

Assessing Trends and Patterns of the Effect of COVID-19 on Public Transit Revenues in the City of Calgary

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Author Notes

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Abstract

Using monthly public transit revenue data from January 2015 to December 2021, we investigate the effect of COVID-19 on public transit revenues in the large urban municipality of Calgary in Alberta, Canada. We find that revenue from transit fares dropped immediately and significantly after the declaration of a state of emergency in March 2020 for all transit fare types. While revenues began to slowly recover, nearly two years following the state of emergency transit fare revenue continue to be significantly lower than then the pre-pandemic baseline in most cases. Only revenues from transit fares for school-aged children and low-income persons have recovered to the pre-pandemic baseline, suggesting these groups are relatively more dependent on public transit compared to non-low-income, adult users. With revenues from transit fares continuing to be 60% below the pre-pandemic baseline, replacing this lost revenue is essential to maintaining service standards for those dependent on public transit. However, there are no simple answers to this problem given the ongoing shock to adult ridership. Over the short term, transit will need increased support from other revenues sources such as local property taxes or transfers from higher orders of government. Over the longer-term, the City of Calgary will need to weigh the trade-offs from pursuing fare increases, lowering service standards, and/or expansion of services to serve more riders with objectives such as addressing climate change, labour mobility, and accessibility.

Introduction

On 25 January 2020, Canada reported its first case of the novel coronavirus disease (SARS-CoV-2 and hereinafter COVID-19) in Toronto (The Canadian Press 2020). By 26 February 2020, Canada had 12 confirmed cases, which marked the beginning of the first wave, with cases growing exponentially (Bronca 2021). By mid-March 2020, every province and territory in Canada had recorded cases and began declaring states of emergency. A number of large urban municipalities across Canada also declared states of emergency (Canadian Urban Institute 2021). While much of the focus has been on the unprecedented impact these measures have had on the labour market (e.g., Amery (2020); Baker, Koebel, and Tedds (2021b); Fuller and Qian (2021); Jones (2020); Maroto, Pettinicchio, and Lukk (2021); Qian and Fuller (2020); Scott (2021)) and the balance sheets of the federal and provincial governments (Office of the Parliamentary Budget Officer 2021), municipalities have also faced inordinate fiscal pressures. Yet, little attention has been paid to the municipal experience during the pandemic, even though they provide vital goods and services that support people in their day-to-day lives.

An essential municipal service that underpins local economies and which faced significant challenges throughout the COVID-19 pandemic was public transit. In the first wave of the pandemic, public health orders required that, among other things, people maintain physical distancing in public places. This directly impacted public transit in a number of ways including reduced capacity (Liu, Miller, and Scheff 2020). Further, these public health orders indirectly altered transit use patterns through: the closing of K-12 schools and post-secondary institutions, orders to work from home, the shut-down of in-person dining, and the suspension of travel and tourism (Statistics Canada 2021). Fear of contagion from tight and enclosed spaces further exacerbated the emptying of public transit (Joselow 2021). While transit use declined, at the same time, essential workers, which included not just health care workers, but also grocery, warehouse, first responders, childcare, and critical infrastructure workers, remained reliant on public transit:

some base level of public transit service had to be maintained regardless of usage (Public Safety Canada 2020). This paper examines what this meant for transit revenue collected from fares, which finance a large share of transit operating expenses.

Using monthly public transit revenue data for the City of Calgary from January 2015 to December 2021 we take an in-depth look at the effect COVID-19 has had on public transit revenues in Calgary—a large, urban municipality in Alberta, Canada. Calgary provides a poignant environment in which to conduct such a case study. Like many of Canada’s large cities, Calgary was hit hard early on by COVID-19 caseloads and spread. The City of Calgary was the first municipality in Canada to declare a state of local emergency, which it did on 15 March 2020, two days before the province of Alberta declared a provincial state of emergency (Province of Alberta 2020; The City of Calgary 2020d). The impact of COVID-19 on public transit revenues was large and sudden. In the first two months of the pandemic, the City of Calgary reported an 88 per cent decline in fare revenues culminating in revenue losses that amounted to \$13 million a month (The City of Calgary 2020a). Early in the pandemic it was hoped that this first wave would be the only wave; however, the first wave ended up being the first of many waves. Subsequent waves and emergency declarations at both the local and provincial level occurred during successive waves (Government of Alberta 2021; The City of Calgary 2021a). It was not until 2 December 2021 that the City of Calgary let their State of Local Emergency expire permanently despite the ongoing nature of the pandemic (The City of Calgary 2021b).

It is important to examine the impact of COVID-19 on transit revenues for two reasons. First, given that, like many cities, the City of Calgary has a general policy set by City Council of recovering a set portion of its costs from public transit fares (i.e., 50-55% for the City of Calgary), it is important to understand the degree to which public transit revenues can cover transit costs both in the short- and longer-term including during public health events (Passifiume 2017). Second, assessing this information will provide clues on whether transit revenues will recover and how to plan for funding transit in the future.

We find that the pandemic had significant short- and medium-run effects on public transit. Revenues from transit fares dropped immediately and significantly after the declaration of a state of emergency in March 2020 for all types of transit fare types: revenue from transit fares in April 2020 were approximately 6% of April 2019 revenues. Revenues began to pick up slowly in May 2020 and by September 2020, revenues generated from transit fares had stabilized. For adult fares, revenues in September 2020 were about 50% of September 2019 revenue. Revenues from child fares, and child and senior concession fares recovered the most, with revenue reaching 73%, 69% and 87%, respectively, of the revenue in September 2019. These trends improved in 2021, indicating a high dependency on public transit of children and low-rate users. In contrast, in 2021, revenues from adult monthly transit fares declined into 2021, stabilizing at the lowest rate of 30% of 2019 revenues. Given the persistently low revenues collected from adult transit fares and the high (but declining) budgetary reliance on adult fares, this suggests that Calgary Transit should develop a long-term financial framework. In the short-term, Calgary Transit could increase reliance on revenues from local property taxes or transfers from higher order of governments. Over the longer-term, the City of Calgary will need to weigh the trade-offs from pursuing fare increases, lowering service standards—knowing that these will most likely affect children and low-income

riders the most—and expanding ridership, including through service expansion, while also balancing climate, labour mobility, and accessibility objectives.

This paper proceeds as follow. We first provide a brief overview of Calgary Transit and the COVID-19 pandemic in the City of Calgary. Next, we discuss the impact of COVID-19 on transit revenues and expenditures followed by a detailed analysis of the impact of COVID-19 on transit fare revenues from 2015 to 2021. We then discuss the strategies that the City of Calgary could implement to achieve a balanced budget in the long-term and conclude.

Background

Calgary Transit

The City of Calgary is responsible for operating, developing, expanding, and maintaining the public transit system within Calgary. Calgary Transit is comprised of both buses and light rail transit (otherwise known as the “C-train”). In 2020, there were 166 bus routes with 6,144 bus stops throughout the city (C.o.C. Calgary Transit 2021). In addition, there are presently two C-train lines: the blue line and the red line. The blue line runs east to west, includes 16 stations, and is about 12.5km in length. The red line runs north to south, consists of 20 stations, and is about 30 km in length (Hayer et al. 2013). Both the red and blue line run through downtown along which is called the 7th avenue transit mall. This consists of 9 stations and is approximately 2.1 km in length (Hayer et al. 2013). Since the early 1980s, persons travelling only between the downtown stations are not required to purchase a transit pass: the downtown corridor is a Free Fare Zone.

