466

A barely perceptible shock rippled around the table. “Y-you mean above th-...” 467

“Yes,” sharp, whip-like. “Above the annual standard increase. We’ve quelled Neighborhood petitions”⁸ 468

7 RELX Group (parent company of Elsevier) (2017) Annual Reports and Financial Statements 2017. Available at: <http://www.relx.com/~media/Files/R/RELX-Group/documents/reports/annual-reports/relx2017-annual-report.pdf>

8 Nineteenth Judicial District Court, Parish of East Baton Rouge. (2017) “Board of Supervisors of Louisiana State University and Agricultural and Mechanical College Versus Elsevier: Petition for Preliminary Injunction, Declaratory Judgement and Damages.” February 27, 2017. Available at: <http://www.arl.org/storage/documents/publications/2017-LSUElsevier-Petition.pdf>

before, and we can do it again.⁹ They have no choice but to pay. We own Urban Management,¹⁰ we own the Atmospheric Environment,¹¹ we own their very Cells.¹² But most importantly—never forget this—most importantly, *they need this city*. They are lost without it. The fear of another Anthro-collapse has inspired a passion that cannot be put to words. Do not underestimate how deeply they believe in this project that is Elsevier.” His voice had lowered, spell-like. “Do not underestimate the opiate of purpose we have given every one of them. The faith of a voluntary prisoner is total...”

“... Raise. It.” 469

The sharp ‘t’ was like a surgical cut into the cold fleshy silence that stretched after it. 470



Underneath the web of distributed ledgers and cloud of server farms and impartial Corporations, a few lines of code snaked outward from that round table, as if the Swede’s words had condensed into two drips of black oil in water. 471

9 Sabi Kastro (Elsevier Regional Sales Office, Account Manager) (2017) Letter to Dr. Stanley Wilder (T.H. Middleton Library, Louisiana State University). April 22, 2017. Available at: <http://www.arl.org/storage/documents/publications/2017.04.22-ElsevierLettertoLSU.pdf>

10 “The Journal of Urban Management is an international, peer-reviewed open access journal covering planning, administering, regulating, and governing urban complexity.”—A subsidiary of Elsevier Limited, ISSN: 2226-5856 Available at: <https://www.journals.elsevier.com/journal-of-urban-management>

11 “Atmospheric Environment is the international journal for scientists in different disciplines related to atmospheric composition and its impacts. The journal publishes scientific articles with atmospheric

relevance of emissions and depositions of gaseous and particulate compounds, chemical processes and physical effects in the atmosphere, as well as impacts of the changing atmospheric composition on human health, air quality, climate change, and ecosystems.”—A subsidiary of Elsevier Limited, ISSN: 1352-2310 Available at: <https://www.journals.elsevier.com/atmospheric-environment>

12 “Cell publishes findings of unusual significance in any area of experimental biology, including but not limited to cell biology, molecular biology, neuroscience, immunology, virology and microbiology, cancer, human genetics, systems biology, signalling, and disease mechanisms and therapeutics.”—A subsidiary of Elsevier Limited, ISSN: 0092-8674 Available at: <https://www.cell.com/>

The civStat algorithm silently rebalanced, immediately pushing out peer review notifications and shifting tax thresholds and Neighbourhood licensing fees. An extraordinarily complex mathematics recalibrated to maintain competition between Neighbourhoods, to obscure redundant technology submissions, and most importantly, to keep each Civic Innovator unknowingly perched at the threshold of precarity. This is where they were most loyal, and most productive—without the dangerous rot of free time to write malware like Open Access. Revolution foments in in the slack camaraderie of unfilled leisure.

..

A notification flashed on Jonathan’s forearm: Block-Garden was declined. His heart skipped. He tapped his wrist for details, and a soft voice narrated the message from The Heliyon Corp’s reviewer:

“No initial seed offering. Need stronger revenue model. Excess food and tokens should be bundled as an environment credit and redeemed with Elsevier central gov. Revise project finance model and resubmit.”





SPATIAL JPEG

—Matthew Claudel

It is possible that, over the course of its several million year history as the southernmost outcrop of land-and-glacier in the world, the shore of Tierra del Fuego has seen a blue whale wash up, roll over, and breath its last. Less likely that a colossus would have chosen the copse of trees in Bosque Yatana, Ushuaia, as a final resting place, making its way a good seven city blocks from the tide line before expiring. In the spring of 2009, twenty-eight meters of whale carcass nonetheless lay amidst that thicket, heavily dying.

