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## Looking forward while being pushed back: How accurate were economic forecasts for Maine during the pandemic?

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## Looking forward while being pushed back: How accurate were economic forecasts for Maine during the pandemic?

### Cover Page Footnote

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# Looking Forward While Being Pushed Back:

## How Accurate Were Economic Forecasts for Maine during the Pandemic?

by Andrew Crawley and Angela Hallowell

### Abstract

Economic forecasting is a challenging process, and how we understand the future often relies on what we have seen in the past. As COVID-19 case numbers began to increase, economies were forced to shutter and stay-at-home orders were implemented. Here, we compare our initial forecasts for output, employment, and tax revenue to actual values for 2020. Overall Maine's economy was more resilient than our forecasts first predicted, with tax revenues far exceeding the initial projections. However, when the numbers are explored further, it becomes clear that federal funds were a critical lifeline during turbulent times, and without this support, the damage to Maine would have been far more severe.

months before traditional measures such as gross domestic product (GDP) or employment are available (Fiske et al. [1991](#)). Indicators such as monthly employment weren't available for two months after the initial shock; meanwhile, other indicators like GDP and personal income for the second quarter weren't released until July and September, respectively. At the time of writing in May 2021, we still await official data about other indicators such as poverty rates, household income, or migration.

### INTRODUCTION

The rapid global spread of COVID-19 plunged nations into uncharted economic territory. As case numbers rose, people's behaviors changed, and governments issued stay-at-home orders. Never in modern economic history had nations been forced to shut down swaths of their economies, resulting in dramatic unemployment and structural changes to industries. Even more remarkable was the pace at which this occurred, with major shocks being felt over a six-week period. As it became clear that the pandemic was creating significant economic challenges, there was a greater need to forecast how long these effects would last and what the long-term impacts of shut downs would be.

Economic forecasting is challenging at the best of times, but attempting to forecast dynamic, fast-moving activity with incomplete information presents unprecedented issues. Economic forecasting is unique compared to other forms of forecasting in the sense that forecasters are forced to show their hand in almost real-time as they generate their forecasts. The product of these forecasts are usually observable against reality within a short time frame, thus any mistakes are evident almost immediately (Elliott and Timmermann [2008](#)). Economic forecasting is highly constrained by data availability, and it usually takes

Furthermore, when official data were released, they were subject to significant revisions as social distancing measures affected survey response rates and led to the misclassification of workers, and therefore increased error margins.<sup>1</sup> Faced with all these challenges, economists turned to novel real-time data such as cell phone information on people's travel-to-work patterns and Google search trends on whether people were researching filing for unemployment (see, for example, the work of Brough et al. [2020](#); Larson and Sinclair [2021](#)).

This paper presents original forecasts made using these novel data during April and May of 2020 for GDP, unemployment, and tax revenue for Maine. Throughout March 2020, information regarding the pandemic was changing daily. In Maine, the first COVID-19 case was reported on March 12, 2020. Although the governor's Stay Healthy at Home Executive Order did not take effect until three weeks later, on April 2, 2020, Maine's response time line shows that new precautionary measures took effect every day through the end of March.<sup>2</sup> Since then, the pandemic has played out in ways both expected and unexpected; the duration of the pandemic and social-distancing measures, the severity of illness, federal and state fiscal policy, vaccination rollouts, and even the weather have affected

economic outcomes in the past 18 months. In this paper, we reflect on our early forecasts and compare them to actual outcomes. In addition, we evaluate the forces that contributed to unexpected outcomes and present lessons learned about public policy during the pandemic.

