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Abstract

The Mexico City microbus cannot be understood merely as a vehicle or as a lagging component of the mobility system. It is a social infrastructure where urban form, the economic organization of privately operated transport, travel routines, and the occupational health of its drivers intersect. Based on a systemic analysis of urban dynamics and academic literature on space production, mobility, precarious employment, and ergonomics, this essay argues that the demands of the driver's job are the result of a socio-spatial chain: the separation between housing, employment, and services produces long commutes; these flows put pressure on the transport system; and this pressure is then transferred to the driver's body through long workdays, sustained postures, exposure to noise, informal monitoring of competition for passengers, and limited decision-making capacity. The text proposes that the modernization of public transport must include, in addition to vehicle renewal, criteria for decent work, ergonomic design, rest management, operational reorganization, and road safety understood as an effect of the city that is produced daily.

Keywords: minibus driver; truck driver; job insecurity; ergonomics; urban mobility.

Introduction

In Mexico City, discussing minibuses and their drivers is often a contradictory topic. For some, the drivers represent the face and, therefore, the identity of a mode of transportation that provides access to areas inaccessible to other modes. For others, however, drivers represent discomfort, uncertainty, exposure to risk, and a form of mobility that resists planning. Both perspectives are valid, but incomplete if they exclude the worker who sustains the service. The minibus driver doesn't just drive a vehicle: they manage schedules, collect fares, negotiate with passengers, interpret traffic, compete for passengers, resolve mechanical problems, absorb a considerable portion of the city's tensions, and, nowadays, many drivers even protect women from sexual harassment.

In this sense, this work arises from reflecting on public transportation and its urban dynamics. Therefore, it also considers that the transportation system is not an independent element, but rather a relationship between the territory, the activities carried out in the region, and the flows generated by these activities, both by the transportation system and by the system of activities themselves. Thus, it can be considered that the available transportation determines how and when the population moves, but these flows also condition the location of activities and, therefore, exert pressure on the transformation of the city. This can be exemplified as follows: first, when the activities of a territory are modified (by opening a new hospital, school, or shopping center), flows will be generated that will possibly require new transportation systems—such as a new bus line or stops—that is, activities-flows-transport are generated. In the second case, the creation of a new transportation system—such as a subway station or an intermodal terminal—results in the establishment of businesses and new activities due to the increased volume of people using it; that is, transportation-flow-activities. This co-evolutionary paradox, originally formulated within the tradition of Manheim's transportation systems analysis ¹, allows us to analyze the work of the minibus driver as a material consequence of the urban structure and not merely as a job that individually exposes individuals to various risks and demands.

¹ Marvin L. Manheim, *Fundamentals of transportation systems analysis, Basic concepts*, MIT Press, 1979

This raises the question that gives rise to this work: why are the ergonomic demands of minibuses so significant in a city whose daily mobility depends on flexible public transportation services with low levels of job integration? If job integration is understood as the difficulty of the work process, poor adaptation, and unsatisfactory job security, coupled with the flexibility of the service, then the answer requires examining the relationship between urbanization, the business structure of the public transportation sector, and socio-historical factors—including public policies within globalized and neoliberal contexts—that have created market structures establishing high levels of competitiveness and low fares. Therefore, job insecurity is not simply a matter of income level but rather encompasses elements that drive an organization and division of labor that demands long working hours, outdated, unsafe, and uncomfortable vehicles, ultimately leading to uncertainty, accumulated burnout, stress, and difficulty in controlling one's own work pace ². In turn, they manifest physiologically in ailments that include the back, neck, eyesight, hearing, sleep, and muscle tension.

In this sense, this work is an interpretive essay, which does not intend to make an epidemiological measurement or a field ergonomic evaluation, but rather to contribute as an analytical framework to the debate on the need to modernize public transport in aspects beyond just the technological and operational ones; that is, the organization and division of labor must be included, and the driver must be considered as an agent that determines social costs, such as public health, road safety, and the proper functioning of transport systems; since aspects such as the renewal of the vehicle fleet, the reorganization of routes and the regulation of fares may fail if they do not modify the conditions that produce fatigue, competition and daily exposure to the risks and demands on the driver.

