Impact of Amazon's return to office on local business activity in downtown Seattle

1. Context

Amazon asked its employees in Seattle (and globally) to work from home in March 2020, at the beginning of the COVID-19 pandemic. On May 1, 2023 – more than three years later – the company implemented a hybrid work model, requiring employees to work from the office at least three days per week.

This analysis looks at initial data to evaluate the impact of this new policy for the economic vibrancy of Seattle's South Lake Union and the Denny Regrade neighborhood, where the majority of Amazon's Puget Sound headquarters employees are located.

2. Method and Data

We conduct a descriptive study to analyze the impact of Return to Office (RTO) on local economic activity. We use mobility data from Mapbox, along with anonymized transactions data from Mastercard for our analysis. Mapbox measures human activity across the U.S. by aggregating (anonymized/de-identified) mobile device activity data. The entire country is divided into small 'tiles', each measuring roughly 100x100 meters (approximately 0.06x0.06 miles) and human activity in each of these areas, as proxied by geolocated mobile data points, is measured at a daily level.[1] The fine granularity of the data allows us to calculate mobility for specific periods of the week (e.g., Tuesday-Thursday when impacts of RTO are assumed be more pronounced), which in turn helps to isolate the impact of RTO by comparing it with trends on other days of the week which were not directly affected by RTO (e.g., weekends).

Mapbox applies a normalization process to the data that converts the raw counts to an index, without which a comparison across geographic regions and time would not be possible. The index, thus, measures the extent of people mobility. This index varies between 0 (no activity) and infinity. Since the index is an unitless measure, we apply a scaling factor to predict footfalls.[2]

We complement our analysis using Mastercard SpendingPulse, which is a macroeconomic indicator of retail sales across all forms of payment. The data reports both transaction counts and sales estimates in the U.S. and these metrics are also available at a high spatial resolution level (i.e., 150x150 meters or 0.9x0.9 miles, and 600x600 meters or 0.37x0.37 miles[3].) We use the aggregation at the latter level to ensure consistency with analysis from the movement data. A key advantage of this transactions data is that it provides data disaggregated by industry, and this breakdown will allow us to zoom into the sectors which we think are likely to be impacted by return to office.

[1] More information about Mapbox Movement's activity index is here https://docs.mapbox.com/data/movement/guides/activity-index

[2] Footfalls are estimated by scaling the activity index with Placer.ai's foot-traffic data https://downtownseattle.org/programs-services/research/economic-recovery/

[3] Similar to Mapbox Movement, they are provided as an unitless index which ranges between 0 and~~to~~ infinity.

Our data spans March 2020 to May 2023 and reflects movement in a 500 meters (0.3 mile) radius around two Amazon locations in downtown Seattle: (a) Dawson building (to capture activity in South Lake Union), and (b) Amazon Spheres (to capture activity in and around Denny Regrade Way). A map of the places selected is in Appendix A (see Appendix Figure 1 and Appendix Figure 2).

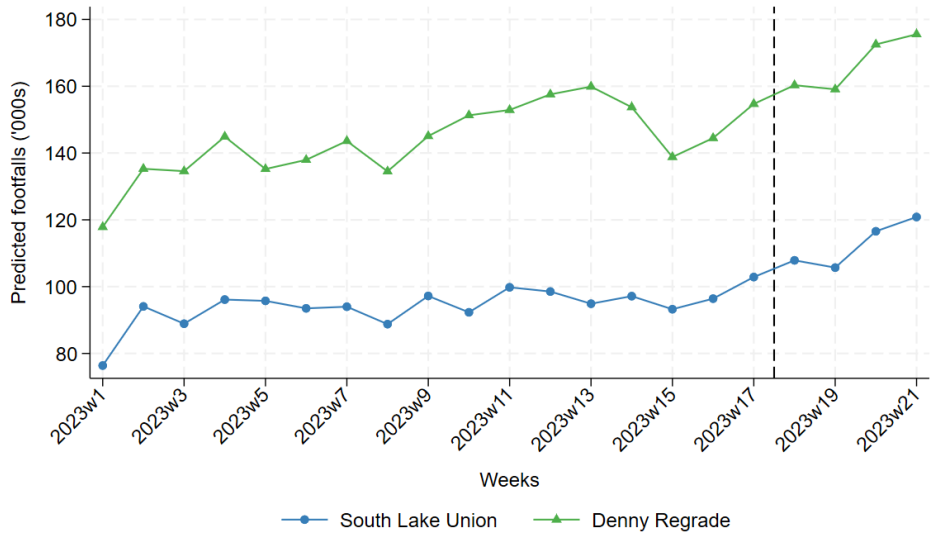
3. Findings

We present our results in four parts. We first consider trends in the weekly data in 2023 and then analyze the impacts compared to previous years (2020-22). We then conduct a difference-in-difference analysis to tease out the causal impact of RTO and finally conclude with suggestive evidence from the transactions data that provides insights into the mechanisms driving the change.

