REVENUE PER KILOMETER DRIVEN: THE FORGOTTEN INDICATOR IN PROFITABILITY MANAGEMENT OF ROAD FREIGHT CARRIERS

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Resumo: Purpose: to examine why cost per kilometer driven (CPK), the dominant indicator in road freight carrier management, is insufficient for pricing, fleet allocation, and contract renegotiation decisions when not paired with revenue per kilometer driven (RPK), and to propose a consistent methodology for calculating RPK linked to the idle-capacity rate (empty kilometers driven). Design/methodology/approach: a systematized literature review, conducted following the PRISMA protocol, on performance measurement, pricing, procurement, and capacity utilization in road freight transportation, with searches covering publications from 2021 to 2026. The final academic corpus (n = 12) was complemented, in a dedicated section, by regulatory and market-institutional sources. Findings: the reviewed literature shows that the financial dimension of performance measurement systems in the sector is dominated by cost metrics, that capacity utilization recurs, but in a scattered, non-standardized way, and that the revenue-per-distance indicator—widely practiced in the market under the name revenue per mile—lacks rigorous methodological treatment in academic research. An illustrative scenario, anchored to price ranges observed in the Brazilian market, shows that two routes with equivalent cost can present a per-kilometer margin more than four times higher under a moderate backhaul rate once analyzed through the RPK lens. Originality/value: the article proposes RPK, formalized and linked to CPK and the

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idle-capacity rate, as a complementary and inseparable axis of performance measurement systems currently centered on cost, offering both a theoretical synthesis and a research agenda together with a managerial implementation roadmap.

Palavras-chave: revenue per kilometer driven; cost per kilometer driven; logistics performance indicators; road freight transportation; fleet idle capacity; systematic review.

Abstract: Purpose: to examine why cost per kilometer driven (CPK), the dominant indicator in road freight carrier management, is insufficient for pricing, fleet allocation, and contract renegotiation decisions when not paired with revenue per kilometer driven (RPK), and to propose a consistent methodology for calculating RPK linked to the idle-capacity rate (empty kilometers driven). Design/methodology/approach: a systematized literature review, conducted following the PRISMA protocol, on performance measurement, pricing, procurement, and capacity utilization in road freight transportation, with searches covering publications from 2021 to 2026. The final academic corpus (n = 12) was complemented, in a dedicated section, by regulatory and market-institutional sources. Findings: the reviewed literature shows that the financial dimension of performance measurement systems in the sector is dominated by cost metrics, that capacity utilization recurs, but in a scattered, non-standardized way, and that the revenue-per-distance indicator—widely practiced in the market under the name revenue per mile—lacks rigorous methodological treatment in academic research. An illustrative scenario, anchored to price ranges observed in the Brazilian market, shows that two routes with equivalent cost can present a per-kilometer margin more than four times higher under a moderate backhaul rate once analyzed through the RPK lens. Originality/value: the article proposes RPK, formalized and linked to CPK and the idle-capacity rate, as a complementary and inseparable axis of performance measurement systems currently centered on cost, offering both a theoretical synthesis and a research agenda together with a managerial implementation roadmap.

Keywords: revenue per kilometer driven; cost per kilometer driven; logistics performance

indicators; road freight transportation; fleet idle capacity; systematic review.

INTRODUCTION

Ask the operations director of a trucking company what their fleet's cost per kilometer driven is, and the answer will most likely come back accurate to the cent. Then ask what the same fleet's revenue per kilometer driven is—not total monthly revenue, not the average rate on the price sheet, but the revenue actually generated divided by the kilometers actually driven—and the answer tends to be hesitant, approximate, or simply nonexistent. This asymmetry is no accident: the literature on performance measurement in road freight transportation shows that the financial dimension of performance measurement systems has historically been dominated by cost metrics, while the systematic capture of revenue per unit of distance traveled remains poorly standardized (Dadsena et al., 2023).