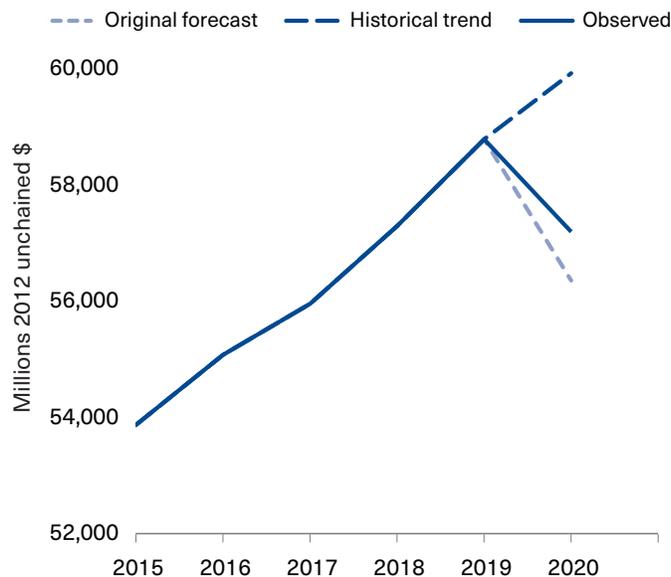
## OUTPUT

A nation's output is usually one of the first barometers people use to assess how well it performs economically. GDP provides a snapshot of monetary or market value of all finished goods and services produced within a country's borders in a specific time period (Sutton et al. 2007). During the start of the pandemic, GDP was expected to collapse; the bigger challenge was to estimate when it would recover. No modern economy had previously seen such a *hard stop* occur, thus we had no prior comparison to use as a model for forecasting its impact. While policymakers and academics alike faced this paucity of data, a team at Harvard and Brown Universities proposed one immediate solution: the Opportunity Insights Economic Tracker (Chetty et al. 2020), which provides real-time open-source information.

The tracker is built using anonymized data from private companies, such as credit card processors and payroll firms, from which they construct statistics on consumer spending, employment rates, and other indicators by county, industry, and (precrisis) income level. We used a two-stage procedure to convert the data from this tracker to a usable form. First, real-time trends were linked to individual sectors, which allowed us to obtain perspective on the likely direction and magnitude of sector changes. We then used up-to-date information on sectoral changes (as of May 2020) to proportion how long these effects were likely to last, based on COVID-19 case numbers and transmission rates. Once we had formulated these inputs, we used the IMPLAN model to estimate the effect of these scenarios on total output.

IMPLAN is the acronym for "IMPact analysis for PLANing," a well-established and widely used economic model that uses input-output analyses and accounts for over 500 industries to estimate regional and industry-specific economic impacts (for more details about this model see Crawley and Welch 2017). Figure 1 displays the forecast along with the historic growth trend (representing

FIGURE 1: GDP Output Forecast



growth had there been no pandemic) along with the actual real GDP recorded for Maine 2020.

First, it must be noted the significant effect the COVID-19 pandemic had on output for the state of Maine. If the pandemic had not occurred, the economy would be significantly bigger than it is now. Real chained-dollar GDP was just over \$56 billion in 2020, marginally above the original forecast of \$55 billion made in May 2020. This reflects a relatively successful forecast and shows how output can be understood by looking at individual sectors' real-time performance. A bigger question remains in how long it will take for the economy to return to its previous growth path, which is more complex to answer.

COVID-19 has fundamentally changed how certain sectors such as hospitality and business services operate, the latter now contending with remote working and the former with social distancing and consumer behavior changes. Some initial evidence suggests changes are here to stay. Barrero et al. (2021), after conducting a survey of more than 30,000 Americans, found that 30 percent of workers would be working at home in some shape or form postpandemic. Spencer and Ashburn (2021) found an average decrease in rental income by more than 12 percent from Q1 to Q4 of 2020. The decrease suggests that many companies might be closing brick-and-mortar locations. Finally, there is anecdotal evidence that food and delivery

services will continue to thrive as consumer behavior has permanently changed.<sup>3</sup> Academic work by Crawley (2014) prior to the pandemic found the commute times affected workers utility; this fact, coupled with structural economic changes, presents a new economic reality that the state of Maine will have to deal with in the future.

