

Inflationary Impacts on Delivery Logistics During the Covid-19 Pandemic

Impactos Inflacionários na Logística de Entrega Durante a Pandemia da Covid-19
Impactos inflacionarios en la logística de entrega durante la pandemia de Covid-19

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Abstract: The pandemic caused by the COVID-19 virus caused significant impacts on several commercial sectors, and logistics was no different, affecting sectors and economic activities, in addition to supply chains. This has resulted in increased spending due to economic instability. The present study consists of analyzing how the inflation caused by the pandemic impacted the operational costs of transportation in logistics, specifically in the delivery sector. This is because, with the increase in online shopping in the pandemic period, delivery logistics had to deal with high operational values. The survey is based on fractional cargo transportation cost (INCTF) and capacity cargo (INCTL) indices that reflect inflation in the sector. In the end, it can be concluded that the COVID-19 pandemic has led to an increase in logistics costs, mainly due to inflation, affecting the supply chain and the delivery industry. And as can be seen in this study, the sector is recovering and adjusting to inflationary pressures, albeit slowly, to maintain financial balance.

Keywords: Inflation; Pandemic; Transport; E-commerce; COVID-19.

Resumo: A pandemia originada pelo vírus da COVID-19 provocou impactos significativos em diversos setores comerciais, e na logística não foi diferente, afetando setores e atividades econômicas, além das cadeias de suprimentos. Isso resultou em aumento de gastos devido à instabilidade econômica. O presente estudo consiste em analisar como a inflação causada pela pandemia impactou nos custos operacionais de transporte na logística, especificamente no setor de entregas. Isso, pois, com o aumento das compras online no período pandêmico, a logística de entrega teve que lidar com valores operacionais elevados. A pesquisa é baseada em índices de custos de transporte de carga fracionada (INCTF) e de carga lotação (INCTL) que refletem a inflação no setor. Ao final, pode-se concluir que a pandemia da COVID-19 proporcionou aumento nos custos de logística, principalmente devido à inflação, afetando a cadeia de suprimentos e o setor de entregas. E como poderá se conferir neste estudo, o setor está se recuperando e ajustando-se às pressões inflacionárias, mesmo que lentamente, para manter o equilíbrio financeiro.

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Palavras-chave: Inflação; Pandemia; Transporte; E-commerce; COVID-19.

Resumen: La pandemia provocada por el virus COVID-19 provocó impactos importantes en varios sectores comerciales y, en la logística no fue la excepción, afectando mucho más allá de la cadena de suministro. Esto resultó en aumentos del gasto debido a la inestabilidad económica. El presente estudio consiste en analizar cómo la inflación provocada por la pandemia impactó en los costos operativos del transporte en la logística, especialmente en el sector de entregas. Con el aumento de las compras online, la logística de entrega tuvo que lidiar con altos valores operativos. La investigación se basa en índices de costos de transporte de carga fraccionada (INCTF) y carga de capacidad (INCTL) que reflejan la inflación del sector. Al final, se puede concluir que la pandemia de COVID-19 provocó un aumento de los costos logísticos, principalmente debido a la inflación, afectando la cadena de suministro y el sector de entrega, cómo se puede comprobar esto en este estudio, el sector se está recuperando y ajustándose a las presiones inflacionarias, aunque sea lentamente, para mantener el equilibrio financiero.

Palabras clave: Inflación; Pandemia; Transporte; Comercio electrónico; COVID-19.

1. INTRODUCTION

The COVID-19 pandemic has changed several aspects of daily life, whether social or economic, and logistics have been no different. “The pandemic has caused huge impacts on global logistics, profoundly affecting supply chains” (BARIONI, p.1, 2022).

However, this change in life has also brought increased costs, affecting the world economy. According to projections from the Economics Department of Banco Bradesco (DEPEC, p.1 2020), “the estimated drop in Brazil’s GDP is -5.9%, as a result of the drop-in economic activity”.

The COVID-19 pandemic has brought previously unexplored needs to the world’s population, impacting the logistics sector in the coming years. The widespread increase in the prices of goods and services has intensified the pressure on the lives of companies and individuals. For organizations in the supply chain, rising inflation has been one of the biggest challenges. In addition to increasing costs for the transportation of goods, high inflation has generated higher levels of uncertainty and made it difficult to plan inventory and warehouse management operations (RANGEL LOGISTICS SOLUTIONS, 2023).

Therefore, the pressing research question that emerges in this study is: How did inflation caused by the COVID-19 pandemic impact operational logistics transportation costs?