This academic gap stands in contrast to market practice in other regions. In the North American truckload sector, revenue per mile (RPM) is routinely reported by carriers, industry associations, and financial data providers as a standard metric for tracking commercial performance. The fact that an indicator so well established in practice lacks rigorous methodological treatment in the academic literature is itself a relevant finding: it suggests that revenue per kilometer driven (RPK, adopted here as the equivalent of RPM, adapted to Brazil's metric and regulatory context) is not a novel construct, but rather one that the market practices tacitly and that research has yet to formalize.

The central argument of this article is that RPK—not cost per kilometer driven (CPK) on its own—should hold a complementary and inseparable place at the core of any route and fleet optimization strategy for road freight carriers. By construction, CPK tells only half of the profitability story: it reveals how much it costs to move a vehicle, but says nothing about how much revenue that movement actually generates. Two routes can show virtually identical CPKs and still produce very different contribution margins, depending on the freight rate charged, the capacity utilization rate, and the share of empty kilometers on the return leg. Without RPK as a counterweight, CPK alone cannot tell a profitable route from a

money-losing one.

This article has four objectives: (i) to systematically review the past five years of academic literature on performance measurement, pricing, procurement, and capacity utilization in road freight transportation, positioning the revenue-per-kilometer indicator problem within that body of knowledge; (ii) to formalize a consistent methodology for calculating RPK that can handle the heterogeneity of routes, distances, and load profiles that characterizes a carrier's real-world operations; (iii) to demonstrate, through an illustrative scenario with sensitivity analysis, how cross-referencing RPK with the share of empty kilometers guides pricing, fleet allocation, and contract renegotiation decisions more precisely than cost analysis alone; and (iv) to outline the study's limitations and a future research agenda for the empirical validation of the proposed indicator.

The research questions guiding the review are: (RQ1) How does recent academic literature address the financial dimension of performance measurement systems in road freight transportation? (RQ2) To what extent is capacity utilization (idle capacity) explicitly incorporated into the financial indicators reviewed? (RQ3) What methodological gaps explain the absence of a consistently formalized revenue-per-kilometer indicator in the literature, despite its well-established use in the market?

REVIEW METHODOLOGY

The review was conducted as a systematized literature review following the PRISMA protocol (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) across its four stages—identification, screening, eligibility, and inclusion—focusing on academic literature published between 2021 and 2026, the five-year period preceding the preparation of this article. In the interest of methodological transparency, an access limitation must be noted: searches were performed through academic search engines and scientific content aggregators (including indexed pages from ScienceDirect, SpringerLink, Wiley Online Library, IEEE Xplore, MDPI, Inderscience, IDEAS/RePEc, and ResearchGate), rather than through direct, exhaustive access to the Scopus or Web of Science databases. This is an

