Center for Research On the Wisconsin Economy
University of Wisconsin- Madison

Air Traffic Data as a Proxy for Economic Activity in the Transportation Sector

Simeon Alder

Center for Research on the Wisconsin Economy, UW-Madison

April 8, 2020

Overview

The imposition of numerous social distancing measures in response to the COVID-19 pandemic has curtailed economic activity significantly. The impact, however, varies across industries and one of the challenges at this time is to measure the impact in a timely manner.

One sector that has been affected significantly is air transportation. Measures ranging from outright quarantines to milder "Safer at Home" directives have been associated with a sharp decline in mobility – both internationally and domestically – and the number of airline passengers has fallen sharply in recent weeks.

In this brief we use daily departure information at Wisconsin's three major commercial airports, *General Mitchell International Airport* in Milwaukee, *Dane County Regional Airport* in Madison, and *Green Bay Austin Strobel International Airport* in Green Bay to gauge the decline in activity between the beginning of March and April 6, 2020. We compare these trends to broader national air traffic patterns and some international developments.

We also measure foot traffic at retail outlets at the three Wisconsin airports in order to estimate the decline in the numbers of passengers and hence seat load factors in addition to the somewhat coarser data on flight departures.

In addition to providing individual travel services, the industry also plays an important role in the transportation of goods. While timely data on the movement of cargo is scarce, there is some evidence that airborne freight capacity is in short supply. This is of independent interest since it is likely to affect the shape of the broader economic recovery once the most stringent social distancing measures are lifted. The extent to which domestic and international supply chains can be restored quickly depends, in part, on the availability of adequate transportation capacity. The timely restoration of these supply chains, in turn, is one of admittedly many factors that determines if the recovery is *V* rather than *U*-shaped.

Data Source

We use data provided by *FlightStats.com* for daily flight status information at the three Wisconsin airports. We are mainly interested in the developments since mid-March, which is when the salient social distancing measures were starting to take effect.

We track the daily *departures* from each airport using historical flight status information. In particular, we classify "On Time", "Delayed", and "Diverted" as successful departures. "Cancelled" flights are failed departures. Since mid-March, a growing number of flights has an "Unknown" status. Typically, these are scheduled flights with no push-back (from gate) time or runway ("wheels up") time and no arrival information. We treat them like cancellations and hence as failed departures. In some industry publications, these flights are described as "Removed from Schedule".[1]

In addition, we gather evidence for the broader domestic and international markets from *Cirium*, which is *FlightStats'* UK-based parent company, *OAG*, and the *Transportation Security Administration* (TSA).

The foot-traffic data was provided by *SafeGraph*, which measures foot-traffic patterns at 3.6 million commercial points-of-interest from over 45 million mobile devices in the United States.[2]