3.1. Weekly patterns in 2023

First, we ask if there is any correlation between RTO and people mobility, as measured by cellphone device activity data.

Figure 1: Workday mobility trends in downtown Seattle in 2023



Note: Workday mobility refers to total estimated foot traffic per week (Monday-Friday). Weeks are referred to by their position in the calendar year. For example, 2023w1 represents the first week of the year 2023, 2023w2 represents the second week, etc. The dashed line is drawn between 2023w17 and 202318 such that weeks to the right of the dash line represents the periods after RTO, while weeks to the left of the line represent periods before RTO. The four data points to the right of the dashed line are 2023w18, 2023w19, 2023w20 and 2023w21. Week 18 of 2023 which fell between Monday, May 1 and Sunday, May 7 and coincided with return to office at Amazon. Source: Mapbox movement, Placer.ai.

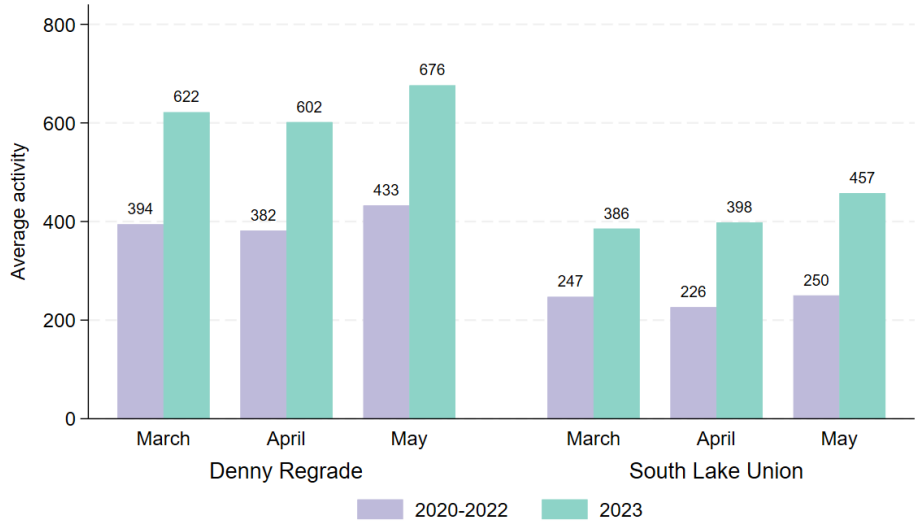
Figure 1 shows the weekly trends in people's movement in two neighborhoods, and we see a steady rise in activity across both Amazon locations. The weeks following return to office (weeks 18-21 i.e., May 1-

28) saw the highest footfalls in 2023. The estimated workday foot traffic was an average of 169k in and around Amazon Spheres and 114k in and around Amazon Dawson, compared to only an average 134k and 90k in January 2023 at the two locations, respectively.[4]

3.2. Comparisons with months from previous years

Next, we ask how have movement patterns changed in the past three years. Below we compare foot traffic in each month in 2023 with the corresponding average traffic in the same month in 2020-22.[5] By comparing mobility data with a reference period, this month-over-month comparison allows us to assess the percentage change that is immune to seasonal variations.[6]

Figure 2: Comparison of mobility patterns in downtown Seattle between respective months of 2020-22 vs 2023



Note: The purple bars represent workday (Monday-Friday) mobility averages for the past three years. For example, March 2020-2022 refers to the average mobility in March 2020, March 2021 and March 2022, while March 2023 refers to the average mobility only in 2023. Source: Mapbox Movement data.

Figure 2 indicates that estimated workday foot traffic in and around Amazon Dawson in South Lake Union was 457k in May 2023 which is an 82% increase compared to the average foot traffic in the months of May in the years 2020, 2021 and 2022. The area in and around Amazon Spheres in Denny

[4] Estimated average workday foot traffic in and around Amazon Dawson was 90k in Jan ’23, 93k in Feb ’23, 96k in Mar ’23, 100k in Apr ’23 and 114k in May ’23. Estimated average workday foot traffic in and around Amazon Spheres was 134k in Jan ’23, 140k in Feb ’23, 155k in Mar ’23, 150k in Apr ’23 and 169k in May ’23.