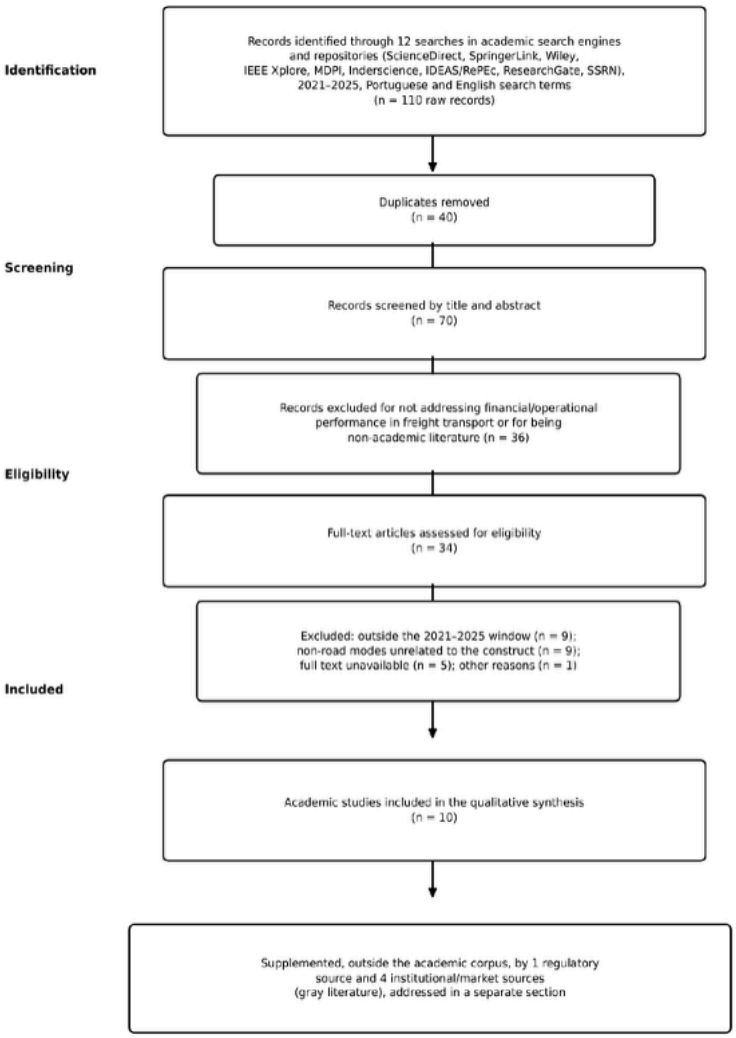
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explicit limitation of the protocol and is discussed in Section 9.

Twelve searches were run using combinations of Portuguese and English terms, including "performance measurement road freight transportation," "trucking key performance indicators," "truckload procurement pricing review," "capacity utilization freight transport," "empty running deadhead mileage," "revenue per mile trucking," "custo por quilômetro rodado transportadoras" [cost per kilometer driven, carriers], and "faturamento por quilômetro rodado" [revenue per kilometer driven]. The study selection flow is shown in Figure 1.

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Figure 1. PRISMA flow diagram of the study selection process.



The inclusion criteria favored studies that addressed, directly or indirectly: (i) financial and operational performance measurement systems applied to road freight carriers; (ii) pricing and procurement of truckload transportation capacity; (iii) capacity utilization and fleet idle-capacity indicators; and (iv) sustainability (ESG) frameworks incorporating operational or financial indicators related to cargo space utilization or to the sector's economic and financial performance. Excluded were studies published before 2021, studies

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focused exclusively on non-road transportation modes with no direct bearing on the construct under investigation, and non-peer-reviewed content (generic institutional web pages, corporate blogs, and commercial market-data tools); the latter were redirected to a dedicated section on supplementary literature (Section 3.5).

Given the finding, previewed in the Introduction, that there is no consolidated body of literature treating revenue per kilometer as a named and empirically tested construct, the synthesis presented in Sections 3 and 4 was built through theoretical inference from adjacent studies—chiefly financial performance measurement systems (BSC, DEA), truckload procurement and pricing, and sustainability frameworks that touch on capacity utilization—rather than by directly citing a construct already validated under that exact name in the international literature. This is itself one of the article's contributions: identifying and naming a gap, rather than merely synthesizing an already established body of work.

THE BLIND SPOT OF COST PER KILOMETER IN ISOLATION

FINANCIAL PERFORMANCE MEASUREMENT SYSTEMS IN THE SECTOR: THE DOMINANCE OF COST

The study by Dadsena et al. (2023), published in Transport Policy, integrated the Balanced Scorecard (BSC) with an Imprecise Data Envelopment Analysis (IDEA) model to assess the performance of eighteen road freight carriers in India. One of the study's central findings is that the financial perspective requires special attention precisely because high operating costs, combined with fleet underutilization, are the main drivers of the carriers' weaker financial performance—not a lack of cost control per se, which is already widely practiced in the sector. In other words, the problem is not a lack of cost measurement, but the lack of a counterpart that measures, with equal rigor, the revenue generated by each unit of capacity operated.

