

Caterpillar's Spatial Metamorphosis: Heavy Equipment Manufacturing in the Twenty First Century

Abstract:

Caterpillar, Inc., the world's largest heavy equipment manufacturer, grew rapidly in the early and mid-twentieth century before a crisis of overproduction in the early 1980s threatened the company's survival. In response, it launched the \$2.8 billion "Plant with a Future" program, a sweeping material and ideological overhaul that remade the company for the post-Fordist global economy. This article shows how Caterpillar's metamorphosis hinged on flexibility, pursued through four interrelated spatio-temporal strategies: restructuring bureaucracy to devolve accountability and responsibility; reconfiguring assembly via cellular production; financializing production by embedding accounting logics into decision-making; and vertically disintegrating supply chains through outsourcing, joint ventures, and dealership expansion. These moves were informed by an ideological project that valorized decentralization, accountability, and an outward orientation. We contribute to debates around the distinctiveness of the post-Fordist transition by arguing that post-Fordism is best understood as the pursuit of flexibility—a spatial project expressed differently across firms and industries. Caterpillar exemplifies how companies both follow and reinvent the "playbook" of post-Fordism, underscoring that it is not a singular paradigm but a set of "post-Fordisms" each articulated through distinctive organizational practices, discourses, and value systems that reproduce the paradigm's durability.

Key Words: Heavy Equipment Manufacturing, flexible accumulation, spatial fix, profitability crisis, financialization, post-Fordism

Introduction

Caterpillar, Inc. is the world's biggest and best-known manufacturer of heavy machinery for the mining and construction sectors. Its logo—the word CAT scaling a mountain—is emblazoned on everything from baseball caps to work boots to miniature excavator toys and playing cards. But this dominance was not always certain. In the 1980s Caterpillar confronted severe crises of overproduction and profitability, which the company overcame by both following and inventing the post-Fordist manufacturer playbook.

Caterpillar ascended sharply in the postwar era, expanding from annual sales of 52 million in 1929 to around 20 billion by the 2000s (Pripps 2000). However, in the early 1980s, the US manufacturing sector faced a crisis of overaccumulation. The recession of 1981-82 caught Caterpillar overextended and unawares and plunged the company into a profitability crisis (Clarke 1990, 465).

As the long postwar boom wore off in the 1960s, the rate of profit in the US and internationally started to decline. This led to the stagflation of the 1970s and culminated in the recession of the early 1980s, a crisis of overaccumulation and profitability that impacted many sectors of the economy and hit manufacturing particularly hard.

The stagflation crisis of 1973-1975 squeezed the US manufacturing sector, and the recession of 1981-1982 became the final nail in the Fordist coffin (Clarke 1990). This recession had all of the features of a classical Marxian crisis of overaccumulation— “the collapse of the credit system...sudden and forcible depreciation...and the actual stagnation and disruption of the process of reproduction” (Marx 1999 [orig. 1894], 162-163).

Caterpillar was especially vulnerable to these macroeconomic shifts because its systems were out of date, the company faced strikes, and competition from the Japanese company Komatsu was eating into Caterpillar's market share. Caterpillar's management was struck by the economic pressures of the end of the Fordist regime and undertook emergency

measures as temporary fixes. These included sweeping layoffs and plant closures, which bought Caterpillar breathing room to assess its structural shortcomings and develop long-term strategies to address them.

The profitability crisis pushed manufacturers to seek new production models, and the lean, just-in-time Toyota Production System (TPS) became the preeminent post-Fordist paradigm. General Motors and John Deere, for example, adopted hasty imitations of TPS. Most research argues that US manufacturing firms merely imitated TPS (see Vidal 2013, 2019). However, Caterpillar's approach was distinct, underscoring its utility as a case study. Caterpillar had forestalled the economic turbulence of the 1970s through rapid domestic expansion and international capital stock investments. In 1985, Caterpillar's newly appointed CEO, George Schaefer, recognized the durability of the profitability crisis and sought long-term redressal through corporate restructuring. Rather than fully adopting TPS, he selectively integrated practices such as just-in-time inventory, flow manufacturing, and adaptable design, while favoring low-cost, practical tools over expensive technological upgrades (Henkoff and Alpert 1988, 2).

Caterpillar responded to this existential crisis by rolling out its 1.8-billion-dollar reform program entitled, "Plant with a Future" (PWAF). The Plant with a Future model—rooted in notions of flexibility, decentralization and just-in-time production—sought to overhaul the entire company through spatial means. Caterpillar developed and refined its long-term reorganization plan over several years. The reconstruction program encompassed both ideological and material dimensions. It included redesigning administrative structures as well as the physical layouts of its plants. It sought to overhaul its reporting and responsibility systems organization-wide and to redesign factory floors and assembly processes. This initiative--the Plant with a Future--was a forward-looking program for capital accumulation and reinvestment (Nolde 2000, 133).

This article offers a case study of the PWAF program to provide insights regarding the constitutive role of flexible accumulation and flexibilization in post-Fordism. The Caterpillar case suggests that the post-Fordist transition is characterized by four flexibilization processes—1) organizational bureaucratic restructuring from a vertical, centralized chain of command to a highly devolved decision-making structure, 2) the restructuring of production systems including reorganizing assembly processes and adopting cutting-edge technology, 3) financializing production at the firm-level by embracing accounting innovations and placing accounting processes and data at the center of decision-making, and 4) pursuing flexibilization through vertical disintegration.

Caterpillar's new corporate values centered on decentralizing decision-making and responsibility for these decisions. The Plant with a Future involved encouraging workers to think and act with a certain amount of freedom, which stands in contrast to the more rigid TPS model. Caterpillar also preferred experimenting with innovative managerial strategies and evolving accounting apparatuses, while resisting sector-wide management-union agreements. These observations underscore the variegated character of the post-Fordist firm and suggest that firms in core Fordist regions of North America pursued diverse and often contingent strategies during their transition to post-Fordism. Rather than imitating the lean production model wholesale, firms selectively appropriated, modified, or rejected various elements of it at different historical junctures. This suggests that the post-Fordist transformation was shaped by firm-specific decisions and sectoral particularities, rather than by uniform adherence to leanness. In driving corporate restructuring at Caterpillar, firm-level financialization played a crucial role, facilitating the expanded reproduction of capital.

There is no consensus in the literature as to whether post-Fordism is a distinct institution or “the continued unraveling and restructuring of the Fordist system” (Peck 2017, 138). The Plant with a Future case highlights post-Fordism's distinctiveness as a regime of

accumulation, substantiating the notion of a clear break between the Fordist and post-Fordist systems (Vidal 2013). We argue that the ideological focuses on flexibility and efficiency, devolved decision-making and accountability, personalized customer service, and supply chains as loose assemblages of firms scattered across the globe, represent a distinct epistemology from Keynesian ways of knowing.

In this paper, we offer a fine-grained case study of the mechanics of one firm's post-Fordist transformation. Caterpillar, Inc. provides a useful case for analyzing post-Fordism because heavy machinery production is the material precursor to extractive and construction supply chains. Since extractive and construction industries are responsible for large-scale transformations of the biophysical world, heavy machinery underpins the most environmentally consequential circuits of capital accumulation. This case, therefore, illuminates how post-Fordist strategies reverberate outward into the material processes that remake nature itself. Furthermore, as a leading manufacturer rooted in the American Midwest, the Caterpillar case stands in for the broader phenomenon of the erosion of stable, well-paying industrial jobs. Its history thus reflects the broader transformations that redefined labor markets and working-class livelihoods in the shift from Fordism to post-Fordism (Bluestone and Harrison 1990).