To this end, the general objective of this study is to analyze the inflationary impacts suffered by the delivery sector during the COVID-19 pandemic. This study is justified by the fact that the demand for online shopping increased significantly during the pandemic (ABCOMM, 2020) since people could not leave their homes. Therefore, the delivery sector, which expanded its demand, had to deal with high operational costs due to inflation (OLHAR DIGITAL, 2022).

In this context, the specific objective is to provide a comprehensive understanding of the inflationary impacts on the delivery sector during the COVID-19 pandemic. This includes contextualizing inflation, addressing its typologies, the causes that trigger it, and the effects it has on the economy. The study also aims to describe the current scenario of the delivery sector, identify the causes for the increase in operational costs of delivery logistics, and compare the variations between the period studied and previous years.

In order to provide the appropriate basis for this analysis, a survey will be conducted to explore the results generated by the pandemic in the cargo handling sector. The development and results analyzed will be prepared through exploratory research, by consulting books, articles, websites and case studies in a qualitative format.

The planet has undergone significant transformations in recent years due to the COVID-19 pandemic, changes that have harmed social and economic aspects. The pandemic has accelerated transformations, altering consumption with the increase in online app purchases and forcing companies to adapt to the digital world. This research project will address how these changes influenced delivery logistics during the COVID-19 pandemic.

Amidst the disruptions caused by the virus, companies have shown remarkable adaptability. The shutdown of numerous areas of the supply chain has not deterred consumer demand. Instead, it has led several companies to pivot towards online commerce and allocate "more investment in technology, productivity and the search for local suppliers, who meet the needs of more demanding consumers" (CNN BRASIL, 2020).

According to a report by the Conversion agency, Brazilian e-commerce grew 40% in one year of the pandemic, driven by the increase in online shopping due to social isolation. The closure of physical stores has driven consumers to turn to e-commerce for their essential purchases (E-COMMERCE BRASIL, 2021).

It's clear that logistics has played a pivotal role in these pandemic years. In 2019, deliveries in Brazil increased by 23% and the expectation was that they would maintain this growth in 2020. However, the COVID-19 pandemic has completely changed these predictions. Isolation measures have directly affected several areas such as the economy, transportation and logistics. However, amidst the decline in most industries, the delivery logistics industry is achieving exponential growth, underscoring its crucial role in these challenging times (GOMES; LOURENÇO, 2023).

2. THEORETICAL FOUNDATION

2.1 COVID-19

On December 31, 2019, the Wuhan Municipal Health Commission in Hubei Province, China, reported a cluster of pneumonia cases. A new Coronavirus was then identified. On November 26, 2021, the World Health Organization - WHO released a sub-variant of COVID-19 B.1.1.529 as a concern, Omicron. This variant has presented many mutations, some of which are worrying. The other concern variants are still circulating, including Alpha, Beta, Gamma, and Delta. That said, the most effective way to control the pandemic was to take care of the risk of exposure initially and then through vaccination, which in Brazil was only possible from the second quarter of 2021.

In Brazil, given the emergency caused by the Coronavirus, it was necessary to maintain social distancing, wear masks, clean and disinfect the environment, and adopt quarantine for suspected and confirmed cases as coping measures. It was necessary to adopt online classes, companies implemented home office, and many non-essential services had their activity suspended or reduced capacity. Several companies were significantly affected by the pandemic outbreak. These organizations had to pay attention to the protection of their employees and restructure their logistics processes to deal with the congestion in the e-commerce sector due to the number of orders increasing exponentially during the period (EXAME, 2020).

2.2 INFLATION

Inflation is a common economic phenomenon worldwide. The term refers to the increase in the level of prices and services in the economy. In Brazil, several indexes help institutions measure inflation. The Brazilian Institute of Geography and Statistics—IBGE (2023) uses the IPCA as its main index.

The Broad Consumer Price Index (IPCA), the IBGE, lists the various items in the lives of many Brazilian families with purchasing power ranging from 1 to 40 minimum wages. This list is divided into topics such as Health, Education, Transportation, Housing, and others "to ensure coverage of 90% of families in urban areas". A monthly price survey is carried out to indicate the variation between the month of collection and the previous month and will show the inflation rate in this period (IBGE, 2023).

2.2.1 INFLATION SEGMENTS

However, several phenomena can cause this variation. One example is demand-side inflation, which can be understood, according to Khan Academy (2023), as "changes in factors such as average income and preferences" that directly influence consumption. Thus, the demand for a good or service is more significant than supply, so traders raise prices to maintain profit conditions.