[5] Since the pandemic had a deleterious impact on local business activity, causing a level shift down in economic activity, any return to pre-pandemic levels is only feasible in the medium/long run. It is for this reason that we consider the pre-pandemic period outside the scope of this study.

[6] For instance, trends in Figure 1 might represent a secular increase in foot traffic due to factors other than RTO, like weather (warmer months are associated with more foot traffic than months with colder temperatures/snowstorms impacting commuting).

Regrade which witnessed an 56% increase from 433k (average of May 2020, May 2021 and May 2022) to 676k in May 2023.[7]

3.3. Difference-in-differences analysis of impact of RTO

The analysis so far has focused on a before vs after comparison, comparing mobility during the workday before RTO with that after RTO. This simple and straightforward analysis has provided useful evidence that there is a positive correlation between RTO and footfalls. In order to estimate causal affects, however, we need to also consider a 'control group', without which it is not possible to attribute the changes in human activity to RTO (there could be other seasonal fluctuations like weather, changes in public transit, or factors like cultural events that might have caused the increase in foot traffic in downtown Seattle).

We can ease these concerns by conducting a difference-in-difference (DiD) analysis by using activity on weekends as the control group. Comparing the average change over time in mobility during the midweek to the average change over time during weekends will give us the causal impact of RTO. The key assumption behind this approach is that trends in foot traffic during the midweek and weekends would be similar in the absence of RTO. It is important to note that the DiD design does not require that absolute levels of activity during weekends and weekends should be the same, but only that the trend over time (before RTO) is similar.

Table 1: Causal Impact of RTO on human movement

	Before-RTO (Mar 20-Apr 23)	After-RTO (May 23)	First difference (After-Before)	Double difference (Midweek-Weekends)
	(1)	(2)	(3)	(4)
Panel A: South Lake Union				
Midweek activity (indexed)	0.28	0.41	0.13	
Activity on weekends (indexed)	0.24	0.23	-0.01	
Difference-in-differences estimate				0.14
DiD estimate (% of control group)				30%
Panel B: Denny Regrade				
Midweek activity (indexed)	0.35	0.45	0.1	
Activity on weekends (indexed)	0.32	0.31	-0.01	
Difference-in-differences estimate				0.11
DiD estimate (% of control group)				17%

[7] The estimated foot traffic in Figure 2 is different from that in Figure 1 because a different aggregation approach changed the derived scaling factor.

Panel C: Both locations				
Midweek activity (indexed)	0.32	0.43	0.11	
Activity on weekends (indexed)	0.28	0.27	-0.01	
Difference-in-differences estimate				0.12
DiD estimate (% of control group)				22%

Note: The table reports average weekly activity in periods before and after RTO, across both the 'intervention group' (i.e., midweek) and 'control group' (i.e., weekends). The first difference estimates reported in column 3 subtract estimates in column 2 from column 1. The double difference estimates i.e., the DiD estimate reported in column 4 subtracts estimates in column 3 for weekend activity from those of midweek activity (also reported in the same column). Source: Mapbox Movement data.

Table 1, column 4 presents results from the DiD exercise; it compares the activity index before vs after RTO during the midweek against that in the weekend. The DiD estimate provides a causal impact of RTO by subtracting the before vs after estimate in the midweek group and the before vs after estimate in the weekend group. The analysis suggests that RTO led to a 30% increase in activity in and around Amazon Dawson (South Lake Union) and a 17% increase in and around Amazon Spheres (Denny Regrade). The results are consistent with the analysis above which also found a larger increase month-over-month in SLU compared to Denny Regrade (see Figure 2).

3.4. Sectoral impacts

Finally, we consider the anonymized credit card transaction data to dive deep into the aggregate patterns that we have observed above. If return to office has had a positive impact on local economic activity, we should see an increase in month-on-month comparisons in restaurants, cafes and food stores.

Table 2: Comparison of percentage change of credit card transactions in downtown Seattle between respective months in 2020-22 vs 2023, by industry (in %)

	Mar 2023 vs May 2020-22	Apr 2023 vs Apr 2020-22	May 2023 vs May 2020-22	Total
	(1)	(2)	(3)	(4)
Panel A: South Lake Union				
Hotels	61%	49%	92%	67%
Bars/Nightclubs	-13%	-29%	-28%	-23%
Cosmetics and Beauty Services	.	.	.	
Restaurants/dining	43%	84%	86%	71%
Grocery and food stores	.	.	.	
Total	30%	34%	50%	38%
Panel B: Denny Regrade				
Hotels	140%	112%	101%	118%
Bars/Nightclubs	.	-32%	-40%	-36%
Cosmetics and Beauty Services	14%	10%	10%	11%

Restaurants/dining	45%	93%	109%	82%
Grocery and food stores	32%	34%	49%	38%
Total	58%	44%	46%	48%

Note: Table 2 presents month-over-month changes in local economic activity as measured by percentage changes in transaction volume, comparing average count of transactions in respective month in 2023 with the average of that month in 2020, 2021 and 2022. Data for May 2023 will be available in mid-June 2023. Column (4) reports the average across columns (1) to (3). Source: Mastercard SpendingPulse data.