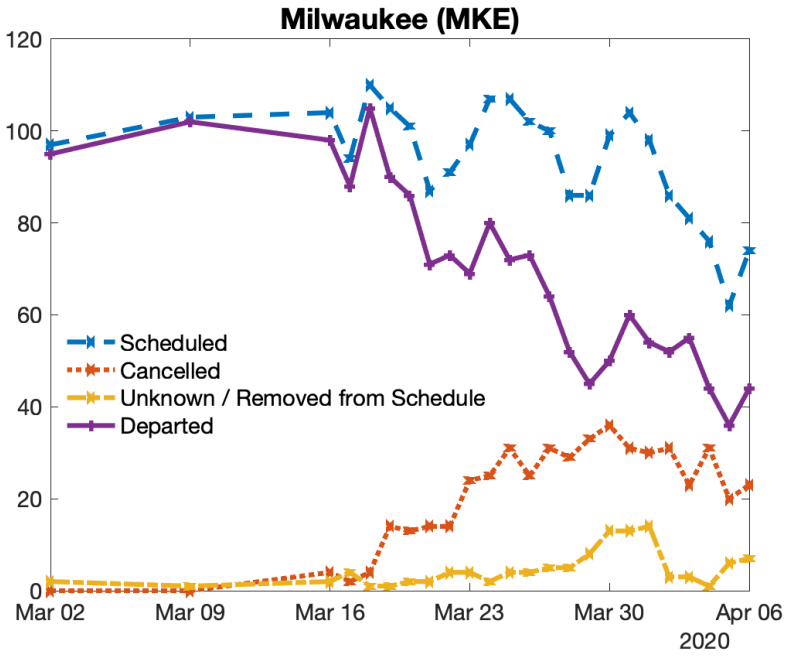
Departures from Wisconsin Airports

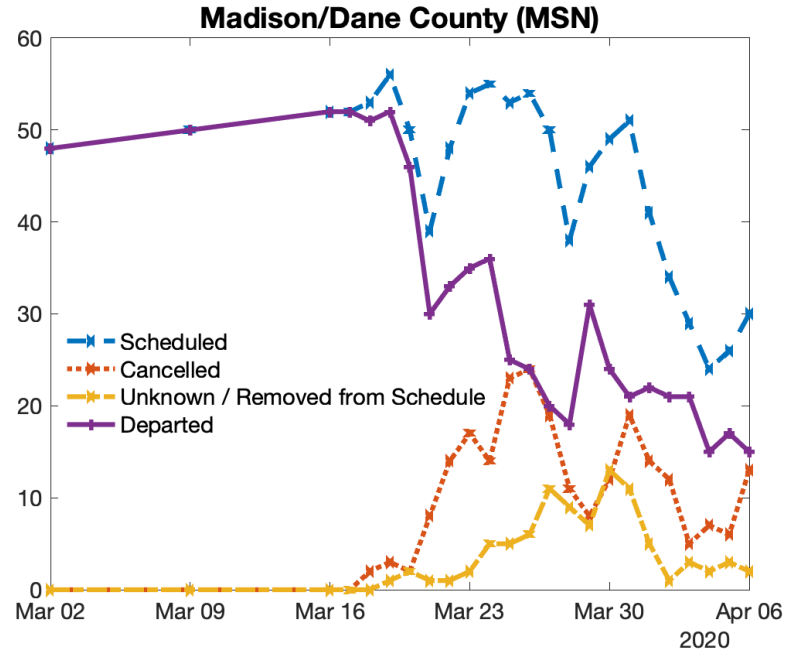
The following plots show the number of daily departures from the Milwaukee, Madison, and Green Bay airports. In early March, we show departures for the first two Mondays. Starting March 16, we're plotting daily departures. The number of cancellations and removals rises sharply in the third week of March. As airlines adjusted their schedules in

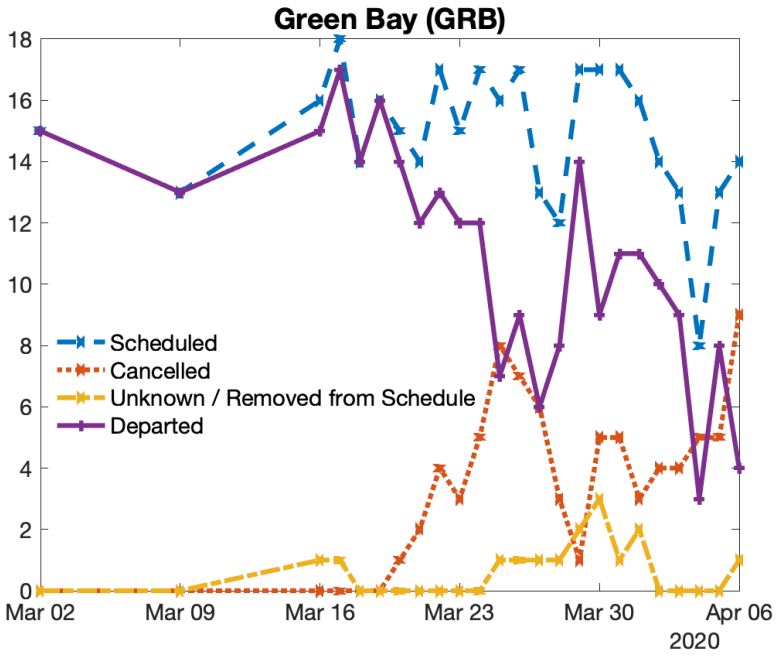
[1] Codeshare flights are collapsed to a single departure and classified as a success or failure.

[2] A more detailed description of SafeGraph's database is available in Noah Williams' April 2, 2020 CROWE data brief, which is available here.

late March and early April, the number of removals gradually diminishes. This effect is somewhat of a technicality related to the fact that records are created 72 hours prior to a flight's scheduled departure. The thinning of schedules implies that fewer flight records are initiated in the first place and hence don't need to be removed over the next 72 hours.







Over the course of the three-week period spanning March 16 to April 6, the number of actual flights (departures) dropped by approximately 55% at the Milwaukee airport, 70% at Dane County Regional, and 73%.[3] Due to the small number of flights, even prior to the pandemic, the data series for Green Bay is rather volatile, but the overall trend is clearly down.

How do these numbers compare to the broader air traffic patterns in the United States, in China, and globally?

As of April 6, the number of all flights with an origin or destination in the United States compared to the same weekday one year earlier declined by 45.2%, according to *OAG*, an air travel data provider.[4] The number of international flights with either a U.S. origin or destination dropped even more.