A similar finding appears in Saeedi, Wiegmans, and Behdani (2022), whose critical and systematic review of performance measurement in intermodal freight transportation systems, published in the World Review of Intermodal Transportation Research, maps the

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dominant methodologies (Data Envelopment Analysis, Stochastic Frontier Analysis, among others) applied to the rail, waterway, and port subdomains. The authors identify recurring knowledge and implementation gaps across these subdomains, notably the difficulty of comparing different efficiency measurement methodologies—a structural problem analogous to the one this article identifies in road transportation regarding the lack of standardization of the revenue-per-unit-of-distance indicator. In a related review of sea-rail intermodal transportation, Abu-Aisha, Audy, and Ouhimmou (2024), writing in the Journal of Shipping and Trade, reinforce this pattern by mapping the literature into five categories—performance evaluation, problem-solving methodologies, planning issues, factors affecting operations, and improvement strategies—showing that performance evaluation is a recurring category but is rarely integrated into a unified financial metric of revenue per operational unit.

PRICING AND PROCUREMENT: A FOCUS ON THE MECHANISM, NOT ON ROUTE-LEVEL RESULTS

This gap is reinforced by evidence from the field of truckload transportation procurement. Acocella and Caplice (2023), in a review published in the Journal of Business Logistics, systematize the literature on shippers' and carriers' strategic and operational decisions regarding the procurement of transportation capacity, noting that much of the academic research centers on auction and negotiation mechanisms in the spot market, with comparatively less attention paid to how operational pricing and capacity allocation decisions affect the carrier's financial performance over time. Hasan, Elomri, and Triki (2023), in an optimization-oriented review of combinatorial auctions applied to transportation procurement published in IEEE Access, corroborate this pattern: the literature on price-setting mechanisms is extensive and technically sophisticated, but rarely connected to post-contract indicators that track actual financial results by route or by trip. This concentration of the literature on price-setting mechanisms—rather than on how carriers should monitor, route by route, the actual financial results of those decisions—helps explain why an indicator such as RPK remains poorly formalized in both management practice and academic research.

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CAPACITY UTILIZATION: PRESENT, BUT NEVER CENTRAL

The problem worsens when one looks at the intersection of revenue and capacity utilization. Nkesah's (2023) systematic review, published in Transportation Research Interdisciplinary Perspectives, groups strategies for improving the sustainability of road freight transportation into three broad categories—technology-based measures, public policy management measures, and logistics and transportation process measures—placing route optimization and cargo capacity utilization at the heart of the third category. From a financial standpoint, that same capacity utilization is exactly what determines whether a given cost per kilometer translates into a positive or negative margin: empty kilometers cost virtually the same as fully loaded kilometers, but generate no revenue at all.

Along the same lines, the study by Reis, Puglieri, and Piekarski (2026), published in the journal Logistics, conducted a systematic literature review following the PRISMA protocol—with a final corpus of 40 articles—combined with an analysis of sustainability reports from nineteen Brazilian carriers, to propose a dashboard of environmental, social, and governance indicators for the sector. Among the critical environmental performance factors identified by the authors is the "truck space utilization rate," cited in multiple studies in the reviewed literature as a relevant indicator—though, according to the authors themselves, in a scattered fashion and without consistent methodological standardization across the studies analyzed. Complementing this, the review by Kharrat et al. (2023), published in the Euro-Mediterranean Journal for Environmental Integration, proposes sustainability and resilience indicators for freight transportation and reinforces a recurring diagnosis in the literature: the many indicators proposed over nearly two decades of research have not converged into a standardized set widely adopted by the industry. The fact that capacity utilization appears repeatedly, but never centrally, and is never tied to a specific financial indicator supports this article's argument: the academic community intuitively recognizes the importance of capacity utilization, but rarely connects it explicitly and systematically to the

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financial indicator it determines—revenue per kilometer driven.

