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EDITORIAL

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Introduction to the special issue on mobility, climate change, and economic inequality

1 | INTRODUCTION

Operations Management (OM) is at the heart of two global sustainability objectives in the 21st century: to reduce the negative impact of operations and supply chains on the climate, and to improve access to good jobs, in order to address growing income inequality. Nowhere is this more evident than in the mobility sector. Mobility and transportation systems are key producers of greenhouse gas emissions and pollution. They are also vital providers of employment and access to work and have been fundamental to global economic growth.

2 | THE CHALLENGE AHEAD

Addressing climate change is one of the most urgent tasks facing society. Research by the World Economic Forum (WEF, 2019) identified extreme weather events and the failure of climate change mitigation and adaptation as potentially the two most severe impacts on the world. Failure to address climate change may result in insurmountable costs to our social and economic structures. Meanwhile, advances in technology, such as automation, have drastically increased efficiency while reducing the cost of transportation. As a result, motorized movement continues to increase globally (IEA, 2021). Transport accounts for 37% of carbon emissions from end-use sectors (IEA, 2021). And while lockdowns during the COVID-19 pandemic reduced the demand for transportation in 2020, by 2021 emissions were back on their pre-pandemic growth track. To reverse the alarming growth in carbon intensity of mobility systems, shifts in transportation modes as well as operational and technical energy efficiency improvements are required (IEA, 2021).

Transportation and vehicle production systems are woven into the fabric of global and local economies, and in many places have been a significant source of middle-class jobs such as trucking, auto assembly, and bus driving. Moreover, the mobility provided by our transportation systems has an important effect on patterns of land use, resource consumption, and access to jobs. To ensure broad participation in achieving climate goals, good jobs must be retained, and the trend of widening income inequality reversed. Without concerted efforts of practitioners, policymakers, and researchers, it is unlikely that climate and social goals will be achieved.

3 | THE ROLE OF OM RESEARCH

Mobility and transportation systems have long been a core setting of OM research. Most studies in this area have focused on traditional outcomes such as quality, cost, and delivery (QCD)—in line with the historical focus of most firms. Supply chain participants used their market power to extract concessions from other participants. Inevitably linked with intense competition are uncoordinated management, bottlenecks, and information deficits and asymmetries, all of which characterize global transportation systems. Added to this are a complex mix of public and private actors, diverse and variable customer needs, and overlapping and at times conflicting regulatory regimes. The result is a system that is vulnerable to disruptions and damaging to social and environmental structures.

Whether Lean—based on the Toyota production system and just-in-time principles—and its many interpretations contributed to this state of mobility and vehicle production systems is discussed elsewhere (e.g., Browning & de Treville, 2021; de Treville & Antonakis, 2006; MacDuffie, 1995; Schonberger, 2007). Important here is that the precedence of short-term calculations over long-term thinking about climate and social externalities resulted in an unsustainable system. Addressing this is in line with the call to broaden the focus of OM research to include value for all stakeholders affected by operational processes (Browning & de Treville, 2021; Gray et al., 2020).

OM scholars are well-positioned to support this move (Pagell & Shevchenko, 2014). One way is to reconsider the traditional idea that sustainability and sound business practices are separate phenomena that need to be balanced (e.g., Wu & Pagell, 2011). Current global challenges raise the question of whether business practices can ever be considered "sound" if their social and environmental impacts are negative.

4 | OLD THEMES AND NEW TRENDS IN MOBILITY AND TRANSPORTATION

Mobility and transportation systems provide a useful setting to demonstrate the need for expanding the objectives, stakeholders, and research methodologies included in OM research. They are mature industries and among the first to be affected by four global phenomena that require a widening of scope: regulatory attention, supply chain globalization, disruptive technological innovation, and a shift from ownership to usership.