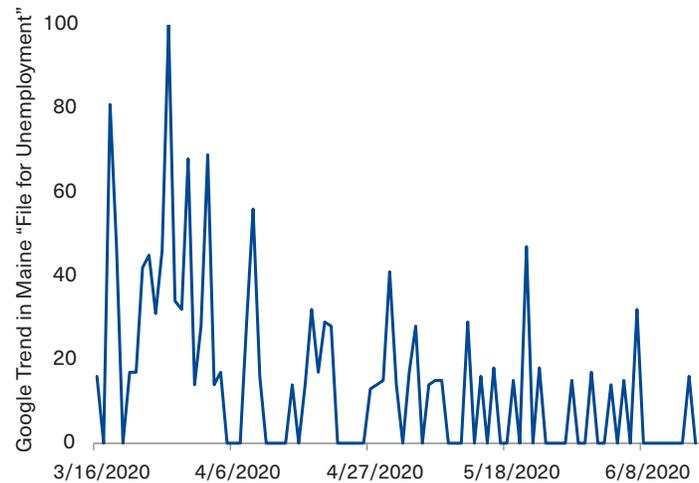
## UNEMPLOYMENT/EMPLOYMENT

Among the most immediate economic impacts felt from the pandemic was a rise in unemployment. As many businesses were forced to close, workers were laid off or furloughed for an unknown period of time. In the week ending March 21, 2020, the first week that COVID-19 significantly affected unemployment, over 21,000 Mainers filed initial claims for unemployment assistance. To put this number in context, prior to COVID-19, Maine's worst week for unemployment insurance claims was in the second week of July 1991, when over 11,000 individuals filed initial claims. By the end of April 2020, over 12 percent of eligible workers in Maine were withdrawing unemployment benefits, the most in the state's history (although that would eventually climb to over 27 percent by the end of May 2020).

The rapidity with which COVID-19 led to record-breaking unemployment cannot be overexaggerated. Our early forecasts carried the assumption that the public health situation, including social-distancing measures, would be the primary driver of labor market outcomes. As with GDP, official unemployment data are highly lagged. However, initial unemployment insurance claims data, an administrative data source, are available with only a one-week lag. In addition to these data, we also used a more novel metric to capture the developing unemployment situation: Google Trends data similar to the work of Goldsmith-Pinkham and Sojourner (2020). Figure 2 depicts the trends for the search term "file for unemployment" in Maine over the period February 2020 to June 2020.

These real-time data were incredibly useful to obtain the pulse of the labor market during this period. Using these real-time data and following the work of Gascon (2020), we used occupational employment statistics (OES) to estimate the number of workers who were at risk of unemployment. We categorized workers in three ways: (1)

FIGURE 2: Google Trends "File for Unemployment"