Everything about this project, finally and enigmatically titled *Mi Familia Muerta*, is monumental. Adrián Villar Rojas and a team of five artists spent weeks on the elemental re-composition of a body with clay, its mass so vivid that it exuded the smell of decomposing flesh, its skin crusting, and its eye the size of a soccer ball, half lidded, slowly drying in the sun. To situate it existentially, the project – created for the *Biennale at the End of the World* – laps the shore between death and life, its incongruousness in this time and place explained only as a creature somehow stranded by the tide of a dream dissipating and waking, or, simply, as rotting myth.

But most importantly – and there must be value in putting it bluntly – the sculpture is huge. It is the body of a blue whale, a behemoth of the same ilk that has plagued, fascinated, ruined, and captured the imagination of an entire seafaring era'. Standing next to *Mi Familia Muerta*, one is acutely aware of its bulk, of its crushing weight, alarmingly acquainted with the fact that such a complex organization of skeleton, fat, muscle, baleen and organs can very simply effect the death of a human with even the most ordinary of death spasms.

That feeling is best described as *wonder*; a word deployed with all of its embedded fantasy, ephemerality, memory and undiluted fear. It is this feeling that the majority of Adrián Villar Rojas' work communicates, in essence, whether clay takes the form of a whale, or of bells, bones, a dying dog, not-dying kittens, of a big² shard toppled across the Jardin des Tuileries, piles of bricks, humans riding horses, humans riding robots, humans, Kurt Cobain, an elephant, something that might be either a beet-root or an internal organ, a dinghy, or massive pure geometric shapes (all clay).

The tool AVR uses to inflict the emotion of wonder on viewers – what leavens the odd zoo of twisted shapes into beings with a horrifying presence – is (necessarily) simple: clay. The material is essentially mud, refined soil, but “a substance that is symbolically loaded,”³ Villar Rojas emphasizes. Clay is traditionally regarded as the origin of man’s physical body and/or all biological life – not only from a Judeo-Christian perspective, but in the creation accounts of Greek, Egyptian, American Indian and Chinese traditions⁴. In the biblical Genesis, the first human creature, Adam, is fashioned from soil, *adama*⁵, in a process that philosopher Peter Sloterdijk summarizes succinctly; “metaphysics begins as metac ceramics.”⁶

The root of the visceral connection we feel to Villar Rojas’ work is, quite literally, a visceral connection to the work. The early model of man (pre-animation) is identical to “statues, human dolls, golems, robots, android illusions and the like... The God of the first phase of human creation embodies a representative of the oldest technological culture, whose main emphasis is on ceramic skills.”⁷ Clay is the most elemental subject of human’s will to form, and with his return to the medium (widely regarded as one of the key turning points of his career⁸), Villar Rojas enacts the same ceramic process of form-making. Like human beings, his work is inescapably subject to time – owing to the instability of the medium, AVR’s sculptures celebrate the life of their subjects as they

visibly accelerate the process of decay. Standing next to a sculpture, each crack, flake and crumble of clay makes a viewer’s skin prickle as it dramatizes his own mortality. Today, after three years’ seasons, the post-sculptural lump that was *Mi Familia Muerta* is incontrovertibly and ominously dead.

Despite all of that – the spiritual, meta-visceral and mortal affiliation we have to these clay beings – the work that AVR creates remains profoundly un-relatable. Standing in front of a lifelike, emaciated woman breastfeeding a pig, crosslegged atop a gargantuan tibia, it is impossible to reconcile the distance from something foreign and otherworldly. The cognitive dissociation that a viewer feels subverts the bodily affiliation that relies on extra-ordinary and hyper-corporeal experience (elemental spirituality and unstable clay, respectively). But would the polarity be reversed by hyper-ordinary and extra-corporeal experience?

Everything about *The Work of the Ocean*, AVR’s almost-hidden solo show at De 11 Lijnen, is emphatically non-monumental. An intentional contrast to the colossal mass of *Mi Familia Muerta*, this exhibition echoes, initially, as bizarre and insubstantial. The largely unpublicized show inhabited a new gallery space nestled within a small and remote complex of 16th century farmhouses. At De 11 Lijnen, off of the art world’s beaten track, *The Work of the Ocean* was staged in an architecturally remarkable 2003 renovation by Golden Lion and Prizaker

prize winner, Alvaro Siza⁹ – but completely neutered it with a sigh of blandness. What the architect masterfully designed as a sculptural sequence of planes, voids, simple geometries and subtle light surrenders to Villar Rojas’ intervention, which can be described, at best, as ‘domestic drab,’ and at worst as ‘cloying kitsch.’