This analysis leads us to three principal interventions. We argue that flexibilization—particularly in its spatial dimensions—constitutes the core of the post-Fordist regime. We show how the language, discourse, and value systems articulated by firms serve to normalize and reinforce the durability of this paradigm. We demonstrate that post-Fordism was not a uniform or monolithic transition. Rather, its adoption varied across firms, industries, and economies. While some companies followed the Toyota Production System (TPS) playbook, Caterpillar adapted and modified it in distinctive ways. In this sense, post-Fordism can be

understood both as a singular paradigm and as multiple “post-Fordisms,” informed by how individual institutions interpreted, adapted, and innovated the model.

We home in on Caterpillar’s Plant with a Future initiative because its rollout generated extensive internal documentation and drew coverage in national media. This unique volume of information allows for a case study that is specific and empirically rich through which to trace the contours of industrial restructuring from the vantage point of a singular yet quintessential manufacturing firm.

Our analysis draws on a range of public and secondary sources along with original fieldwork at the Caterpillar Visitors Center in Peoria, Illinois. The secondary sources include academic literature, popular media coverage, and publicly available financial data. These materials were compiled into a dataset using MAXQDA, which we analyzed qualitatively to identify discursive and material themes and patterns.

Concepts, Frameworks, and Scholarly Interventions

We interpret our case material through an interwoven set of concepts with roots in Marxian economic geography and economic sociology.

Cycles of Overaccumulation and Crisis

Capitalism as a system undergoes periods of expansion and collapse. These periods of expansion often crescendo with asset bubbles that are followed by recessions. This cycle of overaccumulation and crisis is what makes capitalism uniquely dynamic as a political economic system and, counterintuitively, also what limits the reach of its benefits (Clarke 1990).

Competition among firms drives labor-saving and labor-squeezing which can cause the rate of profit to fall (Marx 1990 [orig. 1894]). Falling profit rates shrink investment opportunities, causing capital to overaccumulate and sparking crises. For Marx, one key

indicator of an impending crisis of overaccumulation is the overproduction of capital. These crises act as momentary resolutions to the system's fundamental internal contradictions (Marx 1990 [orig. 1894], 160-163).

Scholars of post-Fordism debate the drivers of the Fordist crisis of the 1970s. Some adhere to Marx's formulation more closely than others. Simon Clarke (1990, 442) echoes Marx that competition produces overaccumulation and that the profitability crisis is "merely a result and not a catalyst of crisis." He sees such crises as a perpetual threat, which cannot be resolved but only temporarily addressed within capitalism. Clarke (1990) argues that Marx's "secular law of the tendency for the rate of profit to fall," though often invoked to explain the crises of the 1970s, was not a one-time or epochal event but rather a permanent feature of capitalist accumulation, continuously shaping the dynamics of production, competition, and crisis.

Other analysts diverge from Marx by suggesting that the declining rate of capital is a cause of crisis and not just a symptom. Matt Vidal (2019) argues that the declining profit rate intensifies inter-firm competition and class struggle, which leads to stagnation, overaccumulation and crisis. Vidal differs from Harvey (2003) in his cautious deployment of the term "crisis", which, he argues, only applies to "periods of large-scale devaluation of capital, extensive bankruptcies and widespread corporate restructuring" such as the Fordist crisis of the 1970s (Vidal 2019, 585).

Trajectory of Fordism

"Fordism," the economic model fostered by the Keynesian welfare state, encompasses the fifty-year period between the 1920s and 1970s (Jessop 1994). The Keynesian state aimed to shore up domestic production, support workers and provide clear sets of rules for economic standardization, continuity and stability. The Fordist manufacturing firm pursued

fixed capital in consumer durables, developing single purpose fabrication tools and securing returns by lengthening the assembly line to exploit economies of scale (Jessop 1994). The principles of scientific management governed labor process. Job categories were narrowly defined and highly routinized. Labor under Fordism sought job security and stability through collective bargaining (Scott 2003).

The Fordist era concluded in the early 1980s, although it began to decline as of the late 1960s with falling rates of profitability. Oil shocks and stagflation exacerbated the decline in the 1970s. Japan struck a blow to the Fordist regime by outcompeting US companies (Harrison and Bluestone 1990). Uncertainty among organized workers tripled annual strikes from the previous decade (Scott 2003). The recession of the early 1980s was the final blow (Scott 2003).

As Fordism drew to a close, American companies developed a reputation as outdated, bloated, and set in their ways. Firms rebelled against the rigidity of the Fordist era and began to look outward to global markets and new FDI targets. Companies internationalized their production, and export sectors grew. Toyota's pathbreaking model of lean production spread across the West causing US firms to sacrifice loyalty to their places of origin and their historical workforces (Harvey 2006). Wages were increasingly seen as "a drag on economic competitiveness rather than a contributor to consumption" (Tickell and Peck 1992, 195). Union participation dropped sharply, and real wage growth slowed and then began to decline.

Flexible Accumulation

Flexible accumulation refers to the increasing dynamism of supply chains in the post-Fordist era. The adjective in the phrase encompasses flexibilization of firm structure, production, labor process, and consumer demand (Harvey 2006).

The post-Fordist firm and state were key drivers of flexible accumulation. Supply-side interventions like product differentiation and advertising helped institutionalize flexible

accumulation as did economic shifts like the rise of financial services and the globalization of production and trade (Harvey 1990, 147). These shifts were reinforced by changes in consumer demand and innovations in communication technology (Piore and Sabel 1984).

The state under post-Fordism harmonizes with the logic of flexible accumulation. Bob Jessop (1994, 2005) terms it the “Schumpeterian workfare state” marked by state support for entrepreneurialism and technological innovation and by the transformation of citizen into worker, unprotected by the social safety net and left to the vagaries of the free market. Jamie Peck (1993, 2001) similarly describes how the “workfare state” reoriented policy away from social programs toward compulsory labor market participation. The workfare state builds and reinforces precariousness for the worker and flexibility for capital, thus buttressing flexible accumulation.

Drivers of Post-Fordism

“Propulsive industries” such as automobiles, consumer durables and capital goods crossed their technical limits in the context of rising real wages, which led them to parrot the TPS and adopt flexible accumulation (Tickell and Peck 1992, 190-195). They accomplished this through outsourcing and subcontracting in the global south. They introduced austerity and leanness into increasingly complex supply chains with just-in-time logic. Companies flattened and decentralized administrative hierarchies. Shopfloor jobs became less specialized as various tasks were integrated.

Although firms themselves drove post-Fordism, interplay between consumer demand and company decision-making reinforced the post-Fordist regime. Globalization increased consumers' appetites for a wider range of products, and companies adapted to accommodate changes in consumer demand kindled by supply-side intervention.

Technological innovation was fundamental to the post-Fordist regime (Jessop 2005, 52). In particular, the microchip, integrated circuit, and semiconductor facilitated modernized

telecommunications, allowed for industrial automation, and brought about software like spreadsheets and databases. This revolution helped firms shape consumer demand through advertising and sell and deliver services over previously unthinkable long distances (Tickell and Peck 1992, 198). It further facilitated communication and coordination across ever vaster and more complex supply chains. Such innovations allowed firms to become more complex, less centralized yet leaner and more efficient than before.

Despite this technological revolution, Caterpillar learned from the missteps of General Motors and other US companies to avoid becoming, “enamored of technology for its own sake” (Henkoff and Alpert 1988, 2). Instead, it prioritized low-cost machining and fabrication tools. Factory modernization for Caterpillar, rather than information technology updates, referred to flexibilization through just-in-time production, minimizing inventory, “flow” manufacturing, and easily fabricable designing processes.

The ascendance of finance capital and financial services also helped entrench post-Fordism (Harvey 1990). Financial services as a percentage of GDP doubled over the 1980s and '90s. Financialization facilitated foreign exchange and expanded intermediate services like banking, investment and insurance.