Prior to the pandemic, annual ridership on Calgary public transit exceeded 100 million, the majority of which were work related (NRG Research Group 2016). The annual operating expenditures of Calgary Transit were approximately \$445 million of which just over \$200 million was recovered through various Calgary Transit own-source revenue sources including transit fares, parking, advertising, and scrap sales (The City of Calgary 2019b)¹, with the majority of these revenues coming from transit fares. Different types of transit fares are available to the public, including single ride tickets along with monthly and yearly passes. A low-income transit pass was introduced in 2015 with three “band” categories that depends on family size and income (details in Appendix A). As seen in Table 1, the prices of transit fares vary across different groups—youth, adult, senior, student, and income level—and have increased from 2015 to 2020. While fares were increased in January 2020, before the COVID-19 shut-downs, there were no fare increases in 2021.

¹ Remaining transit operating costs, not covered by transit own source revenues, are funded through property taxes. This means that the revenue/cost ratio is about 45% which falls short of the 50-55% guiding target set by City Council (The City of Calgary 2018).

Table 1: Prices of Calgary Transit, 2015 -2021

Year	2015	2016	2017	2018	2019	2020	2021
Adult Single Ride	\$3.15	\$3.15	\$3.25	\$3.30	\$3.40	\$3.50	\$3.50
Youth Single Ride	\$2.10	\$2.10	\$2.25	\$2.30	\$2.35	\$2.40	\$2.40
Adult Day Passes	\$9.50	\$9.50	\$10.00	\$10.50	\$10.75	\$11.00	\$11.00
Youth Day Passes	\$6.75	\$6.75	\$7.00	\$7.50	\$7.75	\$8.00	\$8.00
Adult Monthly Pass	\$99.00	\$99.00	\$101.00	\$103.00	\$106.00	\$109.00	\$109.00
Youth Monthly Pass	\$65.00	\$65.00	\$70.00	\$75.00	\$77.00	\$79.00	\$79.00
Adult Ticket Book	\$31.50	\$31.50	\$32.50	\$33.00	\$34.00	\$35.00	\$35.00
Youth Ticket Book*	\$21.00	\$21.00	\$22.50	\$23.00	\$23.50	\$24.00	\$24.00
Student Pass-Winter	\$125.00	\$130.00	\$130.00	\$140.00	\$145.00	\$151.00	N/A
Student Pass-Fall	\$125.00	\$130.00	\$140.00	\$145.00	\$151.00	\$155.00	N/A
Low Income Transit Pass-Band A	\$44.00	\$44.00	\$5.05	\$5.15	\$5.30	\$5.45	\$5.45
Low Income Transit Pass-Band B	\$44.00	\$44.00	\$35.35	\$36.05	\$37.10	\$38.15	\$38.15
Low Income Transit Pass-Band C	\$44.00	\$44.00	\$50.50	\$51.50	\$53.00	\$54.50	\$54.50
Seniors' Annual Pass-Regular	\$95.00	\$95.00	\$95.00	\$135.00	\$140.00	\$145.00	\$145.00
Seniors' Annual Pass-Low Income	\$15.00	\$15.00	\$15.00	\$20.00	\$25.00	\$25.00	\$25.00

Sources: Data from the City of Calgary. * means that the effective is September 1st each year, otherwise fare increases are effective the first of January each year.

The COVID-19 Pandemic and the City of Calgary

When the COVID-19 shut-downs began, Calgary was already grappling with the consequences of the collapse in oil prices that began in 2014. The collapse in oil prices led to a mass exodus of workers and companies from the downtown commercial towers. This exodus resulted in a significant decline in property valuations of these towers, which directly led to a drop in property tax revenues from the non-residential sector which had historically contributed to well in excess of 50% of total property tax revenues (The City of Calgary Financial Task Force 2020). The City's fiscal reserve had been tapped into several times since 2015 to not only lessen the blow of property tax increases needed to replace the lost property tax revenues (The City of Calgary Financial Task Force 2020), but also to pay for the controversial event centre approved in 2019 (The City of Calgary 2019c).² The City of Calgary had already taken steps to try to address its precarious financial situation, appointing a Financial Task Force to provide a permanent resolution to the property tax problem (The City of Calgary Financial Task Force 2020). The Task Force tabled a comprehensive report in June 2020, which recommended in part that the City look to various user levies to strengthen its revenue base against volatile property tax revenues. In addition, the City of

² The core of the event centre is a new arena for the National Hockey League team the Calgary Flames that will replace the aging Saddeldome. The event centre deal between the City of Calgary and the Calgary Sports and Entertainment Corporation (CSEC), which owns and operates the Calgary Flames, collapsed in 2021. The City of Calgary, however, renewed its commitment to building a new event centre and began searching for other interested parties to partner with in early 2022.

Calgary had been enacting a series of budget and service cuts to balance its budget (Anderson 2020; The City of Calgary 2019a; Toy 2021).

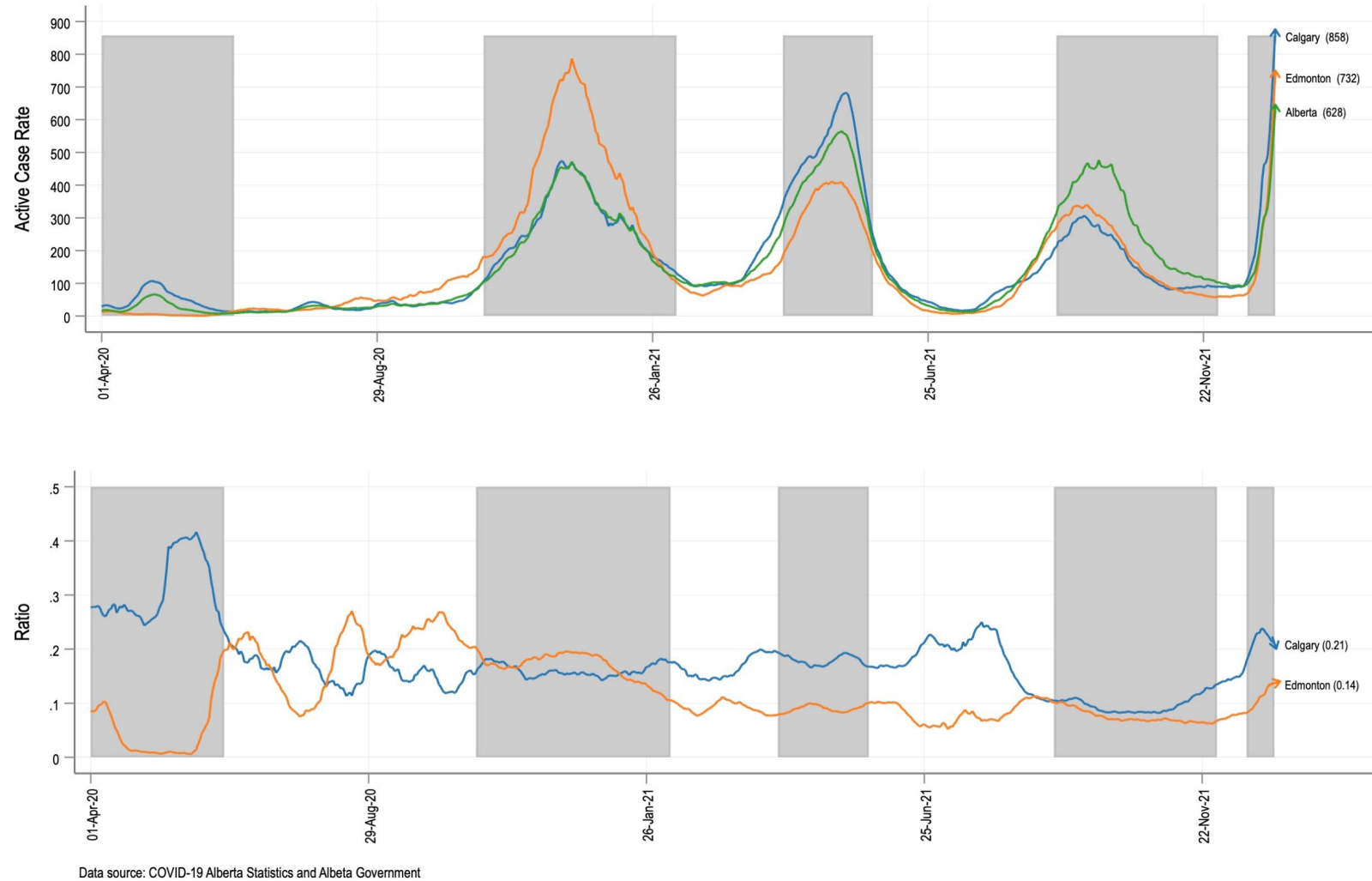
In conjunction with the already existing precarious financial situation, Calgary was hit hard by the COVID-19 pandemic. Figure 1 Panel A presents the daily active case rate per 100,000 persons for Calgary, Edmonton, and for the Province of Alberta. Panel B shows the ratio of daily active cases in Calgary and Edmonton to the daily active cases in Alberta for the period from 1 April 2020³ to 31 December 2021. The shaded areas indicate the periods with more strict public health measures. Figure 1 shows that Calgary had a higher COVID-19 infection rate than Edmonton and Alberta during the first wave. While Edmonton overtook Calgary in the second wave, Calgary once again took the lead in the third wave (the first Delta wave). The fourth wave hit outside of Calgary and Edmonton. Once again though, Calgary took top spot during the fifth wave (the first Omicron wave) which began in mid-December 2021.

