Consumer Responses to the COVID-19 Pandemic

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Overview

As the COVOD-19 pandemic has spread across the United States, consumers have changed their spending habits dramatically. Initially, the changes began with people canceling inessential travel, limiting attendance at large gatherings, generally limiting social exposure, and moving from purchases in-store to online. Social distancing guidelines in most of the US tightened throughout the month of March, with the issuance of public emergency declarations, and an increasing number of states implementing "stay-at-home" orders closing down non-essential businesses. These changes, and the increasing severity of the crisis, accelerated the changes in consumer behavior, and also led to spikes in certain purchases, particularly at grocery stores. By the end of March and into April, consumer behavior has roughly stabilized, but with vastly different buying patterns and behavior compared to only a few weeks ago.

In this brief I analyze consumption trends nationwide and in Wisconsin, using a new data source of weekly transactions. I find that the recent monthly decline of roughly 9% in national retail sales masks a 10% increase mid-March and a 20% decline by the end of the month. There was a spike in grocery store sales of 80% nationwide and 100% in Wisconsin mid-March, driven as much by a growth in sales-per-transaction as transactions. The consumption decline overall was cushioned by increasing on-line sales, which also reallocated sales. In Wisconsin, total sales were down 15% at the end of March, but in-store sales were down 30%, with online sales up 20%.

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Background and Data

While the general narrative laid out in the opening paragraph above could be pieced together in broad outline from news reports, until now it has been difficult to quantify the changes in consumer behavior. This is because official data on consumption and sales is not released with the speed or at high enough frequency to track such a rapidly-evolving crisis. This has spurred the search for new, high-frequency indicators that can track economy in real-time. In other work, I have analyze a new data source measuring economic activity based on detailed foot traffic patterns at commercial locations.

In this brief, I use weekly transactions data from Earnest Research, which provides a clearer picture on the behavior patterns of American consumers. This data set provides a broad sample of aggregated consumption/transaction data, from a sample of roughly 6 million households (with 25-30 million credit and debit cards) nationwide. The data is weekly, and is released with a 1 week delay, with the latest data for the week ending April 8. A good overview of the recent implications of the data for consumer behavior was recently published in the *New York Times*.

The Earnest Research data is quite comprehensive, and allows for disaggregation in multiple ways. The data set tags individual transactions at recognized brands and merchants, a collection of roughly 2,000 merchants, and then aggregates them into categories and sub-categories. Thus the Earnest data misses local retailers, non-chain restaurants, and others, as well as cash transactions. Nonetheless, as I show below, the aggregate Earnest Research sales match national retail sales data quite well, capturing roughly 80% of the total variation in advance retail sales. The Earnest sales data does especially well in tracking some spending categories, capturing more than 90% of the variation in retail sales on clothing, on groceries, and at department stores.

Furthermore, the Earnest data has multiple levels of disaggregation. The data allow for geographic decomposition (by region, state, CBSA, and city), although with varying degrees of coverage, and so varying accuracy. As noted, it has decomposition by category (apparel, grocers, department stores, etc.) and sub-category (i.e. grocers divided into: discount grocers, meal kits, online grocers, specialty grocers, and supermarkets). Finally, the data has separate metrics (sales, transactions, and sales per transaction), as well as separate purchasing channels (in-store, online, or store card).