Financialization is the process of increasing the influence of finance and financial logics in economic governance and the diffusion of these values into corporate culture. Shareholder value maximization, for example, has become a guiding corporate principle, while financial actors, markets and metrics have taken over managerial decision-making (Lazonick and O’Sullivan 2000, Krippner 2005).

Caterpillar’s Plant with a Future embodies the post-Fordist transition. Post-Fordism is widely developed in the theoretical literature but empirical substantiation through historiographic analysis gives it life in clarifying ways.

Spatial Fix

David Harvey (2001, 2006) understands private sector efforts to resolve crises of overaccumulation as fundamentally spatial. Through this lens, the Plant with a Future program can be seen as a series of spatial fixes.

Under ordinary operating arrangements, capitalists can sequester surplus value and seamlessly reinvest it. Overaccumulation interrupts this process (Castree and Gregory 2006, 426). Whenever accumulation outpaces investment, economies experience crisis marked by overcapacity, stagflation, and the destruction of capital surpluses (Glyn et al 2007, Harvey 2006, Wolff 2003).

Harvey (2006) interprets Marx's notion of the cycle of overaccumulation and crisis through the interplay of spatial and temporal relationships. Resolving crises involves temporal and spatial "displacements" or fixes that work to convert "trapped" excess value into investible capital. Spatial displacements expand the geographic reach of capital (e.g., the creation of new investment frontiers or markets). Temporal displacements (e.g., credit and loans) work to defer capital's contradictions into the future (Harvey 1990).

Corporate restructuring

The crisis of Fordism set off a wave of corporate restructuring in the U.S. (Harrison and Bluestone 1990, Wolff 2003, Glyn et al. 1992, Vidal 2012, 2013, 2019). The "deepening" organic composition of capital — increasing investment in machinery and technology relative to labor — created pressure to reduce labor costs (Harrison and Bluestone 1990, 364). In response to declining profit rates, the state and private sector acted in concert to shift power away from labor toward capital by rooting out labor organizing and trimming wages and benefits "to recover profits out of wages" (Vidal, Adler and Delbridge 2015).

This restructuring led to increased employment in labor-intensive service sectors to offset the falling rate of profit (Wolff 2003, 497). Corporate strategies to manage these pressures included redefining job roles, divesting assets, reorganizing supplier relationships,

and limiting union power. U.S. companies, however, struggled to foster innovation and instead imitated the practices of successful European and Japanese firms, a tendency Vidal calls “mimetic behaviour” (Vidal 2012, 560). Events such as the collapse of the Bretton Woods system in 1973 and President Reagan’s confrontation with unionized air traffic controllers reinforced capital’s newfound power (Wolff 2003, 497). Monetarist policies under Federal Reserve Chair Paul Volcker further incentivized corporate restructuring in the U.S. (Glyn et al. 1992, 41).

Capital restructuring increased the role of finance in extracting profits and renewed attention to lowering wages as a competitive strategy (Vidal 2019, 596). This restructuring also reshaped the geography of production, producing localized “new industrial spaces” while intensifying global social and spatial divisions of labor (Tickell and Peck 1992, 209). U.S. firms responded to international competition by outsourcing employment, divesting assets, and subordinating labor relations to wage competition in increasingly shareholder-driven markets. The growing influence of institutional investors and the emergence of corporate takeovers led companies to recruit “finance-oriented CEOs” to implement these strategies (Vidal 2012, 552).

While most American manufacturers mimicked the exemplar lean/TPS practices, large U.S. retailers like Wal-Mart tailored post-Fordist principles to their specific needs, relying on managerial and technical innovations, global outsourcing, internationalized supply chains, and a service and finance-oriented accumulation strategy to extract rents and profits, thus creating new forms of post-Fordist accumulation (Vidal 2013, 553; Vidal 2019).

Contours of Post-Fordism

Scholars disagree on the exact timeline, usefulness and scope of “post-Fordism.” Not all processes across the global economy are uniform, and different countries pursued distinct paths to post-Fordism. Regimes of accumulation are always in process, and post-Fordism

obviates efforts to describe a “final form.” Labor process, accumulation regimes, and modes of regulation remain dynamic and unsettled.

Bob Jessop (2005) highlights four pillars characterizing post-Fordist processes: labor, organizational structure, collaborative supply chains, and credit dominance. The first involves a shift from undifferentiated, semi-skilled, mass labor to differentiated, polyvalent workers who participate in increasingly externalized labor markets. The second is the transition from bureaucratic, centralized corporate organization to flatter, leaner and more flexible organizational forms. Thirdly, post-Fordist firms favor joint ventures, technology licensing, contracting, collaborative research and development, and other forms of collaboration among firms. Finally, Jessop notes a move towards private, international, flexible forms of bank credit linked to a range of financial instruments.

Regulatory restructuring from the Fordist-Keynesian welfare state into what Jessop (1994) calls the Schumpeterian Workfare State sacrificed autonomy and full employment in favor of global competitiveness. For Jessop (1994, 2005), this model adapts to crises by restructuring state roles to support new accumulation regimes, while Peck (1998) stresses that the U.S. turn from welfare to workfare was legitimated by political rhetoric about the “messiness” of Keynesian statism. Yet Peck and Tickell (1994) and Clarke (1988) countered that no stable regulatory framework for post-Fordism had crystallized, as continuing crises in core Fordist economies undercut claims of a settled regime. Others, however, see post-Fordism as established, albeit with “flexibility” as its hallmark (Harvey 1987, Vidal 2013, 2019). Institutional accounts emphasize demand shocks—fragmented and volatile consumer markets—driving “flexible specialization” (Piore and Sabel 1984). Regulationist critics argue this neglects how labor processes, corporate structures, and class relations intersect. Instead, they identify lean production, originating with Toyota and diffusing globally, as the central post-Fordist model, combining mass production and neo-Taylorism

with discontinuities such as vertical disintegration, diversification, and limited worker participation (Vidal 2013, 2019).

Matt Vidal (2019, 586) calls post-Fordism a “dysfunctional” regime in the Atlantic world yet sees it as useful for describing links among tertiarization, financialization, and neoliberalism (Vidal 2013, 454). Jessop (2005, 52–53) cautions that without agreement on whether the decisive shift was the decline of the assembly line or the rise of microelectronics, debates over Fordism and post-Fordism remain unresolved.

Tracing Caterpillar’s responses to the crisis-laden transition from Fordism to post-Fordism highlights four principal interventions of our research into the literature. First, instead of treating post-Fordism as a monolithic paradigm, we show how firms both follow and reinvent the playbook — producing multiple “post-Fordisms.” Second, whereas the literature often treats flexibility as an outcome or feature of post-Fordism, we emphasize its constitutive role—positioning flexibilization as the driving logic that shaped institutions. Third, we advocate for attention to discourse and ideology, highlighting how firms use language, values, and narratives to legitimate transformations, reinforcing the durability of post-Fordist practices. Finally, we substantiate this with a fine-grained, spatially grounded case study. By tracing Caterpillar’s transformation, we demonstrate how theoretical claims about flexibility materialize at the level of a specific firm, connecting abstract debates to concrete organizational strategies.

Stable Flexibility: The Caterpillar Case

Caterpillar’s Early Success and Growth (1920s-1970s)

In 1910, inventor and entrepreneur Benjamin Holt secured a patent for his “caterpillar” style tractor. Unlike traditional wheeled tractors, this machine moved on a crawler system composed of chain links attached to drive wheels (Wik 1979). This design

diffused the 40-ton weight of the tractor, allowing it to plow or till any terrain, no matter how soft or rugged. Although intended for agricultural use, sales soared with the onset of World War I, as these machines proved ideal for hauling artillery and freight across difficult terrain (Swinton 2015). The successful deployment of over 10,000 of Holt's machines in the war prompted him to pivot from agricultural equipment to construction machinery, which led to the merger of Holt Manufacturing Co. and C.L. Best Tractor Co. to form Caterpillar Tractor Company in 1925 (Barnett et al. 1982).