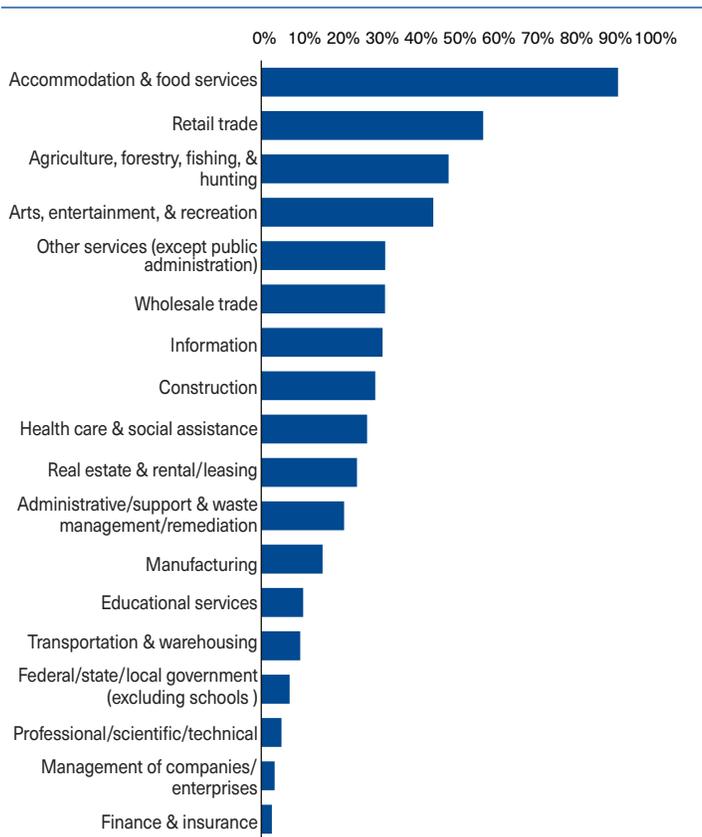


essential workers, (2) workers likely able to work from home, and (3) high-risk workers, typically those with high contact and little ability to work from home. Our ability to categorize these workers depended on our understanding of public health measures and regulations targeted towards social distancing, and in many cases assumptions were based on anecdotes. We found that approximately 31 percent of Maine's workforce was at risk of becoming unemployed due to the COVID-19 pandemic. Figure 3 breaks down this estimated loss of employment by industry. Depending on the rate at which high-risk workers became unemployed, this would translate to a state unemployment rate of between 14 percent and 30 percent during Q2 of 2020. These estimates also predicted that the impacts would be highly disproportionate across industries and wage levels.

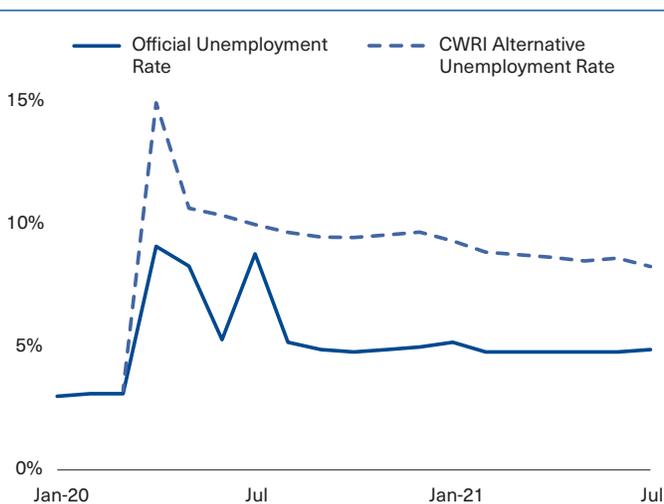
The analysis highlighted that the losses would be greatest in hospitality; retail; agriculture; and arts, entertainment, and recreation, where between 44 percent and 92 percent of workers were at risk of unemployment. Additionally, under this framework, we were able to estimate that nearly 80 percent of at-risk workers had annual salaries under \$40,000, and nearly half of at-risk workers had annual salaries between \$25,000 and \$30,000. Figure 4 displays the official and adjusted unemployment rate for Maine over the course of the last year.

Early in the pandemic, when uncertainty was high and data were scarce, misclassification of those who were unemployed was common.<sup>4</sup> To this end, the Maine

**FIGURE 3: Estimated Loss of Employment by Industry**



**FIGURE 4: Unemployment Rates for Maine**



Department of Labor estimated an unemployment rate holding the labor force participation rate constant. The result was a much higher figure with unemployment topping out at 14.2 percent in April 2020 but then steadily falling.

This was a difficult forecast given the paucity of data available at the time and the uncertainty around vaccination and stay-at-home orders. However, the adjusted rate was inside the margin of error of our original forecast. What fueled our initial forecast for unemployment was the occupational mix within the state. During March 2020 and April 2020, worst-case assumptions about which businesses and occupations would be stable during the pandemic led to a more severe estimation than what we actually saw. While our unemployment forecast was realistic in the first months of the pandemic, it was an overestimate for the summer and fall.

One of the other core drivers of this estimation was the assumption that high unemployment would lead to low expenditures. However, after the Paycheck Protection Program (PPP) provided firms with funds to maintain wages for furloughed workers, enhanced unemployment programs such as Pandemic Unemployment Assistance (PUA) and Federal Pandemic Unemployment Compensation (FPUC) supported those who lost jobs. With these streams of federal aid, consumption remained fairly high, and the economy continued to operate even as the pressures of the pandemic took hold.