AGGREGATE FINANCIAL PERFORMANCE (ESG) AND THE ABSENCE OF OPERATIONAL REVENUE METRICS

A fourth body of evidence comes from the literature on ESG (Environmental, Social, and Governance) applied to the logistics industry. Nenavani et al. (2024), in a panel data study published in Letters in Spatial and Resource Sciences, test the relationship between ESG practices and the financial performance of logistics companies, but operationalize financial performance through aggregate accounting indicators (return on assets, return on equity), with no breakdown by route, trip, or operational unit of distance. Choi, Kim, and Na (2025), in a study published in Sustainability on the mediating mechanisms of stakeholder pressure on the financial performance of logistics firms, follow the same pattern of accounting-level aggregation. This observation matters for the argument of this article: even when academic research moves toward linking sustainability to financial performance in the logistics sector, it does so through corporate-level accounting indicators—never through disaggregated operational indicators such as RPK, which would be needed to guide day-to-day pricing and fleet allocation decisions.

SUPPLEMENTARY LITERATURE: REGULATORY, INSTITUTIONAL, AND MARKET SOURCES

Outside the peer-reviewed academic corpus, and treated separately here because they do not constitute scientific literature, two regulatory sources and four institutional/market sources were used to provide context and an empirical anchor for the discussion in Sections 5 and 6: Brazil's National Minimum Freight Rate Policy for Road Cargo Transportation (PNPM-TRC), established by Law No. 13,703/2018 and amended by Law No. 15,485/2026; the 2025 CNT Highway Survey (Pesquisa CNT de Rodovias); the historical series of the Repom/Edenred Freight Index; and data on empty running (deadhead mileage) released by the

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European Commission and the American Transportation Research Institute, as reported by trade media. This methodological separation between academic and supplementary literature is deliberate and is intended to prevent sources of different natures from being presented with the same epistemological weight.

BUILDING THE INDICATOR: FORMALIZATION, DATA SOURCES, AND CALCULATION CONSIDERATIONS

FORMAL NOTATION

Let r be a specific route operated in period t, R the net freight revenue recorded on that route in that period (net of cancellations, deductions, and contractual adjustments), Dc the loaded distance traveled, and Dv the distance traveled without cargo (empty) in the same trip cycle, both indexed to route r and period t. Revenue per kilometer driven for route r in period t is defined as:

$$RPK_{r,t} = R_{r,t} / (D^{c}_{r,t} + D^{v}_{r,t})$$

Similarly, letting C be the total operating cost incurred on the route (fuel, tolls, maintenance, depreciation, labor, and allocated overhead), cost per kilometer driven is defined as:

$$CPK_{r,t} = C_{r,t} / (D^{c}_{r,t} + D^{v}_{r,t})$$

And contribution margin per kilometer driven—the summary indicator proposed to link the two previous ones—is defined as:

$$MPK_{r,t} = RPK_{r,t} - CPK_{r,t}$$

This notation, deliberately symmetrical between RPK and CPK, allows the two

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indicators to be compared on the same basis and leads directly to margin per kilometer, which is the most relevant decision metric for the actions discussed in Section 7. Using total distance in the denominator—rather than loaded distance alone—is what distinguishes RPK from a simple average rate per loaded kilometer, and it is precisely this choice of denominator that exposes the opportunity cost of empty kilometers.

METHODOLOGICAL CONSIDERATIONS FOR THE CALCULATION

Calculating consistently across heterogeneous routes requires four methodological precautions. The first is defining the time and space boundaries of the measurement period: RPK should be calculated over the full trip cycle—including the loaded outbound leg, any repositioning legs, and the return leg, with or without backhaul freight—and not just over the invoiced leg in isolation. Calculating RPK only over the loaded distance artificially inflates the indicator and masks exactly the problem it is supposed to expose: the opportunity cost of empty kilometers.