Caterpillar, Inc. grew due to the rapid pace of technological advancements and the postwar construction boom. Caterpillar's early adoption and development of diesel engines boosted its rise to the top. Furthermore, the postwar era brought massive public investments in capital-intensive construction projects like the system of interstate highways. Caterpillar equipment was involved in clearing, excavating, grading, and sloping along nearly all sections of interstate highway construction. These machines played a crucial role in some of the most iconic public infrastructure and civil engineering projects of the twentieth century, including the Golden Gate Bridge and the Hoover Dam (Haycraft 2011).

Caterpillar reinvested its substantial mid-century profits into multiple phases of domestic growth and started to expand internationally. It inaugurated its first foreign plant in Scotland in 1958, with another in England the following year. By the 1960s, Caterpillar was exploring new markets as far flung as Australia and Brazil.

Caterpillar's Crisis of Profitability

The macroeconomic shifts of the 1970s caught Caterpillar by surprise. Sudden competition from Japan's Komatsu, Ltd., and related labor issues exacerbated these difficulties. As the surge in large-scale civil engineering projects in North America, Europe,

and Japan plateaued in the 1960s, Caterpillar realized that its public funding-fueled expansion was no longer viable. The early 1980s' recession brought three years of negative growth. Caterpillar began incurring losses. The company's workforce and factory expansion in the previous decades had led to a severe crisis of overproduction and overcapacity.

Komatsu, Ltd., the world's second-largest heavy machinery manufacturer, played a key role in Caterpillar's capitalization crisis. As in the US, Japan's post-war reconstruction necessitated extensive public investments. This spurred Komatsu's considerable domestic growth during the 1950s. By the late 1960s, as public funding for large civic projects was ebbing in the US, Komatsu entered the export market, targeting Caterpillar. Komatsu grew quickly, capitalizing on Caterpillar's crisis of inefficiency. By the early 1980s, Caterpillar had become so bloated compared to Komatsu that it faced a 40% price disadvantage on comparable equipment lines. Additionally, double-digit inflation rates in the US in 1980 and 1981 and consequent dollar-to-yen exchange rates favored Komatsu, enabling it to capture 50% of Caterpillar's market share during the 1980s and 1990s (Sawyer 1983). This forced Caterpillar to sell at a 22% discount to match Komatsu's prices and prevent competitors from cannibalizing portions of its dealership network and clientele.

Labor disputes also contributed to Caterpillar's crisis. The company sought to reduce losses by tightening its workforce, but this strategy backfired. In the early 1980s, frustrated by crisis-induced layoffs, workers in Caterpillar's Peoria factories demanded wage increases and time-off credits. Twelve thousand line-workers in Peoria struck from late 1982 until April 1983.

In 1982, Caterpillar recorded its first ever annual loss, totaling \$953 million. In 1983 the company lost \$345 million and experienced a 60% drop in sales. During fiscal year 1982-1983, losses ran approximately \$1 million per day (Sawyer 1983). This negative revenue persisted throughout the 1980s. Caterpillar weathered the crisis partly through plant closures.

In its 1993 SEC 10-K filing, Caterpillar (File No.1768) reported “surplus” property closures “totaling 2,956,839 square feet of building area and 6,900 acres of land.” It wasn’t until the mid-to-late 1990s that Caterpillar felt some relief from its financial exigencies.

Emerging from the 1980s’ recession, the national conversation in the US focused on the inefficiency, overcapacity, and rigidity of American manufacturing (Main 1994). This debate resonated with Caterpillar’s management, who fixated on addressing their issues at a fundamental level. Their efforts to understand and resolve the crisis led them to embrace the prevailing ideas of the time—efficiency, flexibility, and decentralization. This ideological transformation paved the way for the development of the Plant with a Future.

Caterpillar recovered from its ordeal. Between 1995 and 2005, its annual revenue experienced a 155% increase. 2023 was its most lucrative year to date with 67 billion dollars in profits (stockanalysis.com n.d.). Beginning in the early 1980s, the company undertook a successful structural and ideological overhaul. This transformation centered on spatial fixes and the implementation of flexibilization at various scales.

Caterpillar’s Rehabilitation Regimen: Diagnosis

From its incorporation in 1925, the Caterpillar Tractor Company was organized into strong functional divisions headed by General Offices, or GOs. Each GO was responsible for its own part of Caterpillar’s overall business process viz. engineering, manufacturing, pricing, marketing, etc.

Caterpillar’s success from the 1930s to the 1980s bred complacency, leaving its centralized, inward-looking hierarchy to ossify into an overextended and inefficient bureaucracy (Barlett and Ehrlich 1991, Neilson and Pasternack 2005). As the crisis of profitability set in, Caterpillar began a company-wide retrenchment of around 32,000 workers. Between 1982 and 1988 it closed seven North American factories. The top

management and new CEO, George Schaefer, interpreted these cuts as a “wake up call” to dismantle Caterpillar’s functional silos and make the firm more agile and horizontal (Neilson and Pasternack 2005, 18). The deliberations that followed led to the implementation of the Plant with a Future program.

As the company diagnosed its crisis, much of the blame fell on these functional divisions and the GOs that oversaw them. These functional silos limited communication across divisions and hindered the GOs’ company-wide visibility of profits, pricing, and customer satisfaction. Donald Fites, a senior executive who later became CEO, criticized GOs for wielding excessive control over pricing, calling the practice of general office–controlled pricing “self-defeating” (Neilson and Pasternack 2005, 5). The deeper problem, however, stemmed less from organizational structure than from Fordist practices—stable mark-ups, aggregate profit reporting, and the absence of disaggregated data—that prevented managers from adapting and reinforced the perception of being “too far removed from customers” (Glyn et al. 1992, Schaefer 2013).

CEO Schaefer criticized senior executives for producing a “functionally dominated,” “overmanaged,” “inward focused,” and hierarchically structured organizational culture that had sedimented into parochialism among rank-and-file managers (Barlett and Ehrlich 1991, 12). Even national news media picked up the theme that GOs had become complacent and risk-averse, criticizing them as “homegrown,” “insular,” and “uninformed” (Franklin et al. 1992, Greenhouse 1985, Kleinfield 1985).

Schaefer’s solution, inspired by the Japanese concept of quality circles, adapted a participatory management approach centered on engaging shopfloor workers with various conflicting viewpoints in continuous improvement initiatives (Main 1994). In 1983, Schaefer handpicked nine of “the most forward-thinking entrepreneurial managers” from the middle rungs of management to engage in long-range planning (Barlett and Ehrich 1991, 12). He

looked for “renegades” and “clear thinkers” who could engage in “free-swinging” unrestrained discussions (Neilson and Pasternack 2005, 7). This group would hold weekly deliberations over breakfast in which they would “tell it like it is” regarding Caterpillar’s shortcomings and potential solutions. In 1985, when Schaefer became CEO, his handpicked “renegades” became Caterpillar’s Strategic Planning Committee (SPC). Schaefer brought in external consultants, academics and Caterpillar board members (CEOs of the then leading American firms such as Boeing, American Express, Honeywell, Hewlett-Packard, Ford, etc.) to SPC discussions to contribute input.

The work of the SPC was complemented by additional internal research. Schaefer took managers from 16 North American factories on tours of Honda, Toyota, and Fanuc facilities in Europe and Japan. These tours highlighted Caterpillar’s comparatively excessive product inventories, rigid machining tools, and outmoded accounting systems (Barlett and Ehrlich 1991, 12).