Transport, space and everyday life

Considering socio-spatial dynamics—including the economic, social, political, and environmental processes embodied in human groups and spatially differentiated—the minibus is a particularly revealing object. These vehicles reach the very limits of

² Luis David Berrones-Sanz, "Working Conditions of Minibus Drivers in Mexico City as a Risk Factor in Road Safety", *Social and Behavioral Sciences*, Vol. 160, 2014, 188–194

urbanization, thus indicating the boundaries and determining the form of the city. Consequently, microbus routes connect low-income housing areas with mass transit and areas that concentrate diverse activities such as jobs and services. Therefore, minibuses often emerge as the only transportation alternative capable of uniting what urbanization has separated; they connect increasingly distant and dispersed peripheries and, thus, contribute to the right to the city, understood not only as access to services but also as the collective capacity to transform urban living conditions ³.

Likewise, Lefebvre argued that “social space is produced and reproduced in connection with the forces of production (and with the relations of production)” ⁴; therefore, if this idea is applied to transportation, the street cannot be seen as a simple surface for circulation, but rather it must be considered that each journey condenses historical decisions that have determined land use, housing prices, industrial location, working hours, road hierarchy, and the unequal distribution of amenities; this is directly materialized in the way the city separates functions—areas for living and areas for working—and, therefore, generates urban fatigue when transportation systems become, more than an option, an obligation.

So, minibuses operate in a city with imposed distances, where single-use zones impose long routines, which increase demand during peak hours and create demands on the drivers' work process; that is, demand pressures the driver to accelerate, stop frequently, compete for boarding and alighting (the penny war), and extend the workday; therefore, although the problem does not originate in the vehicles (but in the city), the seats, the steering wheels, the pedals and the vibration of the vehicles end up being the last ladder of a broader socio-spatial organization and, therefore, it is clear that not only is the movement of people important, but also the power relations that determine how people move, at what cost, under what conditions and with what consequences ⁵.

³ David Harvey, “The Right to the City”, *New Left Review*, Vol. 2, No. 53, 2008, 23–40

⁴ Henri Lefebvre, *The production of space*, Massachusetts, USA, Blackwell, 1991, p. 77

⁵ Mimi Sheller, John Urry, “The New Mobilities Paradigm”, *Environment and Planning A: Economy and Space*, Vol. 38, No. 2, 2006, 207–226

Precarious conditions in the privately operated transport sector

Precariousness is understood as a condition of economic insecurity, low protection, and weak control over one's future employment.⁶ In the case of minibuses, this insecurity takes on an urban form, experienced through traffic congestion and rising fuel costs, with their associated externalities such as decreased income; roadworks that necessitate route changes; and mechanical failures that result in downtime and even require drivers to go into debt to purchase replacement parts. All these factors highlight the precarious situation of the driver and arise not as a moral failing of the profession, but rather as a way of organizing the service.

In this sense, one of the central features of drivers' precarious situations is that they bear the operational risk. For example, when a driver works on a piece-rate basis or pays rent for the vehicle (the fare), and therefore their income depends on the number of passengers they pick up, the number of trips completed, or the various and unstable daily arrangements they make, this puts the driver under constant pressure to generate trips. This, in turn, causes the workday to cease being measured as working time and instead become a race against traffic, competition, fares, and fluctuating demand.

In particular, the concessioned transport sector in Mexico includes what the International Labour Organization refers to as non-standard forms of employment⁷, meaning that it has arrangements that deviate from the continuous, subordinate, and protected employment relationship; and in the specific case of the minibus, the work of the drivers combines economic dependence, apparent autonomy, and daily responsibility ; since, although the driver appears autonomous on the road, their real scope is limited by the route, the vehicle, the owner, the authorities, the passengers, and traffic; a mixture that produces the driver-responsibility paradox, meaning that the minibus driver, and in general any professional driver, is held to a high standard in terms of public responsibility and, conversely, does not have adequate working conditions equivalent to that level of responsibility.

⁶ Guy Standing, *The precariat, The new dangerous class*, Chennai, India, Bloomsbury Academic, 2014

⁷ ILO, *Non-standard employment around the world, understanding challenges, shaping prospects.*, Switzerland, International Labor Organization (ILO), 2016

Furthermore, job insecurity in the privately operated public transportation sector extends beyond the type of contract; therefore, formal employment does not guarantee stable, secure, and long-term work. In Mexico City, in recent decades, transportation authorities have sought to transform the owner-operator model (micro-enterprises) into commercial companies, with businesses formed by the different routes or branches operating in the city. It follows that these new forms of organization and technical management have generated a shortage of urban route drivers in the labor market. In general, although the new companies offer social security and benefits, workers continue to face inadequate arrangements that increase the demands of the job. One example is the "open-open" system, where drivers who work the night shift and remain until the end of their route's service hours go to the depot, park their vehicles, and sleep for a few hours in bunk beds within the facilities before waking up to begin their next route's service.