The second precaution is clearly defining what makes up freight revenue in the numerator (R): the recommendation is to use the net revenue actually received, not the list rate or the gross amount invoiced, which may differ significantly from the net amount in operations with frequent commercial discounts or indexing to regulatory minimums, such as Brazil's National Minimum Freight Rate Policy for Road Cargo Transportation (PNPM-TRC), established by Law No. 13,703/2018 and later amended by Law No. 15,485/2026, which sets minimum compensation rates per loaded axle and per kilometer driven for domestic road freight transportation.

The third precaution concerns the source of the mileage data (Dc + Dv). Transportation management systems (TMS) and vehicle telematics tend to be the most reliable sources, since they record the actual distance traveled by each vehicle, as opposed to estimates based on planned or standard origin-to-destination distances, which often underestimate route deviations, returns, and repositioning moves between markets. In practice, the lack of integration between the billing system and the vehicle tracking system is

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the main operational reason why many carriers can calculate CPK precisely but cannot do the same for RPK.

The fourth precaution is to segment the calculation by route, customer, or type of operation, rather than simply reporting an aggregate fleet-wide average RPK—the average hides exactly the most valuable management information: which specific routes destroy value and should be renegotiated, scaled back, or discontinued.

PRACTICAL COMPLICATIONS: ALLOCATING SHARED COSTS AND REVENUES, AND INTRA-ROUTE VARIANCE

Two additional complications deserve explicit mention, as the formula presented does not handle them trivially. The first is the allocation of costs and revenues in less-than-truckload (LTL) operations, where multiple customers' shipments are consolidated on the same trip, or in milk-run operations, in which revenue R does not correspond to a single contract but to the sum of several partial freight charges over the same physical distance. In these cases, calculating RPK requires an explicit and consistent allocation rule (for example, proportional to the weight, volume, or declared value of each shipment), and the absence of such a rule is a common source of distortion when comparing RPK between full truckload (FTL) and LTL operations.

The second complication is intra-route variance: the RPK of a single route can vary substantially from trip to trip, depending on the seasonality of backhaul availability, spot market swings, and changes in the customer mix served. Treating RPK as a deterministic, stable number for each route—as the illustrative exercise in Section 6 does, for the sake of illustration—is a simplification. In the managerial application recommended in Section 8, tracking should rely on moving averages and measures of dispersion (standard deviation, interquartile range) of RPK per route across multiple trips, not just its most recent point value.

CROSS-REFERENCING THE INDICATOR WITH IDLE CAPACITY

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RPK reaches its full analytical power when cross-referenced with the share of kilometers driven without cargo—so-called productive idle capacity, known internationally as empty running or deadhead mileage. Data released by the European Commission and reported by trade media indicate that heavy goods vehicles in the European Union traveled about 34 billion kilometers empty in 2021, and that the share of empty miles in the United States ranged from 14.8% to 20.6% in the early 2020s, according to surveys by the American Transportation Research Institute. Although these figures refer to markets other than Brazil's, and should be read with appropriate methodological caution—they come from institutional and journalistic sources, not peer-reviewed academic literature—they illustrate the scale of the phenomenon: a significant and persistent share of installed road freight capacity is on the road without generating any revenue, even while consuming virtually all of the variable operating costs.

In Brazil, the 2025 CNT Highway Survey indicates that fuel accounts for roughly 30% to 35% of the operating cost of road freight transportation—a share that, added to the fixed costs of insurance, depreciation, and administrative payroll, makes an idle or empty-running truck one of the most expensive line items on a fleet's cost sheet, even while generating no revenue at all. From the cost side, this data point corroborates exactly the argument that RPK makes from the revenue side: an empty kilometer costs almost as much as a loaded one, but its RPK is, by definition, zero.