After two years of research and deliberations, the SPC settled on two principal recommendations: 1) Caterpillar must replace the GO model with a mix of product and geographical business units and 2) Caterpillar must reconfigure and upgrade its production facilities with a view to flexibility and reactivity. Achieving the first of these objectives required replacing functional silos with a decentralized, accountable, and customer-driven structure that would introduce diverse new product lines, maintain low inventory levels, and more nimbly adjust heavy equipment design and manufacturing processes when necessary. The second recommendation involved updating and re-engineering factory layouts for automation, dynamism, and low-cost product development. Schaefer, in an interview reflected, “We were able to decide that the best long-term thing we could do for the company was to *reorganize* it into business units” (Schaefer 2013).

In 1991, Plant with a Future was launched to implement these recommendations. The economic and actuarial analyses suggested that a staggered investment of \$1.7 billion over five years would reduce costs by 22% and ensure average returns of 32% on annual investments. They estimated that after a few years of implementation, the changes would generate enough income for the various component projects to self-sustain. Instead, the transformation took eleven years and cost around \$2.8 billion—1.8 billion for logistics and asset purchases and \$0.9 billion in start-up costs and “employee enrichment” (Miller and O’Leary 1997, 259).

Flexibilization and Factory Design

The PWAF vision of factory design and layout was based on the principles of flexibility in manufacturing and just-in-time material workflow (Carson 1998, Miller and O’Leary 1997). These principles were operationalized through four successive phases: consolidation, simplification, automation and integration (Miller and O’Leary 2002, Schonberger 2018). Consolidation was a euphemism for retrenchment. Simplification referred to design. Automation and integration referred to technological upgrades and reconfigurations.

Beyond short-term cost savings, there were three reasons for the overall factory flexibilization project. First, the post-Fordist global economy was characterized by increasingly dynamic demands on the part of resource extractive industries and end-customers. Second, the regulatory environment was ever less predictable. Third, innovations such as computer integration, machine technology, and factory automation were coming along in more rapid succession, and the factory had to be able to accommodate such advances in real time.

Consolidation and Simplification

One primary goal of the overall restructuring was a 35% reduction in the cost of manufacturing to bring Caterpillar's product pricing in line with that of Komatsu. Caterpillar undertook spatial strategies like plant closures, layoffs, and shopfloor footprint reduction to accomplish these goals. Caterpillar aimed to reduce the overall shopfloor footprint by 28% for each of its seventeen North American factories, which meant reducing square footage from 45 million to 30 million.

Caterpillar approached "simplification" by regrouping and rearranging machines and people associated with assembly and transmission lines. Each factory was dedicated to fabricating a specific model of Cat equipment from start to finish but had to be able to produce a variety of products and parts if need be. Simplification involved streamlining product designs and shop floor operations. New machining tools had to produce various components for various products—parts for both bulldozers and off-highway trucks, for example. Caterpillar reduced its parts inventory such that machines used fewer, more fungible component parts across product lines. New axel design, for example, reduced component parts by 45% (Berg 1989, 14; Schonberger 2018).

Simplified parts design allowed Caterpillar to outsource non-core production to external suppliers in other countries. The giant wheel loader, for example, went from being built all in one place to being fabricated across four countries with the number of parts reduced by 45 percent (Schonberger 2018, 73). Simplification also increased the volume and efficiency of material flow within factory spaces in keeping with principles of just-in-time workflow. Continuous workflow necessitated centralized logistical coordination and integration, prompting Caterpillar to contract with logistics companies and consultants.

Simplification even extended to the company's name. Caterpillar's rebound was almost entirely in the extractive and construction segments of the heavy machinery industry rather than in agriculture, thus in 1986 Caterpillar Tractor Co. became simply Caterpillar, Inc.

In 2001, the company announced a complete exit from the agricultural machinery sector (Khplant n.d.).

Automation and Integration

Inspired by the idea of “unattended assembly” (Carson 1998), the automation and integration phases focused on “common sense automation,” grouping dispersed technologies, and logically integrating workflows with computerized control systems, robotics, and sensor technologies for material handling, fabrication, and assembly transmissions (Miller and O’Leary 1997, 262; Schonberger 2018)

The integration phase established coordination and communication from the top level (central plant computer) to the lowest shop floor level. These networks employed common programming languages to control and deploy rotors or automated material-handling vehicles (Nolde 2000, 133). Shop floor computer screens “specified the precise configuration of each product, reinforcing the idea that workers were assembling products for a specific customer” (Miller and O’Leary 1997, 111). This brought workers into direct contact with designers on one side and end users in the mining industry on the other. Eric Berg’s (1989) comment on shop-floor practices at new Caterpillar factories captures each of these phases as a whole:

New inventory systems are also being introduced to trim the cost of materials.

Machines that cut, bore and remove burrs from metal are being grouped so one worker can produce an entire part. And plant layouts are being revised to place related processes together. (Berg 1989, 3)

It took eleven years to complete the PWAF program. Early retrenchment began in 1983, and the program ended in 1994. The restructuring was successful: efficiency and productivity soared, and market share rebounded and expanded. Caterpillar had resolved its overproduction and profitability crises.

Autonomy, Accountability and Customer Service: The Ideological Foundations of Company-Wide Restructuring

More than an effort to improve economic performance, Caterpillar's restructuring reoriented capital investments to help resolve the immediate crisis and stave off future crises. It was a means of spatial fixing, not just in physical or geographic senses, but in a spatially oriented ideological sense as well. The ideological dimensions of the spatial fix work to justify the material aspects (Lloyd 2017). Indeed, the very language of restructuring is both geographic and political at once. Caterpillar's new ideology, evident in terms like "decentralization" and "horizontality," centered on devolving autonomy and accountability. Additionally, the valorization of the customer and emphasis on customer service further served as moral justification for restructuring.

The ideological component of implementing the Business Unit (BU) model hinged on the two-sided coin of worker autonomy and accountability. This dialectic was foisted on workers through the political work of the concept of decentralization. George Schaefer captures this in a 2013 interview:

All the power in the company [had been] invested in the General Office. All the major decisions were made in the General Office. We were getting too far removed from the customer. That was one of the reasons we broke it up into separate units, and we gave the people in charge of the unit total authority. If they wanted to raise prices or lower prices or whatever, it was their prerogative. Then we'd say, we will measure you on how well you do. Here is the ROI target. If you make that ROI, here is your bonus. If you miss the ROI, too bad (Schaefer 2013).

While formally 'lean' production standardizes labor process and therefore limits rather than promotes worker autonomy, Caterpillar drew on the individualistic and

entrepreneurial zeitgeist of the Reagan era (Price 1994). Unlike the TPS model, PWAF sought to harness the creativity and institutional memory of shopfloor workers by reinforcing decentralized autonomy and responsibility at the levels of the individual worker, the Business Unit and the factory (Kumar and Dougherty 2025).

In 1990 Donald Fites succeeded Schaefer as CEO. Fites took the reins of the PWAF program and operationalized Schaefer's concept of decentralizing accountability. Fites oversaw the material transformation from the hierarchical and centralized "functional" Caterpillar, to the efficient and decentralized post-Fordist firm. The GOs were dismantled and replaced with divisions headed up by divisional vice presidents, who then delegated decision-making to business units under the principle of "downward accountability" (Beach et al. 1998). Once the prerogative of executives at the company headquarters in Peoria, teams of employees all over the world were now responsible for identifying and addressing problems. Glen Barton, a member of the SPC described the restructuring saying, "We dismantled the functional hierarchy and established a mix of product and geographic business units, with some centralized support units that could sell their services to the profit centers" (Nolde 2000, 250). This system allowed the company to compile and analyze economic and worker performance data at a more granular level (Zadoks 1997, 49). Each business unit had a team of managers and workers with near total autonomy. They established their own workplace rules, chose suppliers, and made independent pricing decisions (Briggs 1995).