The declaration of the first local state of emergency on 15 March 2020 by the City of Calgary resulted in the immediate reduction or suspension of many of the City's fee generating services as well as restrictions related to occupancy for services that continued. The financial impact of these decisions was immediate. By 30 April 2020, the City of Calgary was losing upwards of \$15 million per week due to a decline in user levy revenues (660 News Staff 2020). Initially, the revenue losses were predicted to surpass \$400 million (Villani 2020)—13% of the City of Calgary's total annual revenues—but because public health measures were able to be lifted throughout summer 2020 and only had to be reinstated through a second local emergency order on 25 November 2020—the total revenue loss ended up being approximately \$74 million in 2020 (Smith 2021). However, because the second emergency order was extended well into 2021, revenue losses from user levies continued (The City of Calgary 2022a).

A large portion of these revenue losses came from Calgary Transit. As part of the local state of emergency order, public transit required users to board buses using rear doors only and the honor system was used for fare payment (The City of Calgary 2020b), capacity limits were enacted to ensure that Government of Alberta physical distancing requirements could be maintained (Braat 2020), previously issued low-income and seniors' transit passes were extended (The City of Calgary 2020a), and public transit services were reduced (The City of Calgary 2020b). Further, when the province declared a province-wide state of emergency on 17 March 2020, the province enacted measures that further affected transit use. The province required all non-essential businesses to close immediately and those businesses that were permitted to remain open had strict limits on the number of workers that could be onsite, all workers that could were required to work from home, and all post-secondary and K-12 schools were required to immediately shift to online learning (Shofer, Jaffer, and Stein 2020).

³ 1 April 2020 is the date the government started providing active case number by geographic location. We only know the cumulative number of cases between March 6, 2020 and March 31, 2020.

Figure 1: Daily Active Case Rate (per 100,000 population) for Calgary, Edmonton, and Alberta and the Active Case Ratio for Calgary and Edmonton (April 01, 2020 – December 31, 2021)



By the height of the first wave (April 2020), a cascade of events significantly reduced transit revenues. Ridership dropped to 10% of 2019 levels, which also meant lower revenues from reserved parking at Calgary Transit Park & Ride facilities. People returned single tickets and books of tickets for a refund and the post-secondary UPass program was cancelled (The City of Calgary 2020a). Payments were restricted to non-cash forms (The City of Calgary 2020a). Advertising campaigns on buses and LRT trains were cancelled or suspended. By summer 2020, big summer events like the Calgary Stampede were cancelled, area tourism continued to be down as a result of international travel and border restrictions, summer camps for kids operated with extremely limited capacity, and many who could work from home continued to do so as capacity restrictions prevented a full return to work.

In Fall 2020, K-12 schools returned to face-to-face learning, but post-secondary institutions remained online (Baker, Koebel, and Tedds 2021a). That said, when in-person K-12 face-to-face learning returned in September 2020, upwards of 30% of students chose the online learning option (Bench 2021). In addition, Calgary and Alberta quickly moved into the second wave as cases began to rise again in mid-October 2020 (Fletcher 2020). The re-emergence of the virus resulted in K-12 students, teachers, and staff having to isolate as exposures to the virus in schools led to another round of comprehensive social distancing restrictions. A second state of public health emergency was declared by the province on 24 November 2020 (Pearson 2021) and a second state of local emergency was declared in Calgary on 25 November 2020 (The City of Calgary 2020c). On 30 November 2020, in-person classes were moved fully online for grades 7-12 provincially and on 8 December 2020, additional restrictions were imposed until 18 January 2021, with the measures being very similar to those being in place during the first wave. This would be a process that would repeat itself three more times in 2021.

The Impact of COVID-19 on Annual Revenues and Expenditures

Table 2 presents annual revenues and expenditures of Calgary Transit from 2015 to 2021. The revenue is collected from various user levies⁴, and government transfers. Transit fares, a form of user fee, are fees collected from the sale of transit tickets and passes. Government transfers include cash transfers from the provincial government. Regulatory and proprietary charges include revenue from the sale of goods and services collected in a commercial context or fees imposed under regulatory schemes, namely advertising revenue, fines and penalties, and parking fees.

As shown in Table 2, before COVID-19, annual expenditures for Calgary Transit increased from \$431 million in 2016 to \$471 million 2019. With the onset of COVID-19 in 2020, expenditures declined by \$55 million to \$416 million in 2020, and by a further \$13 million to \$404 million in 2021. While this decrease is notable, it is not larger because many transit costs are fixed costs—such as facilities, equipment, and other durable goods—and cannot be altered in the short term. A smaller proportion of the expenditures are variable costs—such as labour, maintenance, and fuel—which can be and were altered over the course of the pandemic.

⁴ See Tedds (2019) for a description of the various forms of user levies in the Canadian context.