The relationship between the two indicators can be expressed simply: letting ω be the route's idle-capacity rate—defined as $\omega = Dv / (Dc + Dv)$, that is, the percentage of total kilometers driven without cargo—a route's average RPK tends to fall proportionally as ω increases, even if the rate charged for the loaded leg remains constant. This means that two routes with identical freight rates per loaded kilometer can show very different RPKs, depending solely on ω—in other words, on how easy or hard it is to secure backhaul freight. This is precisely the dimension that CPK in isolation, lacking any revenue information, could never reveal.

ILLUSTRATIVE SCENARIO WITH SENSITIVITY ANALYSIS

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To make the argument concrete, consider a hypothetical, didactic scenario, built solely for methodological illustration—and not as empirical data from any real operation—involving two road routes with the same total round-trip distance (1,000 kilometers) and virtually identical total operating costs (a CPK of R$2.40 per kilometer on both).

On Route A, the truck drives 500 kilometers loaded on the outbound leg, at a rate of R$ 6.00 per kilometer, and returns empty for the remaining 500 kilometers (ω_{A} = 0.50), since no backhaul is available at the destination market. Total trip revenue is R$ 3,000.00, spread over the 1,000 total kilometers driven: RPK_{A} = R$ 3.00/km and MPK_{A} = R$ 0.60/km.

On Route B, the truck also drives 500 kilometers loaded on the outbound leg, at the same rate of R$ 6.00 per kilometer, but secures a backhaul for the 500-kilometer return leg (ω_{B} = 0). To anchor this backhaul rate in plausible values for the Brazilian market, rather than in arbitrary numbers, the reference used is the range of rates per kilometer driven set by the 2025 PNPM-TRC table, which runs from roughly R$ 2.74 to R$ 10.40 per kilometer, depending on the number of loaded axles and the type of operation.

Taking the bottom of this range (R$ 2.74/km) as a conservative backhaul rate, total trip revenue becomes R$ 4,370.00 (R$ 3,000.00 outbound plus R$ 1,370.00 on the return), yielding RPK_{B} = R$ 4.37/km and MPK_{B} = R$ 1.97/km — more than three times Route A's margin. Taking a mid-range value (R$ 4.00/km) as a moderate backhaul rate, total revenue rises to R$ 5,000.00, with RPK_{B} = R$ 5.00/km and MPK_{B} = R$ 2.60/km — more than four times Route A's margin. And taking the top of the range (R$ 10.40/km), an optimistic backhaul scenario with higher-value freight, total revenue reaches R$ 8,200.00, with RPK_{B} = R$ 8.20/km and MPK_{B} = R$ 5.80/km.

The sensitivity analysis shows that, even in the most conservative scenario within the rate range considered, Route B outperforms Route A in margin per kilometer by more than threefold; in the most optimistic scenario, the gap exceeds ninefold. The key point of this exercise is that, under the CPK metric alone, the two routes would be judged equivalent: both

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have the same operating cost per kilometer, the same total distance and, quite possibly, the same vehicle and risk profile. Only when RPK is introduced—and with it, information on how well the return leg is utilized—does the profitability gap between the two routes become visible, at any reasonable point within the rate range considered. It bears repeating that this exercise is illustrative, built for illustrative purposes, and anchored in market rate ranges only to avoid numerical arbitrariness—it is no substitute for empirical validation with real operating data, which is identified as a research agenda item in Section 9.

FROM INDICATOR TO ACTION: WHAT TO DO WHEN THE NUMBER IS BAD

Finding a low RPK—or a thin or negative margin per kilometer (MPK) on certain routes—is not, in and of itself, a management conclusion; it is a starting point for investigation. The reviewed literature suggests at least four lines of action, consistent with the findings of Dadsena et al. (2023) on the financial perspective of carrier performance, of Acocella and Caplice (2023) and Hasan, Elomri, and Triki (2023) on strategic and operational decisions in pricing and capacity procurement, and of Nkesah (2023) on logistics process measures aimed at improving the efficiency of road transportation.