There is also cost-based inflation (also called supply-side inflation), where the demand for a good or service remains practically the same. What varies are production costs, which can be affected by increases in the price of raw materials, wage increases, increased profits over production capacity, natural disasters, and others (LUQUE; VASCONCELLOS, 1998).

2.2.2 CONSEQUENCES OF INFLATION

The professor of general economics at the University of São Paulo, Dr. Marco Antônio Sandoval de (VASCONCELLOS, 2023 apud VAZ, 2023), states that:

"[...] the existence of inflation is a good thing if it occurs at an acceptable and planned level. Up to the limit of 10% per year, it is considered normal, as it demonstrates economic growth due to aggregate demand growth (Our translation)."

However, inflation still has several consequences for Brazilians' daily lives. During the COVID-19 pandemic, this effect only worsened because, to delay the economic impacts of the reduction in production, the Brazilian Government implemented financial aid, reduced working hours and wages with the consequent reduction in wages, payroll tax relief, and other measures (VAZ, 2023).

2.3 SCENARIO AND TRENDS IN THE DELIVERY SECTOR AFTER THE PANDEMIC

The COVID-19 pandemic has brought profound changes in all aspects, and the logistics sector has not been left out of this transformation. New habits have emerged in a relatively short period, and innovative operations have been

implemented to shape the supply scenario. One of the primary stimuli delivery logistics has faced after the COVID-19 pandemic is the search for companies to adapt to a constantly evolving environment (BAYER, 2021).

Adopting specific technologies has been the answer for companies facing supply chain challenges due to manual processes. Process automation in logistics management has not only solved immediate problems but also allowed for greater precision of risk and opportunity prediction (BAYER, 2021).

2.4 PROCESS AUTOMATION

A adoção de tecnologia nos processos cotidianos é um investimento crucial para impulsionar a competitividade de uma empresa. O uso de tecnologias avançadas como a automação agiliza nas tarefas rotineiras, como o transporte de carga, liberando os funcionários para atividades mais estratégicas. Veículos automatizados controlados remotamente podem reduzir a sobrecarga e garantir rotas precisas, levando a diminuição do tempo nos processos e os custos envolvidos (SEBRAE, 2023)

Segundo a Empresa Brasileira de Infraestrutura Aeroportuária houve um investimento de 3 milhões de reais na automatização do sistema de iluminação da faixa de orientação no aeroporto Ten. Cel. Aviador César Bombonato que fica em Uberlândia. Foi implementado o Sistema de Controle e Monitoramento (SICOM) que faz o gerenciamento e supervisão de dispositivos à distância e administra a movimentação aérea dentro do território brasileiro (G1, 2022).

2.5 SUSTAINABILITY AND ENERGY EFFICIENCY

In sustainable Logistics, operations must minimize the reckless use of resources and ensure the reduction of the environmental impact caused by waste resulting from the organization's activities (PATRUS, 2017).

The National Land Transportation Agency: ANTT, 2022 approved the Sustainable Logistics Management Plan. The project seeks to implement sustainable methods in several areas, ensuring the achievement of objectives, compliance with deadlines, and constant supervision of actions. The project also aims to use natural and material resources and raise employee awareness to ensure effective management in acquisitions and contracts. According to Marcelo Sampaio, Minister of Infrastructure, "The main path and great legacy that we can leave for the environment and sustainability is to balance the transportation matrix" (ANTT, 2022, p.1).

Post-pandemic logistics is reinventing itself, embracing automation, collaboration, and technological innovation. Companies that adapt to this new scenario will be well-positioned to thrive in a constantly evolving environment (BRASIL, 2022).

2.6 DELIVERY LOGISTICS

The COVID-19 pandemic has changed several aspects of daily life. In the retail sector, the easing of the lockdown¹ did not completely alleviate the situation of many merchants and a large part of the population who did not feel safe leaving their homes. This led many retail owners to work together with digital commerce.

In 2020, online sales increased by 73.88%, compared to the expected 18% (Brazilian Association of Electronic Commerce [ABComm], 2019 and 2021).

However, more than opening an online store is required. Investing in a store or profile is easy for customers to access and understand; advertising and publicity that draws attention to the product, stable and reliable payment methods, and honest logistics regarding shipping, delivery deadlines, and guarantees are necessary.