The Earnest data thus provides interesting insights which were unavailable elsewhere. For example, the official US retail sales data for March was just released, which showed a sharp reduction of almost 9%, with substantial variation across sectors. But even this sharp drop obscures the substantial changes that occurred over the month, which the Earnest data makes clear. There was relative stability early in the month, a sharp ramp-up in spending leading up to lock-downs and quarantine, and an overall decline later in the month. That is, the 9% overall decline in March masked a 10% increase mid-month and a 20% decline by the end of the month.
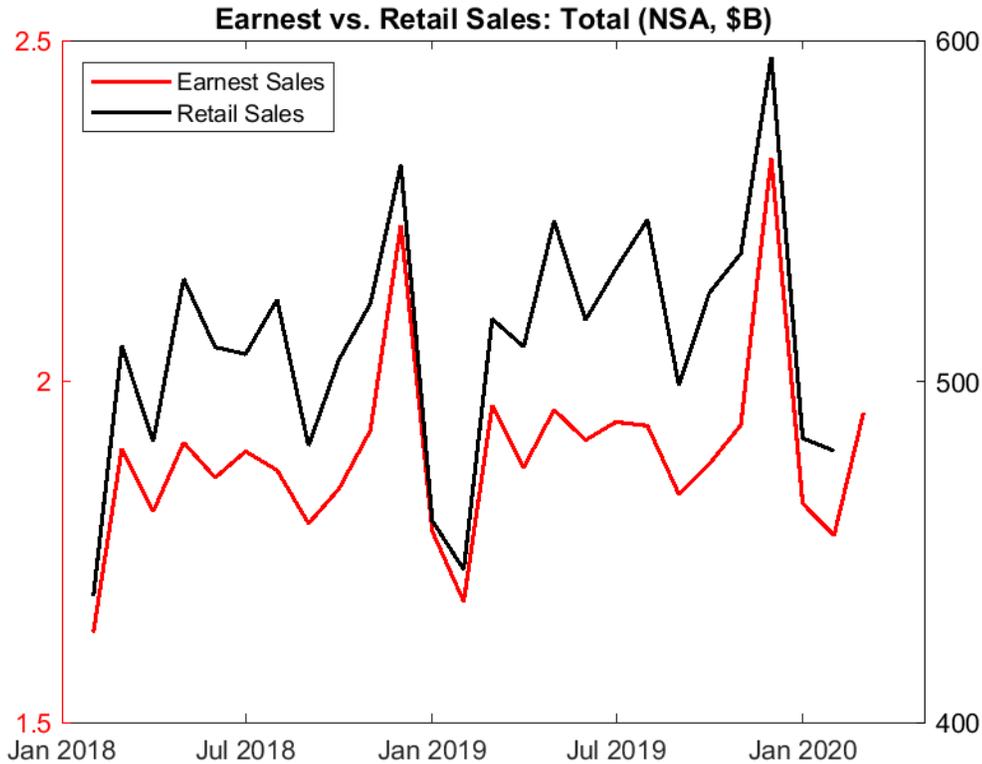
Figure 1: Advance retail sales and total sales from Earnest Research data, monthly totals February 2018 through March 2020.

Further, while the foot traffic data I have used previously also provides useful high frequency information on economic activity, it is best for capturing in-store transactions. Thus it misses on-line and delivery purchases, both of which have increased substantially in recent weeks. In particular, while overall sales fell 20% at the end of March, in-store sales declined by a much larger 30%, with the shift to on-line transactions making up the difference. Moreover, while the foot traffic data does show a big spike in grocery store transactions, sales grew even more. That is, sales-per-transaction increased dramatically starting in the mid-March when consumers began stocking up for the lockdown.

Consumption Trends Nationwide and in Wisconsin

In the rest of the brief, I illustrate the consumption trends in response to the COVID-19 pandemic both nationwide and in Wisconsin, using the Earnest Research data. Overall, the state has followed a very similar pattern to the nation as a whole, with a bit more variation. In general, I find substantial declines in consumption, with weekly sales down roughly 20% year-on-year in the last week of March, with a slight recovery in the first week in April. In addition, there were sharp changes across industry, channel (in-store vs online), and transaction size.

First I analyze how representative the Earnest Research data are by comparing them with the advance monthly retail sales (not seasonally adjusted) from the US Census Bureau. In

Category	Regression Constant	Regression Coefficient	R-Squared
Total Sales	87.36	223.9	0.78
Department Stores	-3.37	202.5	0.92
Clothing	-1.20	299.3	0.94
Grocery Stores	6.83	169.7	0.92

Table 1: Regression results for advance retail sales and selected categories on Earnest Research sales. Monthly sales totals in billions of dollars (NSA), 2/2018-2/2020.