Regulatory attention dates back to the beginning of the industry, which is unsurprising considering the impact of mobility and transportation systems on public space and economic life. Due to its negative environmental impact, it has also been a key subject of climate regulations since the 1970s. This long-term pattern of regulatory involvement has only been reinforced by recent trends. Increasing attention to climate change resulted in more stringent environmental regulations in most developed economies. Moreover, to address growing inequality, the European Commission in February 2022 set the first steps in addressing global working conditions by presenting a directive for "corporate sustainability due diligence" (EU, 2022). Its goal is to make all companies based or operating in the European Union, except SMEs, responsible for the "effective protection of human rights included in international conventions" of those who work in their global supply chains. Public policymakers still grapple to address some recent trends, such as autonomous driving and the prominent presence of shared mobility solutions in public space. OM scholars have been encouraged to actively contribute to public policy (Helper et al., 2021), and mobility and transportation systems are settings that would benefit from this attention.

Supply chain globalization is another phenomenon that has historically been tied to mobility and transportation systems (Cohen & Mallik, 1997). Efficiency gains in transportation and shipping enabled global economic growth (Levinson, 2016). The surge in outsourcing concomitant with the rise of China in the 1990s deeply impacted the automotive industry. The relocation of production replaced the stable, blue-collar jobs that used to be common in vehicle production systems with insecure, low-paying jobs in lower labor cost countries (Weil, 2014), where child labor, forced labor, hazardous conditions, and lax environmental standards may be common practice. A reverse trend is reshoring, which can be driven by geopolitical and economic considerations, but also by social and environmental ones. Here also, OM scholars are well-equipped to provide insights (Gray et al., 2013).

Technological change is hardly a new phenomenon but again one where mobility and transportation systems can provide key insights as an early setting. Both process and product innovation are permanent features of mobility and transportation systems. Process automation has increased efficiency and reduced the number of physically strenuous jobs throughout the history of the industry. While this has led to the displacement of blue-collar workers, it also increased the need for some good jobs such as machine programmer and operator. Recent changes in propulsion technologies, motivated by environmental concerns, reinforce the trend of ever-changing skills requirements throughout the mobility and transportation sectors and their supporting industries. The surge in digital tasks further accelerates the need for adaptation from bus, train, and truck drivers, production line-workers, vehicle part suppliers and purchasers, engineers, city planners, policymakers, gas station employees, and many more. With their knowledge of process change as well as engagement with frontline workers, OM scholars are encouraged to study and support changing job designs and processes.

A more recent trend, in which mobility and transportation were early movers, is changed patterns of consumption that replaced end-of-line sales with subscription schemes for usership. A steep increase in mobility options caused even public transit monopolies to face new competitors such as ride-hailing providers. This shift might spell the end of the steep postwar growth in volumes and types of vehicles produced and thereby reduce the number of jobs in the vast automotive supply chain. OM scholars are well-positioned to support the design of shared usership systems that require fewer physical assets and thus lead to more responsible consumption.

5 | FUTURE RESEARCH OPPORTUNITIES

A short-term focus on local optimization requires limited information-sharing. It is a well-known operational principle that investments in transparency between supply chain parties can reduce the exposure to risk and improve

efficiency (Lee et al., 1997). However, in a competitive setting, information asymmetry between supply chain actors is often exploited for individual gains. This exacerbates overall supply chain weaknesses and hides climate and social damage. It is not surprising, therefore, that supply chain sustainability and transparency are often discussed in tandem (Busse et al., 2017; Gualandris et al., 2021; Jira & Toffel, 2013). Without making actual practices transparent to all stakeholders, addressing environmental and social problems is impossible. To achieve this, a systems view is needed that includes diverse objectives, stakeholders, and research methodologies (Lee & Tang, 2017).

Advances in supply chain management in general, and technology-enabled monitoring of suppliers specifically, have allowed leading companies to safeguard output QCD while reducing their own risks. While leading global firms strictly enforce production output standards in their global supply chains, labor and environmental conditions at their suppliers fall outside their responsibility. The EU directive on corporate sustainability due diligence reverses this trend. The directive recognizes that all stakeholders are needed to ensure a more sustainable future, and thereby forces firms to take more of a systems view.