Business units were grouped thematically, usually around a mix of geographical and product characteristics (e.g., construction, resources, energy and transportation, financial products, etc.) and organized into divisions (Zadoks 1997). The business unit was responsible for product design and development. For instance, the unit responsible for excavators handled design, manufacture and sales of excavators from start to finish (Zadoks 1997). Each business unit had its own profit and loss statement and had to pay a transfer price for inputs received

from other BUs or divisions. Each BU was evaluated individually, against other BUs in its division, and against overall division outcomes. Business units were subject to elimination if they didn't meet certain metrics (Bouchard and Koch 2014). Once restructuring was in place, there were 17 BUs altogether.

Five service centers, with different specializations, provided external support to each BU. The Technical Support Center, for example, ran a corporate laboratory and proving ground for simulating and testing equipment designs and advising each BU on emergent technologies to streamline product design. The Economic Advisory Group advised BUs on market performance and customer service. To reinforce the principles of autonomy and accountability, these service centers charged BUs directly to consult on issues like accounting, marketing, human resources, etc. (Bouchard and Koch 2014, 37).

Rank-and-file employees viewed The PWAF program with circumspection. Shopfloor workers saw it as a radical shift, which provoked uncertainty (Neilson and Pasternack 2005, Zadoks 1997). Given the wariness among employees regarding the changes, management needed a moral justification to ensure sincere compliance among workers. Reimagining the customer and foregrounding customer service provided this moral rationale (Lloyd 2017).

Beyond the financial transaction, company discourse portrayed the customer as performing a service to the company through the articulation of their desires. Abraham Zadoks (1997, 51), then Director of New Technology, described the company's new customer-centered ideal, "We now have an organization that enables our customer to drive our research efforts. Ultimately, they are the ones who will push our organization to stay on the leading edge of technology." Tana Utley, Vice President of Product Development and Global Technology, reaffirmed this belief saying, "Our customers give us our report card. It's like when you are a kid—that's how I feel when I meet with a customer" (Peoria Magazine 2012, 12).

Caterpillar's ideological discourse—premised on individual autonomy, responsibility, and tailored customer service—reinforced the spatio-temporal strategies of the Plant with a Future program. The decentralization of decision-making, coupled with rhetoric emphasizing worker autonomy, creativity, and competitiveness, was spatial in the sense that authority was distributed from headquarters to business units across the globe. Caterpillar framed flexible accumulation as customer service, justifying its spatial transformation and simultaneously marketing flexibilization to customers as added value (Reliableplant 2023). The BU model was also future-oriented, enabling strategic adjustments in the firm's relationships with key stakeholders—employees, dealers, distributors, and customers, thus constituting both spatial and temporal displacements.

Financializing the Shop Floor

The individual autonomy/accountability dialectic, central to company discourse during the transition, infused both administrative reorganization and shopfloor restructuring. Like the Business Units that replaced the General Offices, the factory floor was reorganized into cellular, self-contained and managed “mini factories” (Miller and O’Leary 2002).

Financialization contributed to the new cellular manufacturing model. Industrial engineers carried out the spatial transformation of the factory, but accounting principles and practices, as well as accountants themselves, influenced the new shopfloor. Carrying out the PWAF vision depended on three innovative and experimental accounting technologies: 1) competitive cost and price analysis, 2) internal transfer pricing, and 3) investment bundling (Miller 2003).

Elevating accounting, as Caterpillar did, meant that accountants operationalized the financial logic of the factory by reshaping what “efficiency” and “value” mean for workers (Miller and Power 2013). Internal transfer pricing, for example, imbued cells with profit-

seeking logic, and cost/price analysis redefined success by financial metrics. Under the PWAF model, decisions once made by engineers and product supervisors were now the purview of accountants and financial managers.

Although finance was not a part of Toyota's original cellular production model, Caterpillar's interpretation of the model was shaped by financial logics. These three accounting innovations were central to how cells were organized, evaluated and justified. So, while financialization was not a prerequisite for cellular manufacturing, it redefined its meaning and practice within Caterpillar. The production/assembly overhaul was more than a technical reorganization. It became a financialized system of accountability and control. A Decatur plant worker captured the infusion of financial metrics into workers' daily experiences this way:

We got into trying to cut costs, which guys did all the time anyhow, it has been years that people have been working on things to cut costs, ways of doing things and making things better, more efficient, more proficient. But this thing here [an employee team plan to cut costs and save jobs], we had costed out through accounting, and they estimated that it was a \$80,000 a year cost savings (Arnold 1998, 677).

George Schaefer, trained as an accountant, drove this shift. He began at Caterpillar right out of college in 1951 as a trainee in the accounting department and held various accounting positions, including chief accountant, before entering management. He was thus well-positioned to lead the firm into the era of financialization. At Schaefer's direction, company accountants focused their attention on conducting competitive cost and price analyses. This undertaking unveiled Caterpillar's 40% cost disadvantage in the international heavy equipment market. This led Schaefer to empower his accountants to devise ways to calculate

and transmit granular financial information (Arnold 1998, Miller and O’Leary 1997, Miller and O’Leary 2002).

“Internal transfer pricing” is an accounting technology that appraises costs and revenues at the corporate division level; at Caterpillar, it applied to business units (Miller and O’Leary 2002, 99). By applying supply-chain logic within the firm, it modeled internal prices for intermediate goods and services based on assumed market rates (Eden and Smith 2022).

Caterpillar’s factory re-design was architectural and conceptual. Each production cell—or “mini factory” operated independently. However, related cells were packaged into “asset bundles” grouped by machinery, software, hardware, and worker expertise, among other assets. Financial resources were disseminated by asset bundles predicated on a peculiar financing technology known as investment bundling (Miller 2003). For instance, the Decatur assembly highway and the Morton, Illinois Parts Distribution Center were counted as two distinct investment bundles that could be self-managed. Management identified around 82 investment bundles within the PWAF program, each a complete package, covering workers’ skill upgrade trainings, logistics, hardware and software installation, machining tools, and employee wages (Miller and O’Leary 2002, 107).

The reorganization into business units and factory cells, and accompanying accounting experiments with new data tools, constituted spatial fixes as they became effective means of capital absorption and paved the way for geographically broader processes of financialization.

Financialization contributed to Caterpillar’s renaissance at multiple scales and through various means. At the macro level, financialization enabled Caterpillar’s broader corporate restructuring. The growing use of financial instruments and accounting practices helped management unlock overaccumulated goods and fixed assets while strategically managing cash flows through debt and equity channels. Additionally, financialization

transformed the discourse and values of Caterpillar's workforce from the executive suite to the shopfloor. Caterpillar's "renaissance" was not only about reconfiguring the physical layout of production but also reorienting the very terms through which workers and managers understood their roles. The shift to cellular production was accompanied by a deeper transformation in goals, evaluation, and communication: what counted as success, how it was measured, and how it was rewarded. Crucially, this transformation hinged on the elevation of accounting from a background administrative function to a central organizing logic of the shopfloor. Financial metrics, cost analyses, and transfer pricing mechanisms did more than track performance—they shaped decision-making, structured work routines, and disciplined managers and workers. In this sense, accounting innovations were not incidental, but rather constitutive of Caterpillar's restructuring, embedding financialization into everyday practices of production. Taken together, these developments demonstrate that financialization was not external to productive transformation but constitutive of it, linking the remaking of the shopfloor to the globally expanded reproduction of capital.