Figure 1, I show the total sales from Earnest Research, aggregated to a monthly frequency, along with the retail sales from February 2018 through March 2020. The Earnest sales total includes all categories except finance, which is their baseline measure of consumer spending. As the figure shows, the two series track each other pretty well, both in the seasonal variation as well as over the longer-term. The Earnest total sales data includes many transactions that are not part of the retail sales measure, such as travel expenditures at hotels and airlines, as well as payments for insurance, cable TV, and mobile phones. Nonetheless, the total sales measure had a stronger correlation with retail sales than a subset of the Earnest data which excluded categories not in retail sales.

Table 1 provides a more quantitative sense of the relation between the Earnest Research data and different categories of retail sales. In particular, the table gives the results of simple regressions of categories of Earnest Research sales on retail sales. We see that, as in Figure 1, Earnest total sales captures most of the variation in total retail sales, with an R-squared of 0.78. If we look at different categories, the relationship is even stronger. There is not a one-for-one mapping between the Earnest and Census categories which would allow for a full comparison. But for department stores, clothing (apparel and accessories), and grocery stores, there is a very close relationship. The Earnest Research sales in those categories account for over 92% of the variation in retail sales. These strong correlations at a monthly frequency give me more confidence in using the Earnest Research data to analyze trends at a weekly frequency.

Figure 2 shows how consumption has changed, both nationally in Wisconsin, through the COVID-19 pandemic. In particular, I show the year-over-year sales growth, both for total sales and select categories, using Earnest Research data through week ending April 8, 2020. Overall, the trends were very similar nationally and in Wisconsin.

The upper left panel shows total sales. Apart from the sharp seasonal fluctuations through the holidays, the early part of 2020 was relatively stable, with growth averaging around 2% from January through mid-March. Sales growth increased over the middle of the month, with a national peak of 11.6% for the week ending March 18. This was the week when the national health emergency was announced and the crisis accelerated. Consumption then fell sharply over the next two weeks, as distancing measures and mandated shutdowns increased, down to -20% for the week ending April 1. There was a
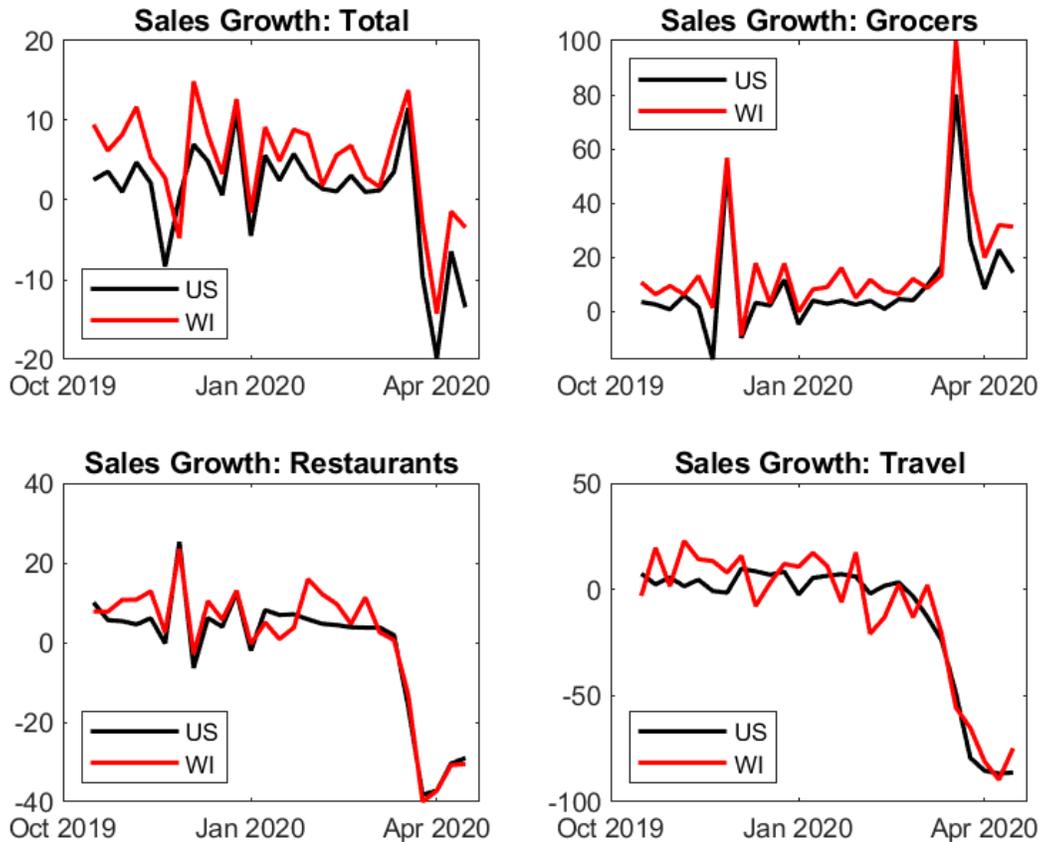
Figure 2: Year-over-year sales growth, total sales and select categories, Earnest Research data through week ending April 15, 2020.