### STATE REVENUE

The final measure forecast was Maine’s tax revenue, something that is traditionally highly vulnerable to recessions. Historically during periods of economic decline, the demand for durable goods drops, individuals lose income, and corporations report less profit. For example, in the fiscal year ending June 30, 2009, during the last major US downturn, Maine’s general fund revenues were down 9.0 percent, or \$276 million compared to the previous year, with over \$200 million of that loss attributed to individual income tax.<sup>5</sup>

However, the pandemic was not an ordinary economic recession. The economy came to almost a complete standstill as the result of public health

concerns, shutdowns, and social-distancing measures. Each of these factors alone could curtail output in the short run. To complicate the situation, none of these factors was economic in nature, which made their effect on consumption difficult to gauge. Primarily, the forecast was driven by the assumption of a major decline in income tax revenue due to historic losses of employment. We also expected significant reductions in consumer spending, leading to losses in sales tax revenue. To estimate these losses, we again turned to the IMPLAN model previously described and averaged the most significant assumption of job loss across all the risky occupations. This translated to a forecast of a 40 percent fall in employment across the risky occupations.

Using occupational employment and wage estimates by industry, we were able to calculate the fall in employee compensation (wages and earnings) at the industry level. We created a nonadjusted and an adjusted wage loss, with the adjusted value offsetting sectoral wage loss by the total anticipated unemployment benefit per sector. This allowed wage-related revenue loss to be dampened as it was replaced by unemployment benefits, which are traditionally taxable. Table 1 gives a detailed breakdown of the forecast. Using the method outlined earlier, we projected colossal impacts to total tax revenues. Total tax revenues were projected to fall by approximately \$358 million in the calendar year 2020 after being adjusted for taxable unemployment benefits. Consumption was forecast to decline by 28 percent.

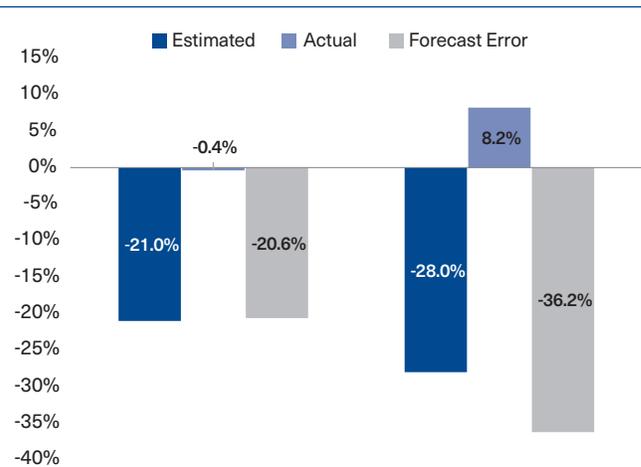
This proved to be the most complex forecast that we undertook, and our projections were significantly different from the actual values Maine saw as indicated in Figure 5. Why the forecasts were so far out has major lessons for the state both in terms of forecasting and also from a policy perspective. The known year-on-year (yoy) changes between the fiscal year 2020 and the fiscal year through to April 2021 show a decline in income tax revenue of -0.4 percent, thus a forecast error of over 20 percent. This large discrepancy can be partly explained as a result of expanded unemployment benefits such as FPUC, PUA, and the Pandemic Emergency Unemployment Compensation (PEUC). All of these programs expanded and significantly broadened the eligibility and amount of unemployment accessible to workers.

According to Federal Funds Information for States (FFIS) tracking for state funding for COVID-19 as of

TABLE 1: Revenue Forecast

Category	Forecast
Total jobs lost	65,728
Direct and induced consumption lost	28%
Wage loss	
Not adjusted	(\$2,212,334,117)
Adjusted	(\$1,060,135,103)
Income tax loss	21%
Not adjusted	(\$772,719,079)
Adjusted	(\$358,386,884)

FIGURE 5: Comparison of Tax Estimates



January 13, 2021, Mainers received over \$1 billion in the extra \$600 payment (FPUC) alone. Between PUA and PEUC, Mainers received \$255 million.<sup>6</sup> These funds are astoundingly high, and this level of transfer benefit (federal to state) has never been seen in modern times even during the great recession of 2008–2009. This influx of money also partly explains the differential in the sales tax forecast, originally projected to fall 28 percent, it actually rose 8.2 percent, a forecast error of over 36 percent. The significantly larger expanded unemployment insurance dampened the blow to both individual income tax revenues and consumption, especially when coupled with Economic Impact Payments from the CARES Act in 2020. The CARES Act (March 2020) provided a one-time, direct cash payment of up to \$1,200 per person, plus \$500 per child for individuals earning less than \$99,000 (or \$198,000 for joint filers).