It seems profoundly strange that AVR would work so hard to achieve such a banal effect. Over the course of three months building,¹⁰ collecting,¹¹ and living,¹² Villar Rojas accelerated and materialized “a life that accumulates things,” creating “a fiction of a life being lived there. I want it to smell like food, smell like life. You go to different houses, and they each have a different smell – so we brought a kitchen, we brought food, we made functional bathrooms.”¹³ The gallery became a living memory, the least common denominator of homes where Adrián grew up and the homes of friends he grew up with.

But there is intrigue. Into that space, Adrián Villar Rojas carefully inserted a menagerie of diminutive, strange little plasticine sculptures – faithful reproductions of the 80+ larger-than-life sculptures that appeared in *DOCUMENTA* at Kassel, 2012 – tucked in odd corners of the ‘home’ like contorted gift shop trinkets.¹⁴ In contrast to the monumental, symbolic and spiritual weight of clay, off-the-shelf epoxy putty never erodes, is *easily sculpt-able*, *requires no firing and will self-cure in a short time to an extremely hard and durable state with virtually no*

shrinkage. So reads the promotional material for Free Form® SCULPT (4lbs. / \$25.00 USD).¹⁵

Critical response to De 11 Lijnen focuses on Villar Rojas’ act of “impoverishment” – the willful degradation or cheapening of his own previous work. The shift in material and scale make it immediately obvious. But the nagging question remains – *why*? Impoverishment to what end? Why trivialize his own history?

One idea is documentation. Perhaps because clay is inescapably mortal, documentation is an obsession for AVR – Hans Ulrich Obrist observed that “when [Villar Rojas] started to make ephemeral sculptures, [he] started to document the process of construction and almost imminent destruction.”¹⁶ But what happens at De 11 Lijnen is not preservation, nor is it documentation, really. It is compression into a different format – a kind of shift in substance. These sculptures could be understood as a *spatial JPEG*.

JPEG¹⁷ is the ubiquitous standard digital image format for cameras, computers, etc. and has two key features: files are small – for easy sharing and transfer – and they can be ‘read’ by almost any machine. To achieve the first, the system performs a kind of ‘lossy compression,’¹⁸ meaning that it only saves about 1:10 of the original material, discarding the superfluous information according to an algorithm.¹⁹ The now-quantized and compressed file can be transferred quickly

and decompressed back into a recognizable image by another machine. This reconstitution happens according to a ubiquitous file decoder, or codec²⁰ – that is, JPEGs are transferable because the codec is something that both the creating and the receiving machine have in common.

That, precisely, is the uncanny power of *The Work of the Ocean*. Domestic space is the human codec. The couches and kitchen and kitsch that Adrián Villar Rojas has carefully assembled are a universal language of shared human experience. As she steps into the gallery, each visitor re-inhabits an eerily familiar scene from her own life, giving the artist a unique point of acupuncture into her psyche. Compressed information – tiny, tchotchke plastic sculpture – is transferred through that portal and is instantly downloaded and decoded in the visitor's mind.

More specifically, AVR transfers potent physical experience into today's (increasingly suburbanized and bland) world. Epitomized in the expansive dOCUMENTA show, Villar Rojas' haptically-charged clay forms are born in the ongoing research at the Brick Farm that he operates in Argentina. For Adrián, this rural site is "all about the work and its sheer materiality. We are building bricks with no electricity or fuel or machines. We cut grass and pull weeds, collect biological waste, even animal innards, and churn everything into huge pools of mud." Despite the grueling manual labor, there is no tangible output

– Villar Rojas is adamant that nothing leaves the Brick Farm. It is pure research into "a primordial, human way of working,"²¹ and the resulting experiences, interactions and images are materialized as sculpture.

Who among Belgium's comfortable middle class have churned waste and entrails and dirt into roiling mud pits? Who has met the eyes of a haggard boy clutching a machete with one hand and holding up ragged shorts with the other? We are born into an anesthetized world where the most potent haptic experience is slumping into a sofa and picking up the remote control.

Yet each visitor has the capacity for imagination, for reanimating the fictive corporeal precondition that Villar Rojas fervently pursues and creates. Visceral, experiential information generated at the Brick Farm is materialized as sculpture, compressed into epoxy trinkets, and through the universal codec of domestic space, is injected into the psyche of each visitor. There, in the imagination, they can be decompressed and blossom into uniquely transformative, living, haptic beings. AVR is using people – anyone – as agents in preserving and expanding the fantastical history that he has created; it echoes as a prickle of the skin, or a dream-like fragment of embodied experience.

