

Beyond Thrift: The Hidden Economic Costs of Social Friction and Its Erosion of Efficiency

Yuxuan Wu

*Faculty of Art, University of Ottawa, Ottawa, Canada
wuyuxuan050308@gmail.com*

Abstract. A common way to judge infrastructure projects is by whether they finish on time and stay under budget. However, daily commuting experience often contradicts this simple measure. This paper examines the Chongqing rail transit system, which saves commuters an average of 11.3 minutes per trip compared to other modes. Based on surveys (N=342) and semi-structured interviews, the findings indicate that crowding, boredom, conflicts between tourists and regular commuters, and stress are not merely sociological side effects but hidden economic costs. Time savings lose value if commuters arrive at work mentally drained. The results show that daily commuters — those who rely most on the system — report the lowest satisfaction and the highest stress. The long-term success of a transit system therefore depends not only on speed and budget but also on whether it provides a tolerable experience for all users.

Keywords: social friction, hidden costs, commuting efficiency, happiness economics, mixed methods

1. Introduction

Large infrastructure projects are typically evaluated by two criteria: whether they finish on time and whether they stay under budget [1]. Optimism bias and cost overruns have been shown to be the norm rather than the exception [1]. In response, planners and governments have increasingly focused on measurable indicators such as construction costs, travel speed, and minutes saved [1]. A different question is raised in this paper: whether those minutes saved are worth as much as commonly assumed.

The Chongqing rail transit system is taken as a case study. Quantitative data from this research show that it saves the average commuter 11.3 minutes compared to driving or buses. In a standard cost-benefit model, those 11.3 minutes would automatically be counted as economic gain. However, such numbers conceal important aspects of commuting reality. Standing in a packed metro car at 8:30 AM, squeezed between tourists with suitcases and elderly riders heading to the market, the experience of "11.3 minutes saved" feels very different from its theoretical value.

This paper introduces the concept of "socio-technical frictions" — crowding, boredom, stress, and small daily conflicts. It is argued that these frictions generate hidden economic costs by reducing the real value of time savings. In some cases, they may cancel those savings out entirely. A

transit system that is technically efficient but socially exhausting is only half as beneficial as its planners assume.

To test this argument, a mixed-methods design was employed in Chongqing, consisting of surveys (N=342) and semi-structured interviews. The objective was to compare measured time savings with commuters' subjective experiences of stress, fatigue, and frustration. The gap between these two measures, it is argued here, represents a real economic loss that standard project evaluations typically ignore [1-6].

2. Literature review — and where this paper fits

The traditional view on infrastructure projects is straightforward. Large projects are systematically biased toward optimism [1]. The commonly prescribed remedy is better forecasting and tighter budget control [1]. Speed and time savings thus become the main measures of success: shorter commute equals higher productivity equals economic gain. This logic, while clean and simple, is incomplete.

An alternative line of research insists that infrastructure is never merely pipes and tracks [2]. Infrastructure becomes real only through daily, messy social practices [2]. Modern networks often produce uneven urban experiences — a process termed "splintering urbanism" [3]. Some groups gain mobility while others experience congestion and exclusion [3].

From the perspective of urban justice, a transit system can look statistically successful while still being unfair or stressful for vulnerable groups [4]. The Chongqing data presented in this paper confirm this: elderly passengers, low-income users, and vendors report the worst experiences during peak hours.

Research on commuting and well-being has also shown that commuting is one of the least satisfying daily activities [5]. The psychological burden of commuting is often underestimated because conventional evaluations count only time, not stress [5]. Passengers are willing to pay real money to avoid crowding, and sometimes value a less crowded train more highly than a faster one [6]. This is a direct economic signal.

Subsequent studies have further integrated travel satisfaction and subjective experience into transportation research [7, 8]. Crowding has been linked to stress and lower psychological well-being [9]. Passenger satisfaction depends heavily on perceived comfort and emotional conditions, not only on speed [10]. In the Chinese context, metro systems in major cities have become social spaces rather than mere transport corridors, with tourism, commercialization, and population density reshaping the commuting experience [11].

Thus, while the literature has established strong links between commuting quality, stress, well-being, and economic outcomes, project evaluations still focus almost exclusively on efficiency indicators. The present paper attempts to close this gap by asking how much economic value is eroded by everyday social friction inside a metro system that is, on paper, highly efficient [1-12].

3. Methodology

A mixed-methods design was adopted, combining a quantitative survey (N=342) with qualitative semi-structured interviews. The survey provided statistical patterns, while the interviews captured the noise, contradictions, and small frustrations that do not appear in Likert scales.

3.1. Data collection

Qualitative data

Semi-structured interviews were conducted with Chongqing residents and regular transit users. Questions covered commuting habits, crowding, comfort, safety, fairness, and social interactions. The interviews were deliberately kept open-ended to allow participants to express complaints in their own words.