Table 2: Revenue and Expenses of Calgary Transit by Year, 2015 -2021 (in Millions)

		2015	2016	2017	2018	2019	2020	2021
Expenditures		\$430.66	\$435.93	\$445.93	\$458.63	\$471.47	\$416.42	\$403.46
Sources of Revenue (\$)	Transit Fare Revenues	\$181.44	\$164.19	\$160.69	\$163.58	\$168.80	\$77.99	\$70.33
	Government Transfers	\$0.00	\$0.12	\$0.01	\$0.00	\$4.75	\$3.75	\$4.12
	Regulatory/Proprietary: Total	\$16.83	\$16.15	\$14.70	\$15.35	\$14.61	\$12.77	\$11.06
	Advertising	\$9.29	\$8.86	\$8.82	\$9.43	\$8.62	\$6.91	\$7.80
	Fines/Penalties	\$1.66	\$1.83	\$1.27	\$1.52	\$1.46	\$0.99	\$0.57
	Miscellaneous	\$0.42	\$1.04	\$0.31	\$0.20	\$0.50	\$0.45	\$0.81
	TCA Developer Contribution	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1.75	\$0.00
	Other	\$1.43	\$1.02	\$1.42	\$1.43	\$1.26	\$1.29	\$1.40
	Reserved Parking	\$4.03	\$3.40	\$2.88	\$2.77	\$2.77	\$1.37	\$0.48
(% of Expenditure)	Transit Fare Revenues	42.13%	37.66%	36.03%	35.67%	35.80%	18.73%	17.43%
	Government Transfers	0	0.03%	0.00%	0	1%	0.90%	1.02%
	Regulatory/Proprietary	3.91%	3.70%	3.30%	3.35%	3.10%	3.07%	2.74%

Source: Data from the City of Calgary.

Note: * TCA Developer Contribution is a type of development charges, which is a type of regulatory charger. It is a one-time levy on developers to finance the off-site, growth-related capital costs associated with new development or sometimes, redevelopment (Tedds, Philips, Enid, and Heather (2019)). Other includes revenue from service charges, recovered expenses, scrap sales. Miscellaneous includes revenue from proceeds sale assets, non-recurring. These sources of revenue descriptions are from the data provided by the City of Calgary.

On the other hand, transit fare revenues saw a significant decline during COVID-19. Before the pandemic, from 2015 to 2019, the share of expenditures that were recovered from transit fare revenues declined from 42% to 36%—with transit fare revenues declining from \$181 million in 2015 to \$169 million in 2019. At the onset of the pandemic in 2020, there was a large decline in the revenue from transit fare revenues—from \$169 million in 2019 down to \$78 million in 2020, a 54% decline. It further declined to \$71 million in 2021. This reduced the share of expenditures recovered from transit fare revenues from 36% in 2019 to 19% and 17% in 2020 and 2021 respectively.

Revenue from regulatory and proprietary sources also saw a decline during the COVID-19 pandemic, but, overall, they make up a much smaller proportion of transit revenues. Revenue from regulatory and proprietary sources dropped from an average of 3.47% of expenditures pre-COVID-19 to 3.07% of expenditures in 2020 and 2.74% of expenditure in 2021.

Transit Fare Revenues

The Impact of COVID-19 on the Annual Share of Revenue of Transit Fare Categories

As detailed in Table 2, the drop in revenue from transit fares was the largest source of revenue decline for Calgary Transit. In this section, we focus on examining the impact of COVID-19 on transit fare revenues. To do this, we break down transit fares into 14 categories as shown in Table 3. Table 3 presents for each category of transit fare the share of revenue from that category; that is, it takes the revenue from that category and divides it by the total transit fare revenues.

From Table 3, we see that before the pandemic, the share of revenue from adult tickets was already dropping from 75.5% in 2015 to 70% in 2019. During COVID-19, the trend continued at an accelerated pace with the share of revenue from adult tickets dropping to 66.1% in 2021. Notably, revenues from adult monthly fares make up the largest share of transit fare revenues compared to all other fare types. Prior to COVID-19, the share of revenue from adult monthly tickets was dropping (from 40% in 2015 to 36% in 2019). After the onset of the pandemic, the share of adult monthly passes revenue dropped faster to 33% in 2020 and to 27.6% in 2021. Comparatively, the share of transit fare revenues from adult single/hourly make up the second largest share of transit fare revenues and, prior to the pandemic, made up a relatively consistent share of transit revenues (18%). However, after the onset of COVID-19, the share of revenue from adult single use tickets increased from 17.7% in 2019 to 21.6% in 2020 and 24.8% in 2021.

Comparatively, child transit fare revenues had, prior to the pandemic, made up the lowest share of transit fare revenues compared to adult and concession fares but had been increasing—from 12% in 2015 to 14% in 2019. After COVID-19, the share of transit fare revenue from child fares initially declined to 11.1% in 2020 but increased to 17.5% in 2021. The largest change within child fares was in the share of transit fare revenue from child monthly passes, which declined from 10% in 2019 to 7.5% in 2020 and increased to 10.5% in 2021. Comparatively, for child singly/hourly fares, the share of revenue increased during the pandemic from 1.7% in 2019 to 1.9% in 2020 and 3% in 2021.

Table 3: Share of User Fee Revenue by Category of User Fee⁵

Year		2015	2016	2017	2018	2019	2020	2021
Adults	Adult Monthly Use	40.08%	39.52%	38.02%	36.73%	36.30%	33.43%	27.55%
	Adult Single/Hrly Use	18.29%	18.48%	18.62%	18.34%	17.71%	21.64%	24.75%
	Adult Bulk Ticket/Admission	16.33%	14.30%	14.78%	14.94%	15.11%	12.66%	12.91%
	Adult Day Pass	0.79%	0.90%	0.96%	0.89%	0.85%	0.70%	0.93%
	Total share of adults:	75.49%	73.20%	72.38%	70.89%	69.98%	68.44%	66.13%
Children	Child Monthly Use	8.23%	9.03%	9.32%	9.78%	10.00%	7.54%	10.45%
	Child Single/Hrly Use	1.38%	1.37%	1.39%	1.73%	1.71%	1.91%	3.01%
	Child Bulk Ticket/Admission	1.87%	1.47%	1.86%	2.07%	2.08%	1.59%	3.91%
	Child Day Pass	0.07%	0.08%	0.10%	0.11%	0.10%	0.09%	0.14%
	Total share of children:	11.55%	11.95%	12.67%	13.68%	13.89%	11.13%	17.51%
Low-Rates	Student Pass	7.09%	8.46%	9.24%	9.80%	9.86%	10.43%	8.21%
	Adult Monthly Concession	3.99%	4.68%	3.80%	3.72%	4.19%	5.69%	5.51%
	Child Monthly Concession	0.69%	0.93%	0.87%	0.71%	0.82%	0.80%	1.10%
	Senior Yearly Pass	0.77%	0.49%	0.68%	0.87%	0.96%	2.95%	1.26%
	Senior Yearly Concession	0.12%	0.06%	0.12%	0.14%	0.15%	0.54%	0.27%
	Total share of low-rates:	12.66%	14.62%	14.71%	15.24%	15.98%	20.41%	16.35%
Cash	0.30%	0.23%	0.23%	0.19%	0.14%	0.01%	0.01%	

Source: Data from the City of Calgary.

Notes: the share of user fee revenue is calculated by taking the revenue from the sales of tickets/passes in the particular category divided by total user fees.

⁵ An adult single/hourly use ticket is an adult (ages 18+) one-time use ticket, which is valid for 90 minutes. An adult day pass ticket is an adult multiple-use pass, which is valid from the time of purchase until the end of service that day.

An adult monthly pass is an adult multiple-use pass, which is valid for one calendar month.

An adult bulk tickets/admission are adult single/hourly use tickets that are bought in books of 10.