slight recovery in the last two weeks, with national sales down 12.5% from a year ago for the week ending April 15. Wisconsin sales followed national sales closely, with a bit of variation: the mid-month peak was slightly stronger (13.8%) and the decline not as sharp (bottoming out at -14.3%) in the state.

The other three panels show spending in a few categories which were particularly affected by the pandemic: grocery stores, restaurants, and travel (which includes airlines and hotels). Grocery store sales have held up the strongest during crisis, with a sharp spike in sales in mid-March hitting 100% in Wisconsin and 80% nationwide. The peak due to panic buying subsided in the following weeks, but sales still remained well above 2019 levels. Restaurant sales fell sharply from the middle of the month, down around 40% over the last few weeks, as dine-in locations were closed and business shifted fully toward takeout and delivery. The travel sector has been hit especially hard, with sales dropping 80% for the final two weeks. Even though airlines are still operating and many hotels remain open, few people are traveling in the current conditions.
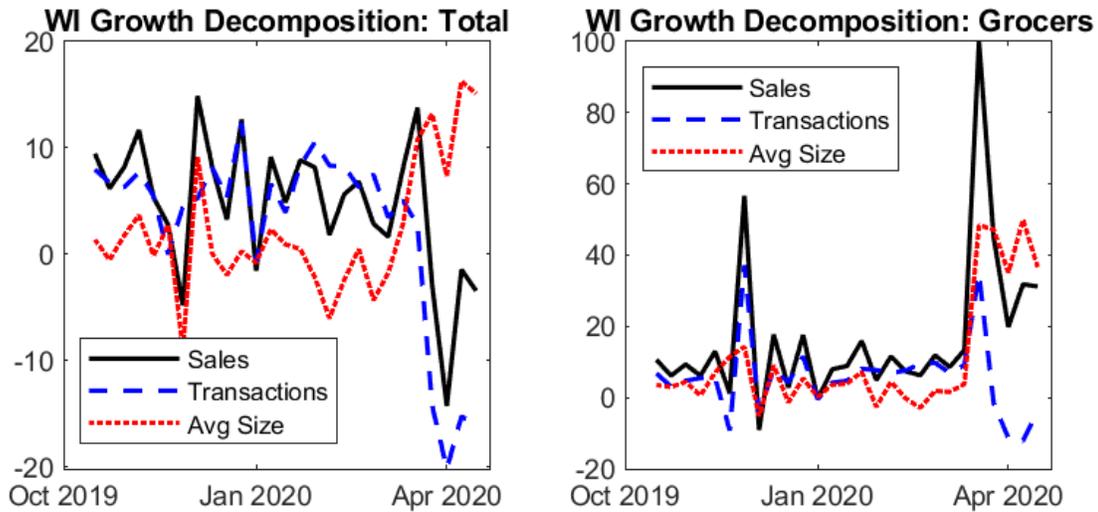
Figure 3: Decomposition of sales growth into growth in transactions and growth in average transaction size. Total sales and sales at grocers in Wisconsin.
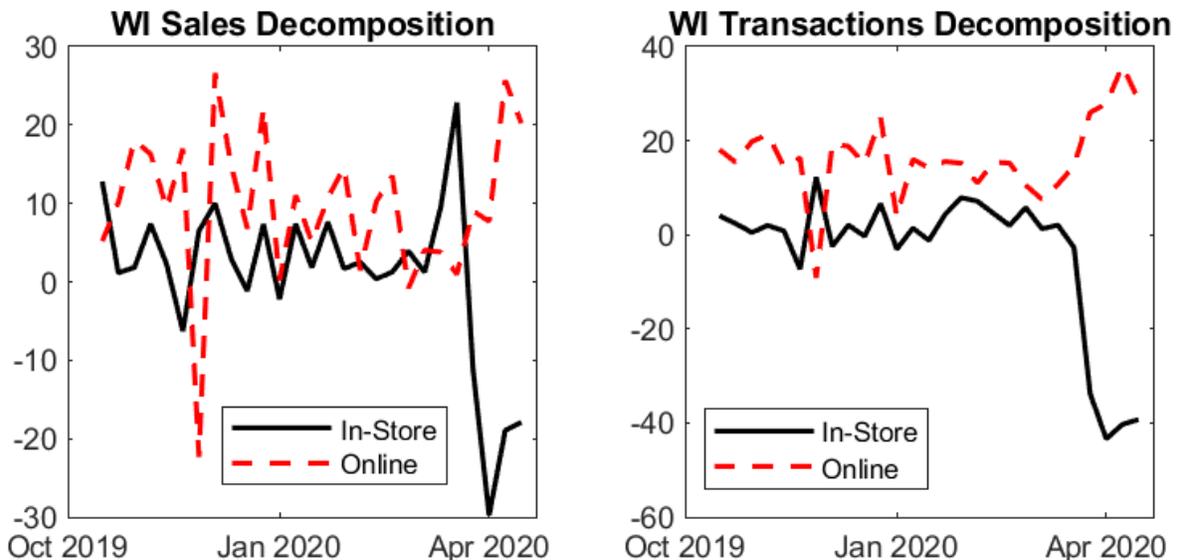