Quantitative data

A self-administered survey was distributed, consisting mostly of closed-ended questions with Likert scales. Variables measured included commuting frequency, satisfaction, stress during peak hours, perceived fairness, and overall experience. Attitudes toward governance and environmental effects were also asked but treated as secondary.

3.2. Analysis strategy

Interview transcripts were analyzed using two-stage coding. The first stage identified repeated themes (crowding, boredom, conflict, exhaustion). The second stage grouped these into broader categories (congestion, inclusivity, stress, user experience).

Survey data were analyzed using descriptive statistics (means, percentages, frequencies). Comparative analyses were conducted through cross-tabulations, chi-square tests, and ANOVA to compare different groups: daily commuters versus tourists, elderly versus young, low-income versus others.

Finally, interview findings were compared with survey results. Agreements strengthened confidence in the conclusions; divergences were noted and, in some cases, proved as interesting as the agreements.

4. Findings

4.1. Qualitative findings – insights from a daily commuter

A particularly revealing case emerged from an in-depth interview with a daily commuter conducted during a summer internship in Chongqing. This respondent consistently described the metro as technically dependable – "safe and punctual" – with infrequent service disruptions. Yet the lived experience of commuting, as the interview made clear, extended far beyond punctuality.

One notable observation concerned the stations themselves. Elderly residents were frequently seen lingering inside stations during the hot summer months, evidently to take advantage of the air conditioning. Small vendors also congregated in these spaces. What this suggests is that the transit system operates not merely as a mobility corridor, but as a *de facto* public social environment – a function seldom captured in performance metrics.

A second tension emerged between the system's stated inclusivity and the harsh realities of rush-hour travel. The respondent expressed appreciation for the metro's tolerance of local customs, such as allowing passengers to carry bamboo baskets – a practice seen as culturally considerate. During peak hours, however, the sheer density of passengers transformed carriages into what the respondent described as a "survival of the fittest" scene, where elderly and physically weaker riders were clearly at a disadvantage.

Beyond physical crowding, the interview also uncovered pervasive feelings of tedium and emotional drain. Although waiting times were short, the commute itself was portrayed as

monotonous and fatiguing. Standing in tightly packed carriages left little room for reading or relaxation; most commuters resorted to scrolling through their phones, more as a way to endure the time than to enjoy it.

An additional layer of friction came from the metro's unintended popularity as a tourist attraction. Visitors unfamiliar with the station layout often halted abruptly in walkways, blocking the flow of regular commuters and generating visible frustration among those who used the system daily.



Figure 1. Liziba Viewing Platform crowded with tourists photographing the "monorail train passing through a building"

Note. From "Liziba Viewing Platform Crowded With Tourists Photographing the 'Monorail Train Passing Through a Building'," by Zhou Yi, 2023, Chinanews.com (<http://www.cq.chinanews.com.cn/wap/news/2023/1221/21-10808.html>). Copyright 2023 by Chinanews.com.

Taken together, these qualitative accounts suggest that technical reliability, while necessary, is far from sufficient for a satisfactory commuting experience. The quality of daily travel is instead shaped by a messy interplay of crowding, psychological stress, social norms, and the everyday management of public space.

4.2. Quantitative findings

The survey data, drawn from 342 respondents, confirmed that the rail system yields an average time saving of 11.3 minutes per trip relative to other modes. Yet this aggregate figure masked considerable variation in user satisfaction.

Satisfaction scores diverged sharply by rider type. Daily commuters registered a mean satisfaction of only 3.2 out of 5, whereas occasional riders and tourists gave significantly higher ratings, averaging 4.1. Statistical tests further underscored disparities in stress levels during peak periods: elderly passengers, low-income earners, and street vendors consistently reported the highest degrees of discomfort.

A chi-square test revealed that 67% of daily commuters experienced congestion-induced frustration either "frequently" or "very frequently." By contrast, only 22% of tourists reported similar levels of annoyance. In other words, the very population that depends most on the system – and thus stands to gain the most from its time savings – also bears the heaviest psychological burden of overcrowding and dissatisfaction.

5. Discussion

5.1. Willingness to pay and congestion costs

A substantial body of transportation economics research has established that passengers do not treat comfort and crowding as mere amenities; they assign tangible monetary value to them [6]. Numerous studies have shown that travelers are willing to pay higher fares for less crowded carriages, better seating, and lower overall stress [6]. In some cases, the willingness to pay for congestion reduction has been found to exceed the value placed on equivalent time savings – a finding that challenges the conventional primacy of speed in cost-benefit analyses [6].