Flexibilization and Globalization

Caterpillar's quest for maximum flexibility led to PWAF's spatial fixes—the transformation of administrative and bureaucratic structures and the transformation of the logic and organization of manufacturing. However, this quest also had implications for the company's global engagement. Caterpillar's newfound enthusiasm for outsourcing and subcontracting, along with the growing importance of its dealership network, exemplify the global reach of this transformation.

Throughout the twentieth century Caterpillar was wary of technology transfer and proprietary in its thinking. Wherever possible Caterpillar sought to keep its supply chain in-house to control quality and capture further added value (Barlett and Ehrlich 1991, 4).

However, Caterpillar's crisis of overproduction and profitability exposed these long-standing policies and practices as spatial barriers to global competitiveness. The company had to learn to trust to tap emerging markets for mining equipment in Global South and Eastern Bloc nations. PWAFF became a program of dismantling Caterpillar's vertical integration through outsourcing and subcontracting.

Vertical Disintegration

Learning to trust meant reluctantly sharing ownership and control over design. In 1994, Caterpillar signed a major contract with a Chinese corporation to access the growing demand for smaller products in East and Southeast Asian markets (Reliableplant 2023). By the mid-1990s Cat equipment was designed, fabricated, and manufactured under license agreements by a host of joint-venture junior companies in Argentina, India, Malaysia, New Zealand, South Africa, South Korea and Turkey. Some strategic acquisitions, like the 1997 acquisition of diesel engine manufacturer Perkins, allowed Caterpillar to enter the compact heavy-duty equipment segment (Haycraft 2011).

By the mid-1980s urban construction in the developing world was rapidly expanding, and Caterpillar's focus shifted accordingly from colossal heavy-duty equipment to smaller and lighter duty equipment. This need for new products encouraged Caterpillar to practice trust and collaboration with outside companies. New products included a backhoe loader that used Ford parts, a hydraulic excavator developed through a joint venture with Mitsubishi, an articulated dump truck, and a giant wheel loader, among others (Haycraft 2011). This novel exercise of trust, involving the transfer of design specs, technology and engineers themselves to external manufacturers, was necessary to speed up product development and unlock the four-billion-dollar Global South market (Barlett and Ehrlich 1991, 9; Schonberger 2018, 73).

By the late 1980s, Caterpillar was outsourcing 70 percent of sub-assembly parts to a worldwide network of around 800 certified external suppliers (Henkoff and Alpert 1988).

Caterpillar's global objectives reduced emphasis on domestic production and sales. Through the acquisition of 20 small firms and 17 joint ventures, Caterpillar added 88 new facilities, worldwide, by 1999. The domestic portion of its manufacturing dropped from 80 to 50%.

Caterpillar's Global Dealership Network

Caterpillar's privately-owned, independent dealership network was a crucial asset in its pursuit of flexibility at a global level, and Caterpillar protected it fiercely (Kozlowski 2011, 23). The network was spatially extensive, spanning 186 countries by the late 1990s, and its strength could overwhelm competitors (Neilson and Pasternack 2005, 222).

The dealership network enabled Caterpillar to operationalize its renewed ideological commitment to customer service. As CEO Donald Fites put it, "local dealers who are long-established members of their communities can get closer to customers than a global company can on its own" (Fites 1996). Dealers, through their on-the-ground observations of what local projects needed, fed insights back to the company regarding product improvements (Fites 1996). Dealerships could also facilitate relationships with other machinery producers. This reinforced Caterpillar's brand, as the company increasingly marketed equipment made by others, painting it mustard yellow and adding the Cat logo, signaling a shift from production control to brand leverage (Franklin et al. 1992).

The growing influence of Caterpillar's dealership network incentivized the company to spin off Caterpillar Financial Services in 1984 to provide credit and insurance to Caterpillar dealers and customers (Greenhouse 1985). In 1988 Caterpillar established Caterpillar World Trading Corporation to extend its dealers' reach into erstwhile closed

markets (Bartlett and Ehrlich 1991). In 1990, Caterpillar established CSARL Parts Distribution, a Swiss subsidiary that managed its global parts inventory through 19 warehouses at key geographic nodes, ensuring efficient after-sales service (Caterpillar's Offshore Tax Strategy 2014).

Investing in its dealership network through the creation of additional captive companies absorbed excess capital. Caterpillar's dealership network grew disproportionately outside of North America. By 1996, Caterpillar had 138 foreign and 48 domestic dealerships (Fites 1996). The dealership network employed more individuals than the parent company did. This growth enabled Caterpillar to get its parts and products delivered anywhere in the world within 48 hours, further operationalizing its customer service model. Thus, through reinvesting in the dealership, parts distribution network, and after-sale services with the aid of credit institutions, Caterpillar managed to metabolize overaccumulated capital and regain its competitive edge.

Research and Policy Advocacy

In addition to the spate of subsidiaries, captive companies, and independent dealerships that facilitated Caterpillar's globalization and financialization, the firm also invested in research and lobbying. Annual research and development investment increased from \$532 million to \$838 million during the 1990s (Froud et al. 1998). The company also formed New Technology Group in partnership with the US Department of Energy for research on low-carbon emission technologies for heavy-duty equipment (Zadoks 1997). During this period, Caterpillar began to undertake earnest lobbying efforts on behalf of free trade to boost its expansionist projects (Caterpillar 2011). Caterpillar lobbied Congress to remove legislative barriers to geographic expansion. In 1985, Caterpillar played a key role in the Plaza Accord, which devalued the US dollar vis-à-vis European and East Asian currencies

to ease the US debt burden and facilitate US entry into these economies (Bouchard and Koch 2014). The company's lobbying streamlined the US free trade agreements with Latin America and China (Chen 2024). Caterpillar's vision found a staunch ally in US President Ronald Reagan, who invoked Caterpillar itself in a speech to the House of Representatives on May 24, 1988:

The experience of the Caterpillar Company in the early 1980s, for example, is indicative of the need to be flexible to meet foreign competition and indeed to survive. They had to utilize layoffs and temporary plant closings to respond to competitive developments. And, as one executive of that company stated, they did not have the luxury then, nor do they now, of knowing with certainty what business conditions would be like 60 days in the future. Without the ability to be agile and responsive, they might have closed their doors permanently. Caterpillar's experience is repeated many times over throughout our economy... We need labor laws that fit the flexible, fast-paced economy of the 1990s, not restrictive leftovers from the 1930s' agenda. (Reagan 1988)

The North American Free Trade Agreement and the General Agreement on Tariffs and Trade acted on Caterpillar's lobbying efforts and removed international trade barriers. Neoliberalization of global trade served Caterpillar well. In 1998 the company celebrated record sales of \$21 billion.

In sum, Caterpillar's efforts at flexibilization and spatial fixing extended across the globe and were carried out through its newfound affection for vertical disintegration. This included outsourcing parts production, branding third-party products, growing its dealership network, investing in research, lobbying for liberalizing trade, and generating a series of subsidiaries to enhance auxiliary activities like financial services and inventory management.

A Fully Flexible Caterpillar: The Successes of the Spatial Fix

The set of fixes Caterpillar instituted “succeeded” beyond all expectations. Caterpillar reclaimed dominance in the heavy machinery sector. The fully flexible Caterpillar focused on specialized core power modules, systems and parts for others’ machines, while enthusiastically entering the lighter-duty equipment market in the Global South. The flexibility built into its fabrication processes allowed the company to design precise and individualized machinery per customers’ specifications. The successes of the PWAF program boosted efficiency and new product capacity.

Time to market shrank. Before PWAF, a 15-ton front wheel loader machine took three weeks to assemble. Once PWAF was in place, throughput time at the Aurora, IL factory fell to two days. On average, Caterpillar reduced manufacturing time by 75% and cut in-process inventories at its factories by 60%.