An adult monthly concession pass is an adult multiple-use pass, which is valid for one calendar month and is purchased at discount.

A child single/hourly use ticket is a child (ages 6-17) one-time use ticket, which is valid for 90 minutes.

A child day pass ticket is a child multiple-use pass, which is valid from the time of purchase until the end of service that day.

A child monthly pass is a child multiple-use pass, which is valid for one calendar month.

A child bulk tickets/admission are child single/hourly use tickets that are bought in books of 10.

A child monthly concession pass is a child multiple-use pass, which is valid for one calendar month and is purchased at discount.

A senior yearly pass is a senior (ages 65+) multiple-use pass, which is valid for one calendar year.

A senior yearly concession pass is a senior multiple-use pass, which is valid for one calendar year and is purchased at discount.

A student pass is a universal pass that is offered to all students.

Finally, prior to the pandemic, the share of revenue from concession fares was increasing prior to the pandemic, from 12.7% in 2015 to 16% in 2019. This increase continued into 2020, with the share of revenue from low-rate tickets increasing to 20.4%. However, the share of transit fare revenues from concession passes then declined during the second year of the pandemic to 16.4% in 2021 (albeit still higher than the pre-pandemic level). This was largely driven by trends seen in the share of transit fare revenue from student passes. Comparatively, the share of revenue from child monthly concession passes more closely mirrored the patterns seen for child passes as opposed to concession passes: the share of revenue from child concession passes dropped very slightly from 0.82% in 2019 to 0.8% in 2020 before increasing to 1.1% in 2021.

There are three main take-aways from this examination. First, the pandemic did not change the trend of an increasing reliance on children’s transit fares and concession passes and a decreasing reliance on adult fares, and it may have hastened the increasing reliance on children’s fares. This likely reflects adults continuing to work from home, while children returned to face-to-face learning. Second, during the first year of the pandemic, those eligible for concession fares remained more reliant on transit than adults and children. This suggests they were less able to transition away from public transit when the shut-downs began, likely because their workplace were considered essential. Third, there is an increasing reliance on short-duration fare types (e.g., single/hourly, bulk admissions, day) relative to longer-duration passes (e.g., monthly). All of this suggests a shift in how, why, and by whom public transit is used during a pandemic in the short- and medium-term.

The Impact of COVID-19 on Monthly User Fees by Category

In this section, we analyze how COVID-19 affected monthly revenue of the different categories of transit fares. In particular, we analyze the magnitude of the impact of COVID-19 on the monthly revenue of the different categories of user fees. Figure 2 presents the year-over-year monthly change of all categories of transit fares from 2015 to 2021. We calculate the monthly change by $\frac{x_{m,i,t}}{x_{m,i,t+1}}$, where $x_{m,i,t}$ is the transit fare revenue of category m in month i and year t , and $x_{m,i,t+1}$ is the transit fare revenue of category m in month i and year $t+1$. To investigate the impact of COVID-19 in 2021, we compare the monthly revenue in 2021 with the pre-COVID monthly revenue in 2019 (as opposed to comparing it to 2020). Panel A shows the year-over-year monthly change of revenues from adult fares. Panel B shows the year-over-year monthly change of revenue from children’s fares. Panel C shows the year-over-year monthly change of revenue from low-rate fares.

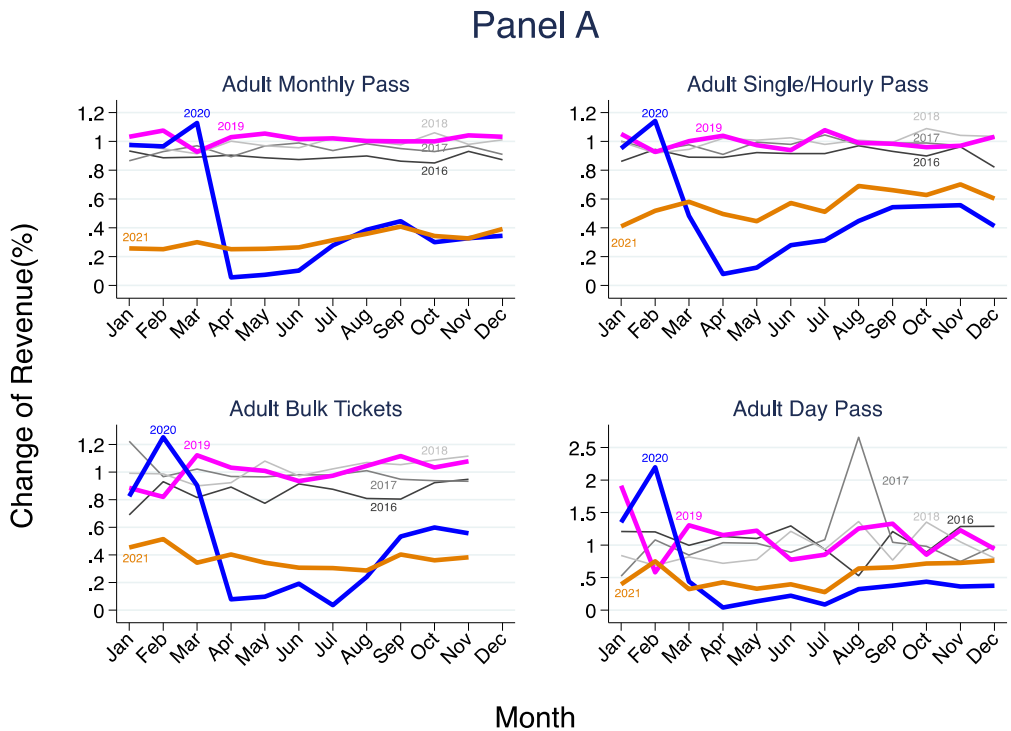
Adult Transit Fares

We begin by examining revenue from adult monthly passes, which, as we saw in the previous section, make up the largest share of transit fare revenues. Figure 2 Panel A shows that revenue from adult monthly passes declined immediately and significantly in April 2020 to 5.6% of the revenue in April 2019. When the first lockdowns were loosened during the summer months, the revenue from adult monthly passes started increasing. By September 2020, it had increased to 44.7% of the revenue in September 2019. As the second wave of COVID-19 hit in October 2020, the change of revenue from adult monthly passes decreased to 34.5% in December 2020. During

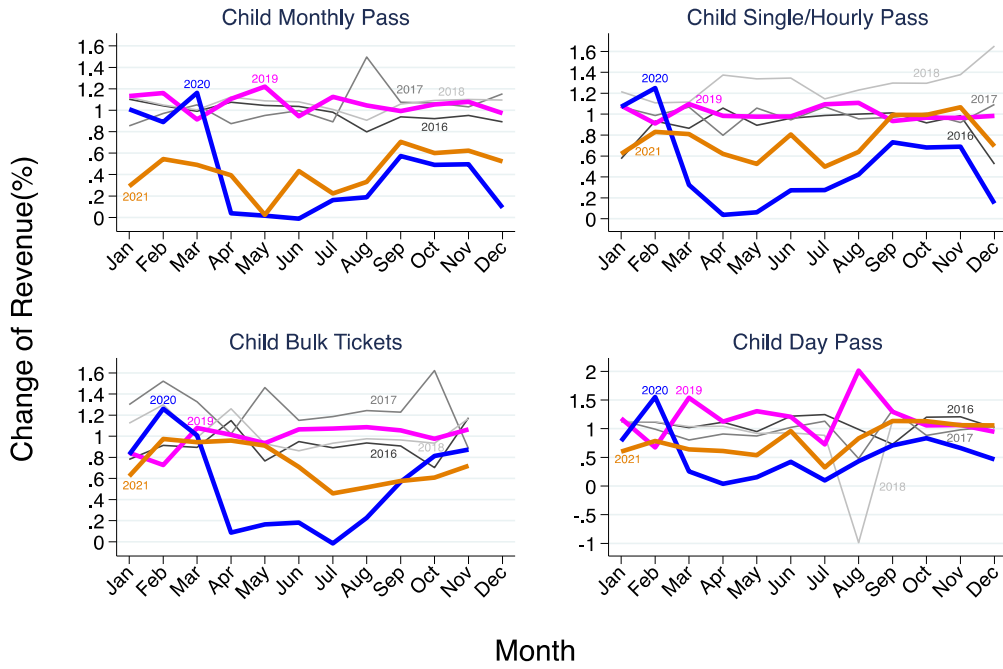
the year 2021, monthly revenue from adult monthly passes stabilized around 30% of the revenue in the corresponding months in 2019.