In an interview with Exame magazine, the President of the Consumer Protection and Defense Program of Rio de Janeiro (Procon-RJ) spoke about the increase in reports and complaints regarding logistics problems in e-commerce during this period:

“In 70% of cases, the complaint is about non-delivery of the product. It starts with a delay, and the customer gives up because there is no longer a point in receiving the order. In 20% of the complaints, the complaint is about loss, when the tracking informs that a product is in a certain location, but this is false. The remaining portion has other causes, such as service failure at the post office or information about a delivery that was not made.”

As a result, many companies have had to reorganize their online sales strategies to remain in the market.

2.7 INFLATION, E-COMMERCE AND LOGISTICS

Due to measures to contain the spread of the Coronavirus, many operations had to be halted, delaying production, deadlines, and deliveries in several sectors.

Even with the increase in e-commerce sales, the road sector suffered a 26.74% drop (National Association of Cargo Transportation and Logistics [NTC & Logística], 2020). Ports, such as Santos, were also closed.

“There was an attempt to resume calls in the 2021-2022 season; however, due to cases of Covid on vessels, it was interrupted in December and January and resumed in March, at the end of the season, which ends in April” (Interviewee Port of Santos apud HOUNKPATIN, 2022, Our translation).

Unfortunately, the Coronavirus left consequences that will still be felt for many years, whether in the social or economic aspect. In logistics, these consequences can be felt in the increase in fuel, freight, and storage prices (UNESP, 2021).

However, every crisis brings a lesson, and the logistics sector has dealt with it well. In an interview with CNN Brasil (2023), the assistant professor of operations and supply chain management at Colorado State University, Zac Rogers, said:

“In 2019, we had all our chips in one hand, that is, things are built in East Asia, come by boat through the ports of Southern California, go by train to

Chicago, and then by other trains or trucks to be distributed on the East Coast [of the USA]. Although it is almost impossible to divorce yourself from China, companies are adopting different paths for the supply chain, whether in Vietnam, Bangladesh, Central America, or in the domestic market (Our translation).”

In other words, companies are now seeking to expand their networks to fill gaps that may arise due to adversity, as we are seeing with the Russia-Ukraine War, which affected the commodity network worldwide (G1, 2022).

Little by little, companies have learned how to adapt and manage the scarcity of resources. Through indicators and strategic insights, it was possible to control the situation (G1, 2022). However, there is still a long way to go in baby steps to return to a satisfactory economy (ECOMMERCE BRASIL, 2021).

3. MATERIALS AND METHODS

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4. RESULTS AND DISCUSSION

DECOPE (Department of Operational Cost Analysis and Technical and Economic Research) of NTC&Logística is responsible for conducting technical studies to calculate the costs of road freight transportation and preparing reference cost indexes to assess inflation in the sector (NTC&LOGÍSTICA, 2022). Two of them stand out: the INCTF (National Index of Less-than-Full Load Transportation Costs) and the INCTL (National Index of Full Load Transportation Costs) (VALDIVIA; SILVA, 2023).

Figure 1: National index of freight transport costs for less than half-tonne cargo (INCTF) in August 2021

MÊS DE REFERÊNCIA								AGOSTO 21
Percurso	Distância (km)	Número Índice	Variação Acumulada desde julho/94 (%)	Variação Acumulada 36 meses (%)	Variação Acumulada 24 meses (%)	Variação Acumulada 12 meses (%)	Variação Acumulada Anual (%)	Variação Mensal (%)
Muito Curtas	50	847,42	747,42	34,29	27,11	21,45	13,79	1,30
Curtas	400	836,40	736,40	35,03	27,77	22,38	14,47	1,40
Médias	800	831,39	731,39	34,68	27,47	22,47	14,67	1,41
Longas	2.400	836,33	736,33	33,07	26,03	22,14	14,97	1,46
Muito Longas	6.000	856,54	756,54	33,09	26,03	22,96	15,88	1,62

Source: NTC&logística (2022)

The average variation of the INCTF was 1.41% in August, accumulating an increase of 22.47% in the last twelve months, from September 2020 to August 2021. This index tracks the evolution of all costs related to freight transport, including transfer, collection, distribution, administration, and terminal costs (SILVA, 2021).

The INCTL reflects the volatility of road transport costs for closed loads, covering all costs related to full loads, such as transfer, indirect costs, and risk management. Like the INCTF, it does not include taxes and profit margins in its calculation. The average variation of the INCTL was 25.31% from September 2020 to August 2021, with a variation of 1.82% in the last month mentioned (SILVA, 2021).