The gains in manufacturing efficiency matched gains in new product development capacity. The burgeoning construction market in the Global South necessitated smaller machinery that could navigate urban spaces, while the mining industry required ever larger equipment to satisfy its expanding spatial footprint. Once PWAF was in place, Caterpillar began its “high velocity new product introduction” initiative, which allowed the company to rapidly introduce 53 new and upgraded products (Saravanan and Vikkraman 2015, 67). By 1988, Caterpillar had doubled its product line, adding the 797 off-highway truck, backhoe loaders, paving equipment, articulated dump trucks, hydraulic excavators, and more (Haycraft 2011). In 1997, it rolled out a 40-ton excavator, which sold so well that Caterpillar doubled its market share in the span of two years (Carson 1998, Neilson and Pasternack 2005).

Caterpillar’s renaissance shocked analysts who heretofore considered such a comeback impossible. Iain Carson (1998) describes the Aurora, IL plant with a tone of awe:

Today, the welding hall is completely clear; the giant slabs of thick steel are quietly cut into shape by high-voltage plasma guns, which produce a much more precise cut and no smoke. It used to take 6,000 workers to get one big back-loader through the plant. Today 3,000 workers can get it through in six days...Some parts are carried silently overhead on conveyor belts; heavy sub-assemblies are driven around in ghostly self-guided vehicles (SGVs). These creatures are summoned by an operator at a computer terminal who notes that a given chunk of metal has finished being drilled, milled, ground or bored and is ready to move to another place, where one of 47 robots will weld it to another chunk. The SGVs find their way around with the help of laser beams and barcodes at every junction on the production lines. (Carson 1998, 1)

Carson's depiction of the factory floor as "clear" "silent" and "ghostly" vividly captures the automation of the Plant with a Future—governed by computers and robots and devoid of human intervention.

Spatial fixes for flexible accumulation equipped management with new means to wage its war on labor. Automation—Caterpillar's 'offensive against its workforce'—reduced jobs, eroded UAW power, and weakened worker bargaining positions (Froud et al. 1998, 704). While implementing the PWAF, Caterpillar closed seven North American plants in Iowa, Oregon, Ohio, Wisconsin, and California and opened four new "union-free plants" in Mississippi, Indiana, North Carolina, and Missouri. It relocated other facilities to "right to work" areas of the southern US, thus reducing its unionized workforce by 17% between 1980 and 1995 (Franklin et al. 1992, 6).

The company's legacy is evident on the walls and throughout the spaces inside the Caterpillar Visitors Center in Peoria, Illinois. The three-story, state-of-the-art, museum-like space displays innovative engines along with colossal mining and construction machinery.

Informal conversations with staff at the Visitors Center revealed that the facility was for the Caterpillar community rather than the public. Personnel stated that, “the Center aims not to attract ordinary visitors but to provide retired employees and their families a chance to cherish their work-life at Cat and admire the impressive machinery they built and operated during their time with the company.” Employees further described the Visitors Center as a recruitment tool and a means of cultivating and reinforcing company pride, describing its purpose as to “inspire younger generations of former employees to consider a future with Cat.” Built in 2012, the Visitors Center is a post-Fordist artifact that reinforces Caterpillar’s ideals of competitiveness, worker autonomy, responsibility and creativity. Inspiring rhetoric, however, replaces job security and wage growth. The Plant with a Future program produced widespread layoffs, eroded union density, and degraded real wages and non-wage benefits. The Caterpillar Visitors Center sits along the Illinois River, next to the Peoria Riverfront Museum, in the city’s modest tourism corridor. It draws visitors to celebrate Caterpillar’s legacy and its ties to the City of Peoria, despite moving its headquarters to right-to-work, corporate tax haven Texas in 2022.

Concluding Remarks

This article depicts the processes undertaken by Caterpillar, Inc. to resolve crises of overproduction and profitability in the waning years of the Fordist capital regime. Caterpillar stands as an emblematic case of the flexible, financialized and globalized twenty first century manufacturing firm. Its distinctive take on lean manufacturing highlights overlooked variability within post-Fordist industrial restructuring.

Caterpillar’s solutions reinforce David Harvey’s (2003) concept of the spatial fix. The completeness of Caterpillar’s transformation at ideological, structural and spatial levels, underscores post-Fordism as a distinct capital regime (Peck 2017). The very name of

Caterpillar's *Plant with a Future* program conjures the spatio-temporal dimensions of its restructuring: Spatial displacements such as the globalization and decentralization of Caterpillar's supply chains and dealership networks operate in concert with the temporal displacements of redesigned bureaucracy, flow-manufacturing, and reinvestment in research and lobbying. The rollout had four phases. *Consolidation* involved closing plants, relocating others to right-to-work states, and reducing shopfloor square footage. *Simplification* referred to streamlining shopfloor organization and machinery design to speed up workflow. *Automation* meant deploying labor-saving technology, while *integration* referred to implementing computing networks for coordination and communication.

Caterpillar's transformation unfolded through four interconnected spatio-temporal strategies. First, it overhauled its bureaucracy, shifting from a rigid, centralized hierarchy to a decentralized structure that devolved accountability and decision-making. Second, it reconfigured production, replacing traditional assembly lines with cellular layouts and integrating advanced computing technologies to streamline workflow and save labor. Third, it financialized operations, embedding accounting logics into production and managerial decisions to better track costs, performance, and profitability. Fourth, it pursued vertical disintegration, outsourcing components, sharing design responsibilities, subcontracting, and expanding its dealership network to globalize supply chains and extend market reach. Each of these processes, at distinct scalar levels, was motivated by the ideological imperative of decentralizing responsibility and devolving accountability.

The technology of financialization shoots through all dimensions of Caterpillar's spatial metamorphosis. The bureaucratic transformation and reorganization of the shopfloor placed financial data at the center of decision-making. Accounting techniques such as investment bundling, competitive cost and price analysis, and internal transfer pricing allowed Caterpillar's manufacturing "cells" to enjoy decision-making autonomy while also

reinforcing their accountability. Financialization, as capital absorption and reinvestment, assumed many forms within Caterpillar's manufacturing overhaul. Its dismantling of vertical monopolies included joint ventures and outsourcing part fabrication across the Middle East and South and East Asia. Caterpillar also spun off new centers and subsidiaries to absorb capital. These included investments in far flung design and tech centers, lobbying groups, captive companies to finance and insure Caterpillar's dealership network, and even branding external products with the Caterpillar logo and color.

The discursive and ideological underpinnings of PWAF, especially the rhetoric of worker autonomy and accountability, fueled and justified Caterpillar's renaissance. Discourse helped reshape labor processes by restructuring shopfloor relations between management and workforce and by coupling workers and machines per algorithms. But it was also pivotal for securing ideological control, fostering worker commitment, and harnessing shopfloor expertise (Kumar and Dougherty 2025).

Discussions of post-Fordist industrial restructuring are not new; however, most scholarship centers synthetic geographic retellings that focus on specific countries or world-regions. Rarely does research zero in on a single firm (see Janoski and Lapadatu 2021). This firm-level analysis pinpoints the links among ideological diffusion, individual decision-making, and the remaking of the global economy. It highlights intimate details that underpin global phenomena. Rather than treating post-Fordism as a monolithic paradigm, we show how individual firms both follow and reinvent the playbook, producing variegated "post-Fordisms." Where scholars often treat flexibility as an outcome of post-Fordism, we foreground its constitutive role in corporate restructuring, and the repurposing of the factory shopfloor for the expanded global reproduction of capital.

The promise embedded in the rhetoric of "bringing back" good manufacturing work to the United States, so central to contemporary political discourse, requires more than tariffs

or tax breaks. It requires an ideological transformation to dismantle the entrenched post-Fordist global economy. This under-the-microscope view of Caterpillar's metamorphosis highlights just how challenging keeping these promises would be.

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