Describing part two of the Genesis routine, '...breathed into his nostrils the breath of life, and the man became a living being,'²² Sloterdijk writes,

"Without the completion of the clay body through breath, Adam would forever have remained merely a bizarre work of earthen art; he would be no more than a willful installation on the untended earth."²³ In the biblical creation of man, form is given life through divine inspiration. Villar Rojas enacts a different but no less vital two-phase animation of form, a dreaming-in of life that can only be carried out by the viewer himself, drawing on his own embodied haptic experience. A gaunt, homeless boy with a machete might not be relatable, but skin, elbows and knife certainly are, and only the human mind can merge the two into a potent lived fantasy.

The Work of the Ocean is not a cynical or destructive impoverishment of Villar Rojas' work, nor is it a trivialization of his chosen medium. The exhibition is a dramatic redistribution of agency to the viewer. Each person is implicated through common spatial memory (domestic space), discovers forms (sculptures) and is tasked with resuscitating experience (bringing them to life). Through a device of the collective imaginary, Villar Rojas will escalate the operation of the verb 'to sculpt' from making android forms of inert material, to entering a partnership with viewers, with the intent of nothing less than reanimation.

This, in a personal sense, is even more powerful than the titanic weight of a beached whale rendered in clay. While *Mi Familia Muerta* was a literal substantiation, *The Work of the Ocean*

is a *transubstantiation*, allowing for even more uncanny, evocative and vibrant life to emerge – from the viewer's own mind. The key to divine creation was the pneumatic vascularity of Adam's clay form, while Villar Rojas' mythic production hinges on the compressibility and decompressibility of form, and on translating haptic experience through a universal codec. *The Work of the Ocean* encodes man's primordial and material experience of space, one that can only be decoded into the modern world by man's own fantasy; it marks Adrián Villar Rojas' shift from morphogenesis to metagenesis. Ultimately, it is your – our – responsibility to enact the climax of the exhibition: bringing little plastic sculptures to life.

MATHEW CLAUDEL
(Salinas, USA, 1990)

Matthew Claudel is a designer, researcher and writer. He is the founder of Field States, a strategic design agency focused on creating civic value. Matthew has authored books, articles, chapters and speculative fiction – primarily surrounding issues of technology, design, and cities. He is a protagonist of 89plus, a global community of artists and an affiliate faculty member of Portland State University. Matthew studied architecture, and holds MSc and PhD in advanced urbanism from MIT.

— 1
from James Cook to Herman Melville.

— 2
90m long, 4m diameter, weighing 45 metric tons. Big.

— 3
Claudel, Matthew. *Interview with Adrián Villar Rojas*. May 12, 2014.

— 4
God the Potter stars in many roles; Greek mythology as Prometheus, Egyptian mythology as Khnum, American Indian mythology as the Earth Shaker, and Chinese mythology as Nüwa (女媧). There are certainly more appearances.

— 5
Botterweck, G. Johannes. *Theological Dictionary of the Old Testament, Vol. I*. Wm. B. Eerdmans Publishing Company, 2003. p. .

— 6
Sloterdijk, Peter. *Spheres Vol. I; Bubbles: Microspherology*. Semiotext(e) / Foreign Agents. 2011. p.33

— 7
ibid, p.33

— 8
Kennedy, Randy. "A Colossus in Clay Speaks a Generation's Message," The New York Times, February 14, 2012.

— 9
Siza, Alvaro. Casa Van Middelem-Dupont. Ostend, Belgium. 1997-2003.

— 10
Transforming the architecture: walls, wallpaper, bathrooms, furniture.

— 11
Hundreds of objects, knick-

knacks, bric-a-brac.

— 12
Three team members – two women and one man – inhabiting the site, full time, from 25 March to 29 April, 2013.

— 13
Claudel, Matthew. *Interview with Adrián Villar Rojas*. May 12, 2014.

— 14
Which, not coincidentally, Villar Rojas has been fascinated with in prior work.

— 15
http://www.smooth-on.com/Epoxy-Putty-Free-F/c1390_1408/index.html

— 16
Obrist, Hans Ulrich. *Interview with Adrián Villar Rojas: De 11 Lijnen*. 2013.

— 17
An acronym for Joint Photographic Experts Group

— 18
The sort of name that can only be suggested, used and loved by computer scientists.

— 19
The algorithm is based loosely on the perceptual idiosyncrasies of the human psychovisual system – that is, it gets rid of colors and frequencies that are invisible to the human eye.

— 20
Codec is an abbreviation of "coder-decoder"

— 21
Claudel, Matthew. *Interview with Adrián Villar Rojas*. May 12, 2014.

— 22
Genesis 2:7

— 23
Sloterdijk, p.36

FROM CLAY TO EPOXY HISTORY CHARACTERS FIGURINES