Existing and new trends such as regulatory attention, globalization, technological innovation, and changed consumption have the potential to disrupt traditional patterns of work and life, redistribute income, and help or hinder progress towards addressing climate change. To predict, analyze, support, and possibly alter the impact of these changes, OM researchers are also encouraged to adopt a systems view. This can support the answering of urgent questions such as:

- Can vehicle production systems only overcome challenges, such as the disruption caused by COVID-19 and a switch of propulsion technologies, under conditions of volume growth? What does this mean for the millions of people employed in vehicle production?
- Can efficiency improvements or achieving climate goals be used to benefit the workforce, for example, by profit- or gainsharing?
- Is keeping the same number of vehicles on the road, and only switching their propulsion technology, sufficient to avoid devastating climate disruption and improve the living conditions of the growing number of urban poor who are disproportionately affected by the adverse health impacts of emissions?
- Can the planet sustain the extraction of natural resources needed for a large-scale propulsion shift? What impact will this have on the types of jobs in this industry?
- Can a reframing of private costs and benefits, such as the hidden costs to companies of high worker turnover, align public and private incentives?
- What incentive structures could shift corporate and operational decision making towards more balanced, longer-term, sustainable outcomes for all stakeholders?
- What are the implications for climate and job quality of upstream innovations such as automation, artificial intelligence, and 3D printing, and of downstream innovations such as mobility-as-a-service, electrification, and autonomous driving?
- Who should have access to the large amounts of data generated by vehicles in the digital era, and can these data be used to support climate goals, for example by road pricing, polluter-pays principles, or congestion charges?

Answering these questions can explicate the link between operational decision making and environmental and socioeconomic outcomes for all stakeholders. By making their research accessible to practitioners, policymakers, and consumers, OM scholars can support the formulation of actionable improvements.

6 | PAPERS IN THIS SPECIAL ISSUE

Wang et al. (2022) focus on last-mile transportation systems, which have important implications for congestion and pedestrian space, the carbon footprint of online retailers, and employment conditions for drivers. Last-mile transportation systems are typified by interactions among multiple organizations with significant market-power asymmetries. Policy makers in the US have traditionally focused on costs, but Wang et al. (2022) encourage them to oversee the misuse of market power by large retailers. This may support smaller companies that are currently losing out in the increased consolidation of this market. To reduce the climate impact of last-mile delivery, Wang et al. (2022) suggest that policymakers incentivize firms to increase off-peak or drop-off point deliveries and replace their existing vehicles with less-polluting ones. This paper is a good example of how OM scholars, with their extensive research experience in transportation systems, can support policy initiatives aimed at increased sustainability and economic equality.

Naumov et al. (2022) study "cash-for-clunkers" (C4C) policies designed to accelerate the adoption of electric vehicles in the US. They suggest that C4C policies can considerably reduce vehicle fleet emissions at a reasonable cost per ton of CO_2. C4C policies bring advantages of cost reductions through scale economies, charging infrastructure deployment, model variety, and consumer awareness. These advantages are amplified when deployed together with policies promoting renewable electricity production and a gas tax or carbon price, underscoring the

usefulness of a systems view on improving the climate impact of mobility systems. A systems view also exposes the potential weakness of the C4C policy: Gas taxes and carbon prices often disproportionately harm lower-income individuals. But by bringing these unintended effects to the surface they are part of the discussion rather than ignored. This paper shows that positive effects in one dimension, such as reduced emissions due to a propulsion technology switch, may lead to negative effects in another, such as increased social inequality. Adopting a systems view can preempt this.

Samson and Swink (2022) discuss the closure process of Toyota Australia's plant in Melbourne and its subsequent results. They adopt an engaged research approach and apply psychological contract theory to provide an in-depth examination of this closure process. Toyota's investment in a respectful plant closure included upskilling and reskilling of workers, which minimized the negative impact on workers and local communities. This paper shows how building up a stock of employee goodwill supports a transition period—even if the ultimate goal is the closure of facilities. Operational decisions such as the relocation of production greatly impact the social and economic wellbeing of workers and their communities, and it is important that these outcomes are included in OM research. This paper illustrates how OM scholars, due to their proximity to production processes and frontline workers, can study the impact on local employees and communities of global relocation decisions.

7 | CONCLUDING REMARKS

Mobility and transportation are key to social life, public space, and economic well-being. They are also major polluters. To ensure the support that is needed to make an urgent shift in how we consume mobility and transportation, a new approach is needed. This Special Issue includes examples how OM scholars can contribute to this task.

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