Figure 2: National index of freight transport costs - INCT-L in August 2021

MÊS DE REFERÊNCIA: AGOSTO 21									
PERCURSO	DISTÂNCIA (km)	Número Índice	Variação Acumulada 60 Meses (%)	Variação Acumulada 48 Meses (%)	Variação Acumulada 36 Meses (%)	Variação Acumulada 24 Meses (%)	Variação Acumulada 12 Meses (%)	Variação Acumulada Anual (%)	Variação Mensal (%)
Muito curto	50	320,27	59,38	57,34	49,12	37,17	28,21	18,78	2,40
Curto	400	309,10	52,87	49,76	42,72	31,85	25,98	18,09	2,00
Médio	800	305,55	50,70	47,29	40,57	30,12	25,31	17,83	1,82
Longo	2.400	297,92	47,01	43,02	36,98	27,03	23,84	17,42	1,62
Muito longo	6.000	293,33	44,97	40,64	35,01	25,28	22,95	17,19	1,53

Source: NTC&logística (2022)

Figure 3: Evolution of the main inputs in the reference month of August 2021

EVOLUÇÃO DOS INSUMOS		AGOSTO 2021	
	Unidade	(%) variação últimos 12 meses	(%) variação ano
Óleo diesel S-500	litro	36,57	26,77
Óleo diesel S-10	litro	35,61	25,65
Óleo de câmbio	litro	8,81	8,81
Óleo de cárter	litro	4,27	4,27
Salário de motorista	mês	7,59	7,59
Manutenção	R\$/km	9,85	6,54
Pneu	unidade	20,31	17,06
Rodoar	unidade	3,89	0,00
Recapagem	unidade	2,50	0,00
Lavagem	unidade	3,40	0,00
Seguros	unidade	30,58	22,06
(% VARIÇÃO NO ANO)			
	Carga	Fracionada	Lotação
Despesas Indireta	R\$/ton	8,66	23,65
Veículo rodoviário	unidade	28,72	21,43
Veículo urbano	unidade	23,64	-
Semi Reboque	unidade	-	8,73

Source: NTC&Logística (2022)

The beginning of 2021 was marked by a significant increase in fuel prices, with 12.49% for S10 diesel and 13.23% for regular diesel in February. In May, another adjustment was 6.67% for S10 diesel and 6.87% for regular diesel. Despite these challenges, the sector demonstrated resilience, with salary adjustments reaching an average of 7.59% in 2021.

Notably, labor, being a fixed cost, had a greater weight in operations with lower running volume. Furthermore, the vehicle and its parts also represent a significant portion of costs, and during 2021, vehicle values increased substantially, by 25.08% for road-oriented vehicles and 23.64% for urban vehicles used in collection/delivery operations (NETO; SILVA, 2021).

Until August 2021, the road freight transportation sector faced historic inflation. The INCTL reached its highest value in 12 months since its creation in 2003, registering 25.31%, while the INCTF reached 22.47%, the highest value in 26 years since August 1995. This data is significant as it indicates an upward trend in the INCTL and INCTF compared to the IPCA due to the increase over 12 months in the prices of fuels, vehicles, and wages (NETO; SILVA, 2021).

Figure 4: IPCA versus INCTF & INCTL from 2020 to 2021



Source: Directory 2021-2022 NTC&logística

Figure 5: National Index of Less-than-Truckload Transportation Costs (NCTF) in the reference month of August 2021

MÊS DE REFERÊNCIA								AGOSTO 22
Percurso	Distância (km)	Número Índice	Variação Acumulada desde julho/94 (%)	Variação Acumulada 36 meses (%)	Variação Acumulada 24 meses (%)	Variação Acumulada 12 meses (%)	Variação Acumulada Anual (%)	Variação Mensal (%)
Muito Curtas	50	945,04	845,04	41,75	35,44	11,52	9,81	(0,23)
Curtas	400	949,09	849,09	44,98	38,86	13,47	10,80	(0,57)
Médias	800	953,27	853,27	46,16	40,42	14,66	11,43	(0,76)
Longas	2.400	981,89	881,89	47,97	43,40	17,40	12,75	(1,18)
Muito Longas	6.000	1034,02	934,02	52,14	48,44	20,72	14,28	(1,65)

Source: NTC&Logística (2022)

It can be noted that the INCTF's average variation was -0.76% in August, and in the last twelve months, it accumulated 14.66% between August 2021 and August 2022 (SILVA, 2022).

It can be noted that the average amplitude recorded from August 2021 to August 2022 was 25.12%, and in the month, it varied -1.40% (SILVA, 2022).