Next, we look at the revenue from adult single/hourly tickets, the second largest share of transit fare revenues. Figure 2 Panel A shows that, as with adult monthly passes, there was an immediate and significant decline in March 2020 to 48.44% of the revenues in March 2019, further declining to 7.9% by April 2020. Over the summer months, when the first lockdown was loosened, the monthly change of revenue from adult hourly tickets slowly recovered. By November 2020, revenue reached 55.7% of revenue in November 2019, slightly higher than the recovery for adult monthly ticket revenue. When the second wave of COVID-19 hit, revenue dropped to 41% in December 2020 of the revenue in December 2019. This drop was less than the drop seen in adult monthly passes. During the first half of 2021, the monthly revenue from adult single/hourly tickets was 50% of the sales in the corresponding months in 2019. In August 2021, the monthly revenue increased and was 69% of the revenue in August 2019. In the next couple of months, despite the third and fourth waves of COVID-19, the monthly revenue from adult single/hourly tickets stabilized around 65% of the revenue in the corresponding months in 2019. This stabilization rate was higher than for adult monthly passes. Similar patterns can be seen in the revenues from adult day pass and adult bulk passes.

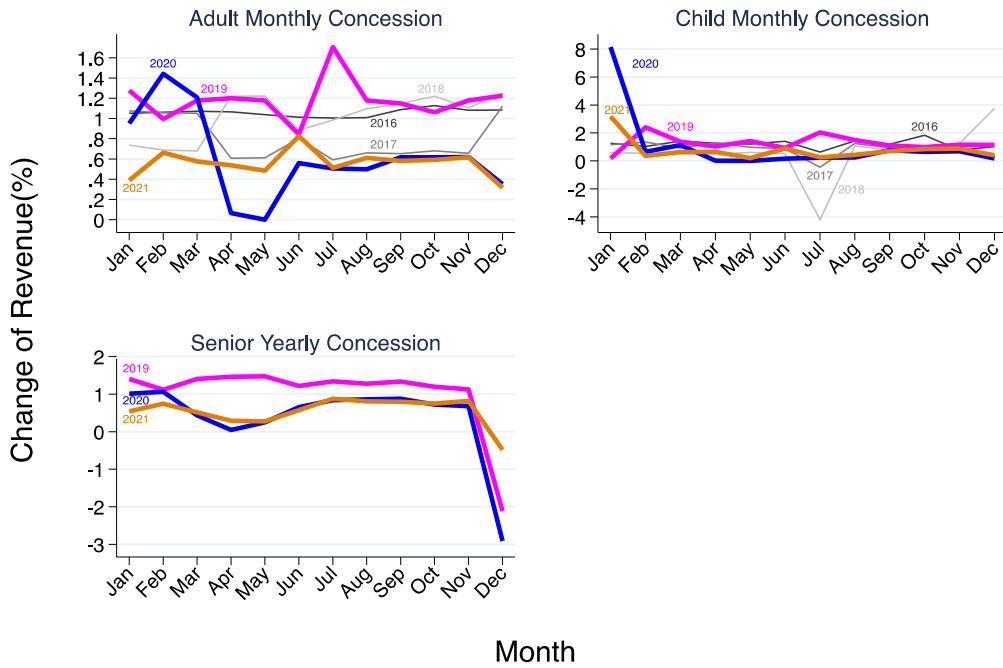
Figure 2: Change of Sources of User Fees, 2015 – 2021



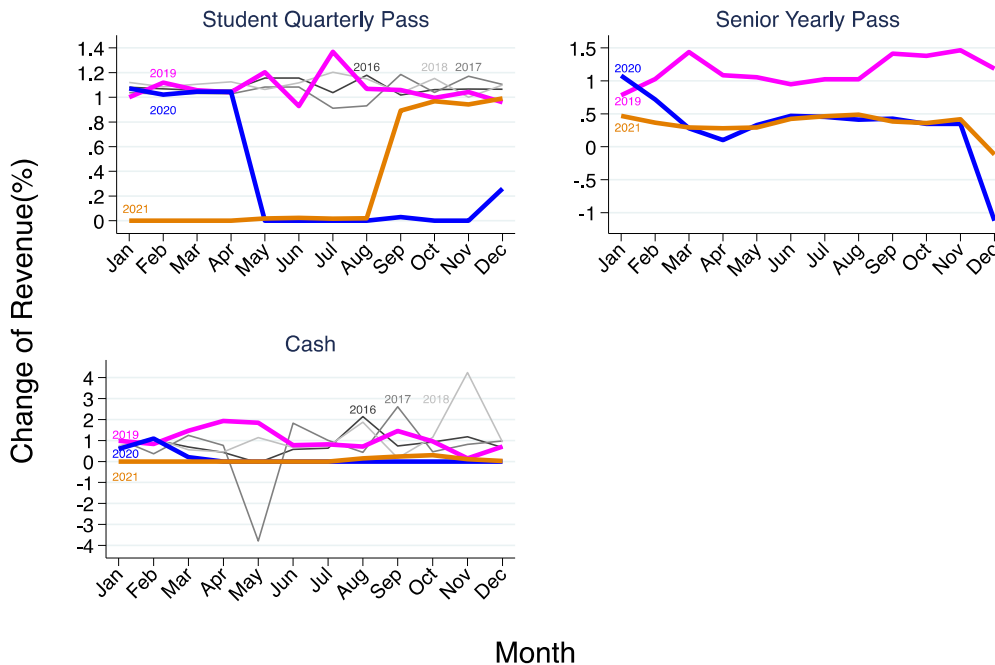
Panel B



Panel C



Panel C - Continued



Source: Data from the City of Calgary

Overall, revenues for all adult fares dropped immediately and significantly at the beginning of the pandemic in March 2020. Throughout the remainder of 2020 and 2021, the ensuing recoveries and declines responded less to the second COVID wave and not at all to the third and fourth wave, but, despite this, revenues remained lower than in 2019 and pre-pandemic levels were not achieved. By the end of 2021, revenue from different types of adult tickets had stabilized, with adult single/hourly tickets recovering the most (65% of its pre-pandemic revenue), and adult monthly passes recovering the least (30% of its pre-pandemic revenue).