• Route rate renegotiation, especially when a low RPK stems from an outbound rate that has historically been underpriced relative to the actual cost of operation—a situation particularly relevant in regulatory contexts such as Brazil's, where the PNPM-TRC sets minimum compensation levels but does not prevent commercial negotiations from settling on rates above the floor when a specific route's cost structure justifies it.

• Proactively structuring backhaul freight, through commercial partnerships, load board platforms, or reciprocity agreements with shippers located in the destination market, so as to systematically reduce the idle-capacity rate (ω) identified in the cross-analysis of RPK and CPK.

• Fleet reallocation, shifting trucks from routes with chronically low RPK to routes with greater demand density and better capacity utilization—a decision that, to be made with confidence, depends on having an RPK calculated consistently and comparably across routes,

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as formalized in Section 4.

• Selective discontinuation of routes or contracts whose margin per kilometer (MPK) remains persistently negative even after attempts at rate renegotiation and backhaul structuring—a decision that, while counterintuitive for managers used to treating volume and gross revenue as synonyms for commercial success, is exactly the kind of decision that a performance measurement system centered solely on CPK would never allow them to identify clearly.

MANAGERIAL IMPLICATIONS AND A CALL TO ACTION

As a practical follow-through—and not as a substitute for the research agenda presented in Section 9—managers responsible for a transportation operation are invited to take on an immediate exercise: calculate their own fleet's RPK over the next two weeks, segmented by route, following the methodological precautions described in Section 4—measurement over the full trip cycle, use of net revenue actually received, actual mileage data from telematics or a TMS, and segmentation by route instead of an aggregate average. By comparing RPK across the routes in their operation, patterns previously invisible through a cost-only lens will very likely emerge—and that is exactly the point at which route and fleet optimization stops being a generic cost-cutting exercise and becomes a data-driven decision about where, specifically, the operation creates or destroys value.

STUDY LIMITATIONS AND FUTURE RESEARCH AGENDA

LIMITATIONS

• Small corpus and non-exhaustive search: the final academic corpus (n = 12) is modest for a systematic review in the full sense of the term, reflecting both the scarcity of literature directly addressing the RPK construct and an access limitation—the search was conducted through search engines and scientific content aggregators rather than through direct, exhaustive access to the Scopus and Web of Science databases, which may have left

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out relevant studies indexed exclusively on those platforms.

• No formal appraisal of the methodological quality of the included studies (for example, using instruments such as the Mixed Methods Appraisal Tool), which limits the ability to weight the findings by methodological robustness.

• Language bias: the search favored literature in Portuguese and English and may have missed relevant contributions published in other languages, especially European studies on empty running written in French, German, or Spanish.

• The proposed indicator has not been empirically validated: RPK, as formalized in Section 4, and the scenario in Section 6 are theoretical and illustrative constructs, respectively, not tested with real carrier operating data—empirical validation is identified as a future research agenda item, not as a result already demonstrated by this article.

FUTURE RESEARCH AGENDA

• Empirical validation of RPK using real longitudinal TMS data from one or more carriers, testing its incremental explanatory power for route profitability relative to CPK alone and to adjacent indicators already formalized in the literature, such as the truck space utilization rate (Reis et al., 2026).

• Development of a statistically validated instrument (along the lines of the expert-panel validation process conducted by Reis, Puglieri, and Piekarski, 2026) that assigns relative weights to RPK within broader performance measurement systems, such as the BSC applied by Dadsena et al. (2023).

• Comparative studies between the revenue per mile metric used in the U.S. market and the RPK proposed in this article, examining whether the conceptual equivalence proposed in the Introduction holds up in light of regulatory differences, such as the existence of a minimum freight rate floor in Brazil (PNPM-TRC) and the absence of one in the U.S. market.

• Extension of the systematic review, with direct access to the Scopus and Web of Science databases and application of a formal methodological quality appraisal instrument, in order to test the robustness of the findings reported here against a broader corpus.

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