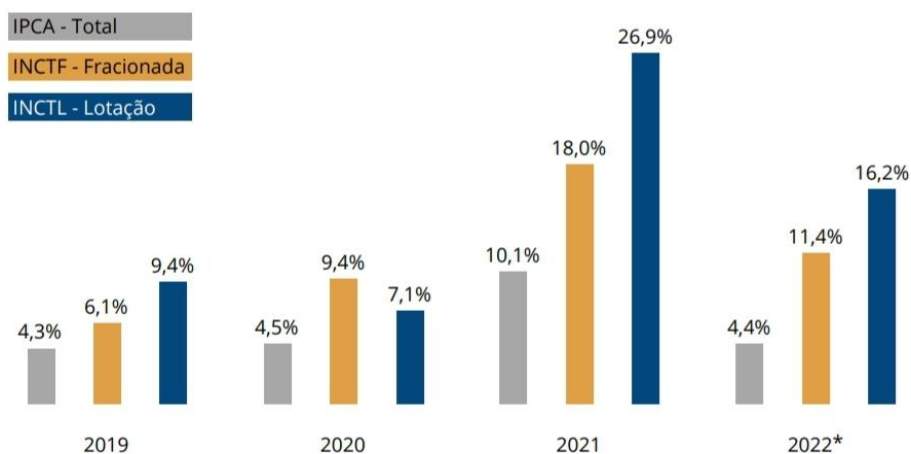
Due to the inflationary escalation in production inputs, suppliers adapt their costs, directly affecting carriers amid the pandemic. This is reflected in transportation indicators, with notable percentage variations. Shortages are pointed out as the main factor behind the continuous real increases. In the second half of 2022, inflation slowed down and was controlled, thanks to the control of the pandemic and the increase in the global supply of goods and services. As a supporting activity, the transportation sector immediately felt pressure on the inputs of the production sectors, being one of the first to suffer the impact of inflation and is now in the process of recovery. The sector underwent a rapid freight recovery, adjusting its production costs and passing on these pressures to carriers. It is crucial to immediately pass on the accumulated fuel increases to maintain the financial health and market balance in road freight transportation (VALDIVIA; SILVA, 2023).

Figure 6: National index of freight transportation costs (INCT-L) in the reference month of August 2022.

MÊS DE REFERÊNCIA: AGOSTO22									
PERCURSO	DISTÂNCIA (km)	Número Índice	Variação Acumulada 60 Meses (%)	Variação Acumulada 48 Meses (%)	Variação Acumulada 36 Meses (%)	Variação Acumulada 24 Meses (%)	Variação Acumulada 12 Meses (%)	Variação Acumulada Anual (%)	Variação Mensal (%)
Muito curto	50	378,86	86,13	76,40	62,26	51,66	18,30	11,48	0,09
Curto	400	380,93	84,55	75,88	62,49	55,25	23,24	14,86	-0,98
Médio	800	382,31	84,29	75,88	62,81	56,78	25,12	16,21	-1,40
Longo	2.400	381,37	83,07	75,35	62,61	58,53	28,01	18,02	-1,90
Muito longo	6.000	380,09	82,24	74,94	62,34	59,31	29,58	18,92	-2,13

Source: NTC&Logística (2022)

Figure 7: Total IPCA versus INCT in the years 2019 to 2022
 Fracionada & Lotação - Variação % ao ano



Source: NTC&Logística (2022)

5. CONCLUSION

This study verified the cost indices for road freight transportation in Brazil, highlighted by DECOPE (Department of Operational Cost Analysis and Technical and Economic Research) of NTC&Logística. Two main indices were evaluated, the INCTF, for the transportation of fractional cargo, and the INCTL, which addresses the transportation of full cargo.

Between the period 2021 and 2022, there was a significant increase in road transportation costs influenced by several factors, such as the increase in fuel and vehicle prices and salary adjustments in the sector. This led to historic inflation in this segment, with the INCTL reaching its highest value in 12 months since its creation and the INCTF also recording high values.

However, a change in trend is noticeable in the sector with a reduction in inflation in the second half of 2022, attributed to the control of the pandemic and the increase in the global supply of goods and services. This shows that road transport is undergoing a recovery process and is adapting to inflationary pressures by passing on costs to carriers.

During the period analyzed, it was found that road freight transport faced significant challenges due to significant inflation in operating costs but is adjusting to the new economic reality and seeking to maintain financial balance.

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