Child Transit Fares

Figure 2 Panel B looks at the revenue for child fares. Beginning with child monthly passes, the revenue from child monthly passes declined immediately and significantly in April 2020 to 3.9% of the sales in April 2019 and continued to decline slightly in May and June 2020. When in-person summer camps and school resumed, revenue increased until September 2020 to 57.29% of the revenue in September 2019. This remained stable until December 2020 when the second wave hit and revenue dropped sharply to 9% of the revenues in December 2019. As students returned to in-person class in January 2021, revenue from child monthly passes increased until February 2021 before declining again and hitting a low point in May 2021, dropping to 2.45% of the revenue in May 2019, consistent with the third wave of COVID. There has been no stabilization of revenue for monthly child passes like there was for adult monthly passes, with fluctuations continuing until the end of 2021 averaging around 49% of the revenues in 2019.

Likewise, revenue from child single/hourly fares immediately and significantly declined to 3.7% of April 2019 revenue by April 2020. When the lockdowns were lifted over the summer months, the revenue from child single/hourly fares increased until September 2020, where the revenue was 73.22% of the sales in September 2019. As the second wave of COVID-19 hit, revenue from child single/hourly use in December 2020 dropped to 14.6% of the sales in December 2019. When students returned in-person classes in January 2021, revenue of child hourly use fares increased to 81% of revenue in March 2019 by March 2021. As the third COVID wave hit, revenues from child single/hourly fares dropped to 52% of May 2019 revenue in May 2021. However, by September 2021, despite the fourth wave of COVID, revenues from child single/hourly fares reached 2019 revenue levels. By November 2021, revenues reached 106.69% of sales in November 2019. Similar patterns can be seen in the revenues from child day passes and bulk ticket/admission passes.

Overall, the monthly revenue from child tickets presents a different pattern compared to the revenue from adult tickets during the COVID-19 pandemic. First, they are more variable and were more responsive to the second and third wave of COVID than adult tickets, although the fourth wave does not appear to have had an impact. Second, revenues from children's fares, regardless of the type, recovered by more than adult revenues by the end of 2021. This suggests that children were more reliant on public transit compared to adults. Finally, as with adults, revenues from children's monthly passes recovered the least and single/hourly fares and day tickets recovered the most, suggesting a shift in the type of fare purchased.

Low-Rate Transit Fares

Finally, Panel C of Figure 2 shows the year-over-year monthly change of revenues for low-rate fares. The revenues generated from adult monthly concession passes in April 2020 dropped to 6.51% of revenues in April 2019, further declining to 0.07% of revenues in May 2020. As with adult monthly passes, revenues from adult concession passes slightly increased over the summer and fall 2020 before declining again during the second wave from 65% in November 2020 to 35% in December 2020, about the same level as adult monthly passes. After this, revenues again increase and, despite the third and fourth waves of COVID-19, the revenue of adult concession passes was around 55% of the revenue of the same month in 2019. This is a larger and more consistent revenue level than for adult monthly passes.

For child monthly concession passes, as with all other passes, the revenue from child monthly concession passes dropped in April 2020 to 2.68% of the revenue in April 2019, further declining to -0.2% in May 2020. During the summer months, when the first lockdowns was loosened, revenue started increasing. By November 2020, it reached 68.6% of the sales in November 2019, while the revenue in December 2020 dropped to 18.9% of the sales in December 2019 during the second COVID wave. Despite an odd and unexplainable jump in January 2021, revenue increased from February 2021 to April 2021. By April 2021, it was 65.07% of the revenue in April 2019. This dropped to 26% in May 2021 during the third wave, similar to but less deep than the drop in child monthly passes (2.45%). When school resumed in September 2021, the revenue increased to a high of 87.63% of the November 2019 revenue in November 2021 before declining again in December 2021 to 40.47% of the revenue in

December 2019. Overall, the recovery of revenues of child concession tickets was higher than the recovery of child monthly tickets, but followed the same general pattern.

For student quarterly pass, the revenue between May and August 2021 dropped to zero except outside of some slight increases (e.g., December 2020): student transit passes had been cancelled by post-secondary institutions en masse. In Fall 2021, when university students returned to in-person classes, student transit passes were restored and the revenue from student quarterly passes reached 2019 revenue levels.

For the senior yearly passes, in April 2020, the revenue dropped significantly to 10.3% of the revenue in April 2019. During the rest of 2020 and 2021, the revenues of senior yearly passes remained around 35% of the revenues in the same month in 2019.⁶ Similar patterns can be observed in revenues for the senior yearly concession passes. In April 2020, the revenue generated from the senior yearly concession passes was 4.74% of the revenue in April 2019. This increased to 87.47% in September 2020. During the remainder of 2020 and 2021, the revenues of senior yearly passes were about 35% of the revenues in the same month in 2019.

Overall, the impact of COVID-19 on the revenue from adult concession fares was smaller than the effect on the revenue from adult monthly passes but it followed a similar pattern—after the first COVID wave there are no strong impact from subsequent waves. Likewise, the impact of COVID-19 on child concession fare revenue followed a similar pattern to revenue from child monthly passes—both responded strongly to the first three COVID waves; however, the recovery of revenue from child concession passes, relative to 2019 revenue, was greater than for child monthly passes and adult concession passes. Finally, the recovery of revenue from senior concession passes and senior yearly passes was less than for adult concession passes and child concession passes and around the same magnitude as adult monthly passes. Together, this suggests that adult and child concession pass holders were more reliant on monthly transit passes than adult and child monthly pass holders, being less able to substitute to private transport or single/hourly or bulk tickets (which do not come at a concession rate). It also re-enforces that children concession holders are more reliant on transit than adult concession holders, as was seen with children and adult passes.

Discussion

This project provides an analysis of the impact of COVID-19 on public transit of a sizeable Canadian municipality: the City of Calgary. We examine, including comparison to historical trends, what has occurred since a state of local emergency was declared in March 2020 and the implications of the COVID-19 impact public transit revenues from fares, both in the short- and mid- term during the COVID-19 pandemic.

Overall, the results indicate that revenue from transit fares dropped immediately and significantly after the declaration of a state of emergency in March 2020 for all fare types. The impact of subsequent COVID waves on revenues from adult passes and adult concession passes

⁶ In this project, we don't analyse the sales from month of December for senior yearly pass and senior yearly concession pass. Please refer to footnote 3 for the reason.

appears to be small or non-existent as adults moved into working from home. However, revenues from both have not recovered to pre-pandemic levels. Further, COVID continued the trend of declining relative budget reliance on adult transit fares while we also see a trend away from adult monthly passes to adult single/hourly use fares. Comparatively, revenues from children's passes and children concession passes, while more impacted by subsequent COVID waves than adults as children moved in and out of school, have recovered to higher levels than adults (including up to and above pre-pandemic levels). COVID appears to have hastened the increasing relative budgetary reliance on children's fares, although there is a shift away from children's monthly passes towards children's single/hourly fares. Finally, revenues from concession passes have recovered to higher levels than adult passes and relative budget reliance on concession passes also increased during COVID.

This suggests that children and those that qualify for concession fares are more dependent on public transit than adult public transit users, being less able to forgo or substitute away from public transit. We hypothesize that the trend of lowered used among adults will continue. In Statistics Canada's post-pandemic survey in August 2020, about 26% of (adult) workers are expected to work remotely once the COVID-19 pandemic is over.⁷ Many of these work-from-home workers are expected to be in higher-paid jobs while those that continue to attend work in-person are in lower-wage jobs (Mehdi and Morissette 2021).