Figure 4: Decomposition of sales (left panel) and transactions (right panel) growth into growth in-store and on-line. Total sales in Wisconsin.

In addition to the changes in types of consumption, the pandemic has changed how individuals have consumed. In particular, as people are leaving home less they are making fewer transactions, but transaction size has increased. This is shown in Figure 3, which looks at sales growth in Wisconsin both overall and at grocery stores. In each case, I show growth in sales, transactions, and average transaction size. The figures clearly show that there has been a much sharper drop in transactions than sales, as the amount of purchases per transaction has grown. This is especially true at grocery stores. While

the spike in sales in mid-March was due to an increase in people going to the store, there was also a nearly 50% increase in average transaction size. In the last couple of weeks transactions have fallen, but sales have remained relatively strong due to the continuing strong year-over-year growth in average transaction size.

In Figure 4, I show how the buying patterns of Wisconsin consumers have shifted toward on-line activity. As the pandemic spread, and then particularly after Governor Evers issued the statewide "Safer at Home" order on March 25 closing non-essential businesses and limiting travel, in-store sales and transactions fell sharply. Total sales were down 15% at the end of March, but in-store sales were down 30% at that point, while online sales ramped up and hit 25% growth over the last two weeks. While online sales played an important role in allowing consumers to cushion the impact of the pandemic shock, they have also diverted sales from local businesses. That is, while statewide businesses have increased their online presence during the crisis, much of the online transactions were through national retailers like Amazon. The right panel of the figure shows that in-store transactions in Wisconsin were down over 40% for the last three weeks, roughly consistent with the measures of activity from foot traffic.