According to *Cirium*, the impact of the various public health measures in China started to affect domestic air traffic in late January. The daily number of flights dropped from close to 13,000 on January 22 to 1,816 by February 13, an 85% decline over the course of three weeks, approximately. By early March, the numbers recovered to about 5,000 flights per day and have plateaued there since then.

The drop in the number of international flights in and out of China is significantly sharper. Compared to the pre-crisis level of about 2,800 daily flights, the number has dropped by almost 98% to less than one hundred daily flights since April 2.

[3] There are sizeable weekday effects in flight schedules. The Monday-to-Monday comparison from March 16 to April 6, however, is not driven by any of these.

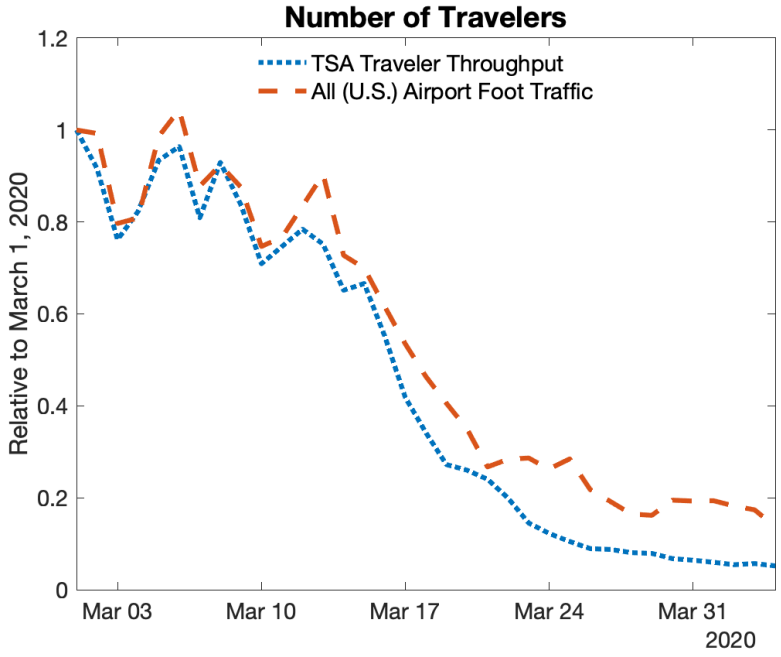
[4] Chart available at https://www.oag.com/coronavirus-airline-schedules-data.

According to *Flightradar24*, the global number of commercial flights dropped from approximately 110,000 per day in January of 2020 to 26,700 on April 5, with a very small recovery in the past two days. The bulk of this 75% drop in the number of flights occurred in the three-week period from March 13 to April 6, 2020. Major European countries and the three aviation hubs Singapore, Hongkong, and the United Arab Emirates (UAE) all saw year-on-year declines of 89% or more.

While large by any standard, the decline in the U.S. is more muted than the broader global market, at least so far. Compared to the national trend, the daily departure counts at the three Wisconsin airports declined more sharply (-55% vs. -45%). It remains to be seen if this is a broader pattern that generally distinguishes peripheral airports from more central hubs or whether Wisconsin stands out even from other peripheral locations.

Passengers vs. Flights

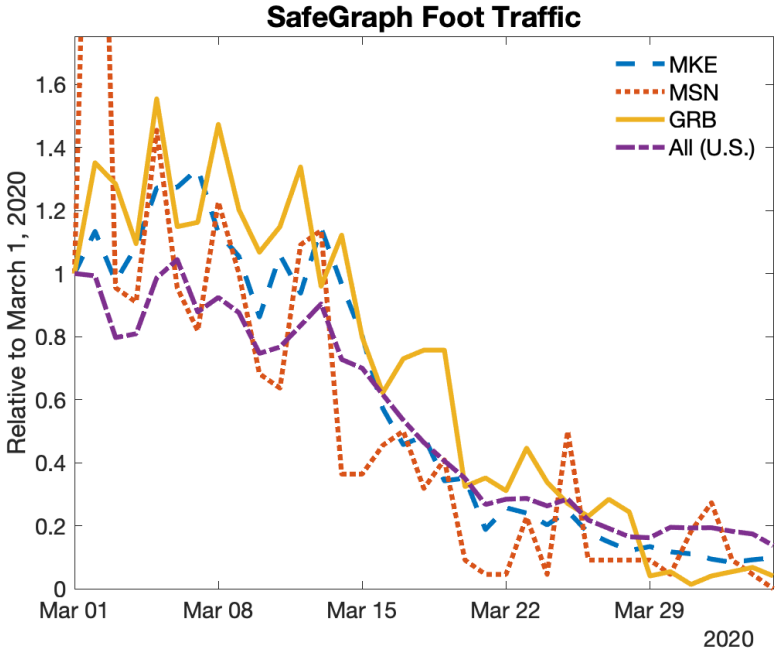
While the year-on-year reduction in completed U.S. flights is about 45%, daily data released by the TSA show a more significant drop in the number of passengers, suggesting a sharp decline in seat load factors (the number of occupied seats relative to the number of available seats or capacity).[5] Put differently, the drop in economic activity may be more dramatic than the change in the number of flights suggests and this appears to be the case nationally, as well as locally in Wisconsin.