With fare revenue continuing to be below pre-pandemic trends, the City of Calgary is attempting to address the revenue shortage. Currently, part of this revenue gap is being filled through funding from the provincial and federal governments, with Calgary Transit receiving \$82M in intergovernmental transfers to combat the shortfall in transit revenues (Villani 2022). Other strategies to increase revenues that the City has committed to include attempting to attract more users by making public transit more accessible and creating a safer public transit space (MacVicar 2022), offering discounted monthly passes as a way to attract users back to public transit as a way to promote habit formation (Tran 2022), increasing service frequency (Calgary Transit 2022a), and encouraging multi-modal travel by equipping all buses with bike racks, allowing bikes on the CTrain, and making shared micro mobility options more available near transit hubs in the warmer months (Calgary Transit 2022c). Through these initiatives, Calgary Transit had anticipated transit ridership would increase from the current 60 percent of pre-COVID levels to 65-70 percent of pre-COVID levels by fall 2022. Recent data suggests that the City of Calgary has exceeded this target, with ridership increased to 80% of pre-COVID levels in September 2022 (Calgary Transit 2022b). However, whether this is a permanent jump remains to be seen it was driven by a 33% increase in ridership between August and September 2022 alone. Further, it still leaves a substantial gap remaining to be filled.

It is clear that Calgary Transit will need to develop a longer-term financial framework. If the City is unable to boost ridership back to pre-pandemic levels for 2023, a possibility if the way residents interact and get around their city has been permanently altered, then without ongoing provincial government transfers, own source revenues may have to be raised. Options include: increasing transit fares, and moving towards greater subsidization of public transit costs from property taxes. City Council should consider the long-term sustainability of its general policy to recover 50-55 percent of costs from fares. Given that major public transit providers in Canada

⁷ See Statistics Canada, Table 33-10-0247-01

recover a much lower percentage from fares (e.g. Translink (Vancouver) 33% and OC Transpo (Ottawa) 13% (Nyah 2022)) and an increasing focus on public transit playing a role in meeting emissions targets, the rationale for this ratio should be carefully considered. Over the longer term, the City of Calgary is making significant investments in expanding public transit, in particular through the construction of the Green Line that will expand transit access for those living in the north and south east of the city (City of Calgary 2022) and potentially significantly boost ridership and hence fare revenues. There are also calls to increase on-demand service to communities that don't have traditional bus service, as well as expanding public transit service beyond city boundaries including to Chestermere, Airdrie, and the Tsuut'ina Nation.

Calgary Transit is also incrementally increasing fares and reducing fare subsidies (The City of Calgary 2022b). Previous literature finds that the bus-fare elasticities are around -0.3–0.4 in the short run and in excess of -1 in the long run (Paulley et al. 2006). However, the calculation of these fare elasticities do not take into account the social benefits of public transit. The two main social benefits of public transit are reducing greenhouse gas emissions and increasing labour mobility. Increasing transit fares could increase greenhouse gas emissions if sufficient transit riders substitute for driving cars. Increasing transit fares could also reduce labour mobility as the cost of transit shifts the cost consideration related to working further away from home. On top of these effects, the elasticity estimates excludes the fact that youth less than ten years old tend to be accompanied by adults (Cain, Hamer, and Sibley-Perone 2005)). The loss of revenue from increasing regular adult tickets could be more significant than the literature has estimated since parents could find it is cheaper to drive their kids around. Compounding this, Goodwin et al. (1983) argue that those who were regular transit users when they are young were more likely to use public transit in their adult life. Finally, accessibility of public transit and clean and reduced greenhouse gas emissions are two main objectives of the government of Canada's vision for public transit (Infrastructure Canada 2022). The increase in fares contradicts these objectives.

On the other hand, public transit ridership is more sensitive to service quality changes. Schimek (2015) argues that in a large city, the elasticity of transit ridership with respect to service quality is -0.45 in the short run and -1.12 in the long run and De Grange et al. (2013) find that the elasticity of bus ridership with respect to service quality is -1.18. From this perspective if the increase in fares is offset by significantly improved services, including the expansion of areas served by transit, there could be a positive impact on Calgary Transit's total revenue.

All the decisions though need to be considered in the context of *Resilient Calgary: Councils Strategic Direction 2023-2026* (The City of Calgary 2022c). Decisions by the City of Calgary must be guided by economic, social, and climate resilience. There are five guiding principles to this strategy with six focus areas. One of the six focus areas is transit with a goal to address climate change, expanding the transit network, improving service quality, and leveraging support of federal and provincial partners. In particular, this focus notes:

“We need to improve our Always Available for All Ages and Abilities infrastructure to provide safe, accessible, affordable, year-round options for transportation for all types of travelers. Transit contributes to social equity and is an important part of our downtown revitalizations.” (The City of Calgary 2022c, 5)

While many of the strategies being pursued by Calgary Transit, as outlined above, are aligned with this strategy, the proposed fare increases, along with the existing commitment to raise a set proportion of revenues from fares and the tenuous nature of the existence of the concession passes, are in tension with this focus. While Calgary Transit is rather unique in Canada in have such a robust set of options related to concession fares, these concession fares are not permanent fare features. Instead, they are debated frequently, are dependent on continued provincial funding for the fare options, and often slated to be deleted due to funding pressures. Yet, as is demonstrated here, those that qualify for concession fares are dependent on public transit in their day-to-day lives but, because of their low-income status, are necessarily sensitive to price changes which often result in them foregoing other necessities as more and more of their income is directed to public transit. The data also shows the dependence of children on public transit, in part of function of underfunding of school busses, yet they are also co-dependent on their parent's use of public transit. Any aspect of public transit, including fares, that exclude public transit use of adults necessarily excludes the use by their children, which impedes progress on longer-term goals of increasing transit usage. Suffice to say, the approach of raising fares to increase revenues to fund Calgary Transit has important interactions with broader strategic objectives that must be carefully considered.

This City of Calgary transit case study shows the significant short- and medium-run effects of the pandemic on a vital municipal service, suggesting that transit authorities across the country are potentially facing a serious policy problem: how to fund public transit in the face of a significant and potentially long-term impact on adult usage of transit. There are no simple answers to this problem and all actions face important trade-offs. What is clear is that municipalities in Canada, and the City of Calgary particularly, are going to need increased support from tax revenues, whether that comes through property taxes or transfers from higher order of governments. Without this support, the role of municipalities in driving productivity, innovation, and economic growth will be at risk.

Appendices:

Appendix A: Income Ranges for Three Bands of Calgary Transit Low-Income Monthly Passes by Household Size

Household Size	Band A	Band B	Band C
1 person	Less than \$12,474	\$12,475 - \$21,206	\$21,207 - \$24,949
2 person	Less than \$15,530	\$15,531 - \$26,401	\$26,402 - \$31,061
3 person	Less than \$19,092	\$19,092 - \$32,457	\$32,458 - \$38,185
4 person	Less than \$23,181	\$23,182 - \$39,407	\$39,408 - \$46,362
5 person	Less than 26,291	\$26,292 - \$44,695	\$44,696 - \$52,583
6 person	Less than \$29,652	\$29,653 - \$50,408	\$50,409 - \$59,304
7 person	Less than \$33,013	\$33,014 - \$56,122	\$56,123 - \$66,027

Source: The Calgary Transit

The City of Calgary's sliding scale fare structure determines the bands of the Calgary transit low-income monthly passes.

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