Translated to the Chongqing context, the measured 11.3-minute saving per trip cannot be evaluated in isolation. One must ask: what is the actual quality of those minutes? If a train is so packed that standing upright requires constant effort, and if the noise and jostling preclude any meaningful use of the time, then those eleven minutes are not a net gain – they are, in effect, a period of low-grade stress. From an economic standpoint, the utility of saved time is substantially eroded, possibly to the point of nullity. This is not to dismiss time savings as irrelevant; rather, the argument here is that their realised value is conditional on the travel environment in which they are embedded [6].

5.2. Spillover effects on productivity and well-being

The negative effects of stressful commutes do not end at the station exit. Psychological strain accumulated during the journey can carry over into the workplace, impairing concentration, task performance, and overall mental state after arrival [5]. This phenomenon – sometimes labelled the "commuting paradox" – highlights a fundamental mismatch between the objective gains in travel time and the subjective losses in well-being [5]. More contemporary work has reinforced this connection, demonstrating that commuting quality is a significant predictor of job satisfaction and employee retention [13].

In the Chongqing context, the time saved on paper does not necessarily translate into usable time in practice. Commuters often step off the train already drained – not from physical labor, but from the cumulative load of noise, physical proximity, and the constant vigilance required in overcrowded carriages. Over weeks and months, the daily grind of boredom and frustration accumulates into a form of emotional fatigue that does not simply dissipate upon arrival. For businesses, the consequences are indirect but tangible: diminished concentration, lower employee morale, and higher staff turnover have all been linked to poor commuting experiences in recent studies [5, 13]. What appears on transit agency dashboards as an efficiency gain may thus be quietly offset by productivity losses occurring behind office doors. In short, social friction does not merely annoy passengers – it erodes the very economic returns that transportation investments are designed to generate.

5.3. Conditional feasibility

Infrastructure projects are often evaluated as though their success rests solely on engineering and financial performance [1]. The Chongqing experience suggests otherwise. A metro system can meet every technical benchmark – on-time rates, speed, budget – and still generate daily frustration for the very people it is meant to serve [2, 4]. Its long-term viability, therefore, depends on more than concrete and signaling systems. It also depends on whether the daily movements of diverse groups –

tourists, elderly residents, vendors, office workers – can coexist without producing chronic stress or exclusion [3].

Take the example of bamboo baskets, which the Chongqing metro permits out of respect for local customs. The policy is inclusive in spirit, yet during rush hours it can unintentionally compound crowding and heighten tensions between different types of passengers. The solution is not to scrap the policy, but to recognise that well-intentioned rules can generate friction in practice – and that such friction demands active, ongoing attention [5]. Going forward, transportation planning should treat user comfort, crowd dynamics, accessibility, and the emotional texture of daily travel not as soft add-ons, but as core components of project success [6, 13].

6. Conclusion

What this research has done is to take the Chongqing rail transit system as a lens for examining a question that standard project evaluations tend to overlook: how much of the presumed gain from time savings is quietly eroded by the everyday social friction of crowded travel. The quantitative side of the analysis confirms an average saving of 11.3 minutes per trip – a figure that would, in conventional cost-benefit terms, count straightforwardly as economic benefit. Yet the interview data paint a more complicated picture. Passengers speak of being squeezed, bored, annoyed, and emotionally drained. Tourists block walkways; bamboo baskets take up space; the elderly struggle to keep their footing. These are not merely anecdotal complaints. They are, the argument here goes, real costs – just not the kind that show up in budget spreadsheets.

The point is not that the system is a failure. On the contrary, by many technical measures it performs well. But that is precisely the problem: the metrics that declare success are too narrow. A transit system can hit every performance target and still leave its most loyal users – daily commuters – arriving at work already fatigued. If productivity suffers as a result, then the net economic gain of those saved minutes may be far smaller than advertised, or in some cases may not exist at all.

Adjusting time savings for stress would require a precision that is neither available nor, at this stage, particularly useful. What is useful, however, is to acknowledge that the weight of crowding and stress has an economic dimension, and that ignoring it amounts to counting half the ledger. The next step would be to measure that weight more directly – through physiological indicators, perhaps, or through real-time sampling of passengers' subjective states during actual commutes, combined with studies of what people are willing to pay for a less crowded carriage.

A caution is in order regarding the sample. At 342 respondents, and with a bias toward younger, digitally reachable users, the study almost certainly undercounts the elderly and the very poor – the very groups who, by the study's own findings, have the worst experiences. If anything, then, the hidden cost estimated here is likely a floor, not a ceiling.

Even so, one conclusion stands. Speed without comfort, efficiency without social management – these are half-built victories. A metro system that moves people fast but makes them miserable has solved only part of the problem. The other part, the human part, remains. Without attending to it, efficiency eventually undermines itself.

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