The Consolidated Appropriations Act (December 2020) provided direct payments of \$600 per person, including for dependents ages 16 and younger. Finally, the American Rescue Plan (March 2021) provided direct cash payments of up to \$1,400 for individuals.<sup>7</sup> The majority of these payments were income-dependent, but almost 96 percent of Mainers were eligible for these funds.<sup>8</sup> All of these direct payments undoubtedly allowed income to remain higher than originally estimated due to workers being furloughed and paid rather than laid off. Job losses were also concentrated in the lowest-wage occupations, with the hardest-hit sector being leisure and hospitality, down 26 percent in 2020.

Finally, and more fundamentally going forward, social-distancing measures and restrictions alone did not cause consumers to stop spending. The work of Gabe and Crawley (2021) found empirical evidence that consumers altered their behavior far earlier than any formal restrictions were in place. E-commerce sales exploded as consumers flocked to make purchases online and traditional brick-and-mortar businesses altered their way of working, switching to more remote activities (Chaudhary 2020). There is also emerging evidence that even as the pandemic eases, consumer behavior as well as business practices will not return to business as usual (see for example the work of Barnes [2020]). In the case of Maine, this change presents challenges and opportunities for the economy going forward.

### IMPLICATIONS FOR POLICY

This paper has provided a review of forecasts generated right at the start of the pandemic from March to May of 2020. They were made at a time of significant uncertainty and a dynamic changing environment, two things that have large impacts on forecasting accuracy. However, two of the three forecasts were fairly accurate, with both output and unemployment being within the margin of error in the short term. These indicators are good predictors as to the overall direction of an economy, and our ability to accurately forecast these even during a pandemic is beneficial. Our use of novel real-time data helped generate this forecast, so we would recommend its continued use in the future. In terms of the actual observed values for output and unemployment, both are still well below/above their historic growth path. This is a point of concern, and one

that policymakers should be aware of. Additionally, the labor market, although recovering, is still not operating as efficiently as it once was; Maine was already struggling to fill job vacancies prior to the pandemic, and it will continue to be a challenge for the state.

Although our first two forecasts were relatively successful, revenue was a different matter, and our projections were significantly wide of the mark. The biggest contributing factor to this forecast's errors was the major stimulus given by the federal government. Our forecasts could be looked upon as an a priori of what would have occurred if these funds had not been made available, and with that in mind, the importance of the funds cannot be underestimated. Maine's economy was able to weather the worst of the short-term pandemic effects by maintaining solid consumption growth and unemployment assistance. But as these programs end, it is imperative that additional support is available to ensure the long-term health of Maine's economy. Acknowledging changing consumer behavior and business practices, the state must be ready to support the development of new digital infrastructure as well as training the new workforce.

### ACKNOWLEDGMENTS

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### NOTES

- 1 For more details about the impact of COVID-19 on error margins in labor market data, visit <https://www.bls.gov/covid19/effects-of-covid-19-pandemic-and-response-on-the-employment-situation-news-release.htm#summaries>.
- 2 For more detail, please refer to <https://www.maine.gov/covid19/timeline>.
- 3 <https://fortune.com/2021/04/20/restaurants-food-delivery-apps-fees-commission-doordash-uber-eats-grubhub/>
- 4 <https://www.brookings.edu/blog/up-front/2020/06/30/who-are-the-potentially-misclassified-in-the-employment-report/>
- 5 <https://www.maine.gov/osc/sites/maine.gov.osc/files/inline-files/2009%2006%20Report.pdf>
- 6 The complete report may be accessed here: <https://ffis.org/SPR/39/10>.
- 7 For more details, please refer to <https://www.usa.gov/covid-stimulus-checks>.
- 8 <https://www.usatoday.com/story/money/2020/04/28/how-many-people-will-get-1200-in-every-state/111604090/>

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