Table 2 shows that restaurants and eating places had the highest percentage (71%) increase across all sectors in the South Lake Union neighborhood. In Denny Regrade, the percentage increase in the restaurant category was also similar (82%).[8] Interestingly, we also observe that the accommodations sector is also witnessing an increase, buoyed presumably by demand from business travel. In March 2023 Amazon alone paid for more than 19,000 hotel nights in Seattle for visiting employees, 2.3 times more than the average of March 2020, 2021, and 2022. Overall, the data suggests that month-over-month spending is up in both locations and that this increased foot traffic can help unlock the potential of local businesses, contributing to job retention and creation.

4. Conclusion

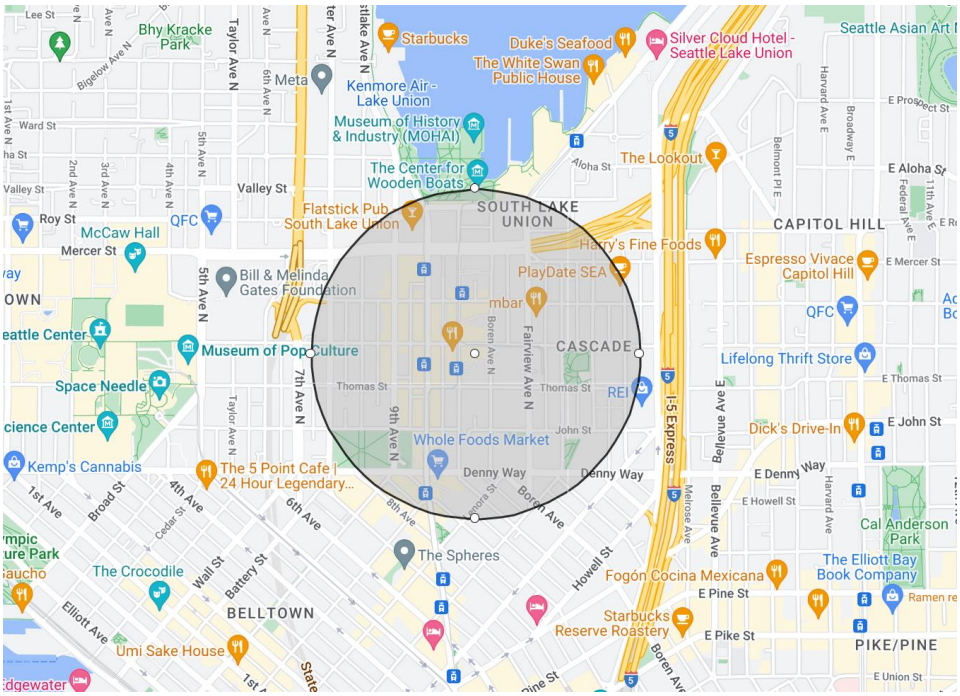
There is preliminary evidence to suggest that return to office has a positive impact on local economic activity and injecting additional vibrancy in downtown areas. We observe that the reopening of offices is spurring increased spending in nearby businesses, providing them a much-needed boost. Key takeaways suggest:

- An 82% increase in foot traffic compared to the average foot traffic in South Lake Union compared to the same period in 2020-2022.
- An 56% increase in foot traffic compared to the average foot traffic in Denny Regrade compared to the same period in 2020-2022.
- South Lake Union saw an average 50% increase in the number of credit card transactions processed following return to office (May 2023 compared to May 2020-22). Most notably, hotel transactions increased by 92% and restaurants/dining increased by 86% month-over-month.
- Denny Regrade saw an average 46% increase in the number of credit card transactions processed following return to office (May 2023 compared to May 2020-22). Most notably, hotel transactions increased by 101% and restaurants/dining increased by 109% month-over-month.

[8] We can also observe that the month-over-month changes (percentage increase in May 2023 compared to May 2020-22) is higher for most segments compared to month-over-month changes in March and April.

Appendix A

Appendix Figure 1: South Lake Union



Appendix Figure 2: Denny Regrade