Between March 1 and April 6 of this year, the total traveler checkpoint throughput dropped from 2.3 million per day to 97,130, a 95% decline (blue dotted line in the figure

[5] The TSA data is available at https://www.tsa.gov/coronavirus/passenger-throughput.

above), approximately.[6] Although we do not have disaggregated checkpoint numbers for the three Wisconsin airports, the *SafeGraph* data measuring mobile-phone-based foot traffic at these locations suggest a decline in foot traffic of 90% or more between March 1 and April 4 (see figure below).



How accurately does the *SafeGraph* data capture the decline in airline passengers? At this point, we cannot provide a definitive answer. Based on a comparison of *SafeGuard* traffic for all U.S. airports with the TSA traveler throughput over the same time horizon, it appears that the point-of-sale foot traffic underestimates the decline. The orange dashed line "Number of Travelers" figure on the previous page plots a decline of 86% (compared to 95% for the TSA checkpoints). Together, the TSA and *SafeGraph* data suggest that passenger numbers at the Wisconsin airports may have dropped even more than the national decline of 95%.

Given the more "moderate" decline in the number of completed flights, both nationally and in Wisconsin, this implies a sharp drop in seat load factors.

This drop in air travel is, not surprisingly, noticeable in airfares. There is no sign of weakening fares in the February 2020 Consumer Price Index (available here) since this predates the introduction of social distancing measures in the U.S. There is, however, anecdotal evidence for significant fare reductions. Travel sites such as Google Flights list transcontinental non-stop fares for as low as $14 (Baltimore to Los Angeles) or $19 (Fort Lauderdale to Los Angeles).

One reason for CROWE's focus on aviation is the availability of (almost) real-time data. During an exceptionally fluid economic downturn, this allows the center to track

[6] The year-on-year decline for April 4 is 94%.

developments in a timely manner. While the flight and passenger numbers are of independent interest, the Center also believes that they point to a significant economic downturn in related sectors such as lodging, ground transportation, or hospitality, for which real-time data is much harder to come by.

In addition to personal travel, aviation plays a critical role in the transportation of goods. It is worth highlighting that in some respects, the challenges in air freight are quite distinct from passenger traffic.

Passengers vs. Freight

The collapse in passenger service triggered a contraction in freight capacity since a large fraction of cargo is transported in the cargo bays of regular commercial aircraft. Freight forwarders have reported price increases of 200% to 300% on trans-Pacific routes and even higher for trans-Atlantic shipments.[7] These price hikes stand in sharp contrast to the drop in passenger fares.

Some airlines are responding with the introduction of cargo-only flights. American Airlines, for instance, recently flew its first cargo-only flights since 1984, on the Dallas-Frankfurt route. Southwest Airlines announced the introduction of cargo-only charter flights. While this may ease some of the capacity constraints, airlines are not yet converting passenger planes to cargo planes. Rather, they are using the cargo decks of passenger planes to operate cargo-only flights.

Due to the scarcity of recent or real-time time data on the amount of cargo flown in cargo-only and mixed cargo/passenger flights, it is difficult to quantify the extent to which supply chains are being disrupted and how quickly they can be restored once the stringent social distancing measures are lifted. Moreover, it is far from clear if Wisconsin's economy is more or less affected by these disruptions than the nation as a whole.

Arguably, the resilience of supply chains – be they local, domestic, or international – to a disruption of this magnitude is an important (but certainly not the only) ingredient in determining the speed of the economic recovery. It is hard to imagine a *V*-shaped economic trajectory without some degree of normalization in the transportation sector, including but not limited to air transportation. The situation remains exceptionally fluid and the Center will continue to monitor the transportation sector in the coming weeks.

[7] WSJ, March 20, 2020, "Passenger Airlines Start Shifting Idles Planes Into Freight Business" available at https://www.wsj.com/articles/passenger-airlines-start-shifting-idled-planes-into-freight-business-1158473779 and WSJ, March 12, 2020, "U.S. Travel Ban Is Expected to Snarl Trans-Atlantic Airfreight" at https://www.wsj.com/articles/u-s-travel-ban-is-expected-to-snarl-trans-atlantic-airfreight-11584040963.