Thus, it is known that precarious and disorganized work is associated with deteriorating occupational health and safety ⁸. Specifically in the microbus industry, disorganization is not just an administrative problem; it manifests in uncertain breaks, improvised meals, inconsistent maintenance, pressure to make up for lost time, and a lack of standardized safety routines. This, in turn, determines the level of fatigue, leads to hasty decisions, and reduces the ability to anticipate road hazards . The problem of disorganization and precarious working conditions among microbus drivers is so significant that, in Mexico, drivers are considered to have the second-highest number of fatalities in the economic sector, second only to construction workers. ⁹ Furthermore, their occupation has a profound impact on public health ¹⁰.

It should also be noted that public policies aimed at replacing vehicles, establishing vehicle color schemes, authorizing routes or corridors, regulating fares, or conducting physical-mechanical inspections are necessary but insufficient actions. A new vehicle can help reduce vibrations and greenhouse gas emissions, but it does not shorten the

⁸ Michael Quinlan, Claire Mayhew, Philip. Bohle, "The global expansion of precarious employment, work disorganization, and consequences for occupational health, A review of recent research", *International journal of health services: planning, administration, evaluation* , Vol. 31, No. 2, 2001, 335–414

⁹ Luis David Berrones-Sanz, Patricia Cano, Diana Sánchez, José Luis Martínez, "Lesiones, enfermedades y accidentes de trabajo de los conductores del autotransporte de carga en México", *Acta Universitaria*, Vol. 28, No. 3, 2018, 47–55

¹⁰ Luis David Berrones-Sanz, "Work stress in bicycle taxi drivers in the Historic Center of Mexico City", *Medical Journal of the Mexican Social Security Institute* , Vol. 58, No. 3, 2020, 265–274

workday. Similarly, while regularity, technical specifications, and operational efficiency can be improved in a corridor, a decent income is not guaranteed if the compensation scheme maintains competitive incentives. In short, it must be considered that technical modernization requires labor modernization, and therefore, these actions will be insufficient if working and health conditions, material living conditions, and, consequently, the driver's daily economic well-being are not improved.

Ergonomics and the driver's body as infrastructure

Ergonomics allows us to translate urban discussions to the scale of the body. Wilson¹¹ defined ergonomics as a discipline focused on understanding the interaction between people and systems to improve well-being and performance. In a microbus, this interaction includes the seat, steering wheel, dashboard, visibility, vibration, temperature, noise, passengers boarding and alighting, repetitive maneuvers, simultaneous attention, and social pressure. The driver does not occupy a neutral position: they occupy a mobile, changing, and exposed work environment.

The physical demands are evident : prolonged sitting puts strain on the lower back; repetitive pedal and steering wheel movements cause tension in the legs, shoulders, and neck; vehicle vibration can aggravate musculoskeletal problems; poor ventilation and heat increase fatigue; and noise raises irritability and hinders communication. On roads with uneven pavement or heavy traffic, the body absorbs micro-impacts for hours. The wear and tears do not appear as an immediate event, but rather as a silent accumulation that makes musculoskeletal discomfort one of the most common health conditions among those causing disability in this line of work¹².

These demands are compounded by cognitive ones; driving public transportation involves processing and interacting with pedestrians, cyclists, motorcyclists, cars, traffic lights, potholes, bus stops, paying passengers, passengers asking questions, vehicles cutting in, and slipping away time. Divided attention is a constant condition. Karasek

¹¹ JR Wilson, "Fundamentals of ergonomics in theory and practice", *Applied ergonomics* , Vol. 31, No. 6, 2000, 557–567

¹² Berrones-Sanz, Cano, Sánchez, Martínez, *Lesiones, enfermedades y accidentes de trabajo de los conductores del autotransporte de carga en México*

¹³explained that work-related stress increases when demands are high and decision-making capacity is low; in minibuses, this combination is frequent, as the driver responds to multiple demands but has little say in the route, road design, demand, fare, or the actual duration of the workday.

Road safety and city organization

Regarding accident prevention, it is fair to say that transportation safety reflects how the city is organized. This is not just a metaphor; accident rates, speed, passenger boarding and alighting maneuvers, lane incursions, and pedestrian safety all depend on infrastructure, but also on the work environment. A fatigued driver on a congested road, under pressure from passengers, faces a combination of risks that no amount of isolated training can resolve.

Road safety, from this perspective, is an emergent property ; it arises from the relationship between urban design, operation, working conditions, road culture, and regulation. Therefore, safe mobility policies must go beyond behavioral campaigns; they require legible lanes, dignified stops, speed management, user information, preventive maintenance, non-punitive enforcement, and working conditions compatible with sustained attention; because, as mentioned earlier, in public transport, protecting the driver means protecting the passenger and the pedestrian.

For its part, the General Law on Mobility and Road Safety ¹⁴placed the right to safe, accessible, efficient, sustainable, inclusive, and equitable mobility at the forefront of the Mexican debate. However, this right cannot be limited to the user's experience alone, and the right to move around is inextricably linked to the right to work or go to school without becoming ill. If the city requires hundreds of thousands of people to travel daily, it must also recognize that the operation of this mobility relies on workers with physical and psychological limitations, and that exceeding these limitations carries high social costs.

¹³ Robert A. Karasek, "Job Demands, Job Decision Latitude, and Mental Strain, Implications for Job Redesign," *Administrative Science Quarterly* , Vol. 24, No. 2, 1979, 285

¹⁴ *General Law on Mobility and Road Safety*, 17/05/2022

In this regard, the intention of the Mexico City government authorities ¹⁵to replace minibuses as part of the modernization of public transportation routes presents an opportunity to improve comfort, reduce greenhouse gas emissions, and enhance vehicle safety. However, it must be considered that if the policy is limited to technological improvements, there is a risk of perpetuating the precarious conditions in new vehicles. This is despite the fact that one of the main requirements of the minibus replacement program is to consolidate the operations of public transportation routes and corridors under a single administration and structure them as legal entities—a requirement that appears to be the biggest obstacle to vehicle renewal and fails to address the structural problem of drivers. Therefore, the issue should not be solely which vehicle is in operation, but rather the work organization, income, training, and ergonomics under which drivers perform their work.

Looking after the minibus driver does not mean prioritizing them over the passenger; it means recognizing that the quality of service depends on their working conditions ¹⁶. It's important to understand that a system that demands punctuality without recovery time only promotes defensive driving in theory; that a system that demands courteous treatment without reducing stress leads to inadequate training; and that a system that demands safety without adjusting financial incentives results in penalties, not prevention. Therefore, ergonomics must shift from individual job evaluations to a systemic approach.

Closing: Work, Mobility and Urban Inequality

The transportation system, in its basic form, is composed of three elements (the road, the vehicle, and the user), and the minibus mode of transport is no exception. In this sense, minibus mobility, from a systemic perspective, reveals that it is not only a matter of infrastructure or vehicle technology, but also of the work of its drivers. Therefore, the precarious employment of drivers, their exposure to risks and demands—both ergonomic and those derived from the organization and technical division of labor—are not separate problems but two sides of the same urban organization; consequently, each journey, although it appears individual, is sustained by a series of territorial

¹⁵ Mexico City Government: *We will replace 5,800 minibuses*, <https://gobierno.cdmx.gob.mx/noticias/sustituiremos-5-mil-800-microbuses/>

¹⁶ Berrones-Sanz, *Working Conditions of Minibus Drivers in Mexico City as a Risk Factor in Road Safety*

decisions, economic arrangements, and physical efforts that fall on the main component of the system: the driver.

Furthermore, starting conceptually from Manheim's systemic vision offers a strong foundation for situating the driver's body within transportation and the circular relationship between system, flows, and territory. This circular relationship and the importance of the driver in the city and the microbus transportation system can be illustrated as follows: if the city produces long journeys, transportation absorbs the pressure; when transportation operates under precarious incentives, the driver's body becomes a buffer; when the body becomes fatigued, road safety weakens, and therefore, the outcome is not inevitable, but rather structural.

Ultimately, considering the microbus system from a socio-spatial perspective means shifting the focus from why drivers behave in certain ways (or, in other words, why they drive the way they do) to what city, what regulations, what service economy, and what ergonomic design make that driving style likely. Therefore, to answer this question, we must rethink the path toward government action; recognize that modernization is not just about replacing vehicles, but about reorganizing the work that makes mobility possible; and assume that a city aspiring to the right to mobility must begin by acknowledging those who make mobility possible, and that they also drive with their backs, their nerves, their sleep, and their dignity.

Conflict of Interests

The author declares that there are no financial, professional, institutional, or personal conflicts of interest that could have influenced the preparation, interpretation, or submission of this manuscript.

Research Data Availability

This manuscript is a theoretical and interpretive essay and does not report the collection, processing, or analysis of an original empirical dataset. Therefore, no research data are associated with this work. The arguments developed in the manuscript are based on academic literature, legal and institutional documents, and previously published sources cited in the text.

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