

Canadian job postings in digital sectors during COVID-19

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Summary

The COVID-19 pandemic and the containment measures put in place in response have greatly challenged the labour market. More than 3 million Canadians lost their jobs during the first lockdown in March and April 2020. The months that followed then saw almost 2.5 million jobs added, until the second wave of the virus began in December (Statistics Canada 2021a). Smaller but still substantial swings in employment levels accompanied the subsequent rounds of lockdowns and reopenings during the second and third waves. The aggregate numbers of job gains and losses mask considerable disparities across sectors: while mass layoffs at hotels, restaurants and airlines dominated news headlines for quite some time, hiring by big tech companies and supermarket chains was repeatedly reported (see, e.g., Zadikian 2020).

One feature of the current crisis is that the continuity of economic activity has been deeply intertwined with the development and use of digital technologies. These technologies help maintain activity while allowing people to follow physical distancing measures to reduce the spread of the virus. In this note, we document how firms' recruitment needs in sectors linked to the production of new technologies have differed from those of firms in other sectors during the pandemic.

To this end, we use near-real-time data from Indeed on job postings by employment sector. Our findings suggest that in sectors linked to the production of digital technology (such as software, hardware and information technology support) recruiting efforts intensified as COVID-19 spread. At the same time, the number of job postings in other sectors decreased. Interestingly, job postings in sectors where digital technologies are becoming more widely used (e.g., the education sector with e-learning or the retail sector with e-commerce) have dropped substantially, which hints at the possibility of technology replacing workers.

Traditional sources of employment data at the industry level—such as the Survey of Employment, Payrolls and Hours (SEPH)—show similar patterns that support our results (Statistics Canada 2021b). Furthermore, according to data from the Job Vacancy and Wage Survey (Statistics Canada 2021c), such patterns are not likely the result of an increase in the proportion of vacancies posted online (versus posted elsewhere) in sectors related to technology production.

While it is still too early to make any long-term projections, the potential for job gains in sectors related to the production of digital technologies appears to exist. We may be seeing only the tip of the iceberg and should further explore labour reallocation and accelerated technological advances as they relate to the pandemic. The ability of the workforce to adapt remains to be seen.

Firms' employment needs during the COVID-19 pandemic

We use data from Indeed on volumes of job postings to analyze how the composition of vacancies is changing. Indeed is the largest online job site in the world, with approximately 250 million unique visitors

each month.¹ TalentNest (2020) reports that Indeed was the top source for job hires in Canada in 2019. Indeed collects data on job postings made either on its website directly or on other firms' websites. The job posting data are filtered to avoid duplication.

Indeed provides data on job postings in Canada categorized into 57 sectors through a proprietary mapping system.² Data are daily with weekly updates and a one-week lag, giving us the opportunity to analyze the labour market in near real time.

This note analyzes the period from January 1, 2020 to May 27, 2021. We have information on the total volume of job postings active on the Indeed website each day, regardless of when they were posted. It is worth noting that job postings can remain on the website for up to 30 days; firms can then renew the posting if the job is still vacant. Some companies also take postings down if the job is filled before the posting expires.³

Using data from the Labour Force Survey (Statistics Canada 2021a) and the Job Vacancy and Wage Survey (Statistics Canada 2021c), we find total job postings co-move with total employment (see Chart A-2 and Chart A-3 in the Appendix).

Defining digital categories

For this note, we use the working definitions established by Statistics Canada in its efforts to measure digital economic activity (Statistics Canada 2019).⁴ We follow Statistics Canada's approach and construct three categories of digital sectors related to the production of digital technologies and the potential use of these technologies:⁵

- digitally enabled infrastructure—the production of digital technology goods, such as hardware, software and supporting services
- digitally ordered transactions (e-commerce)—the provision of retail and grocery products and other services that are typically sold online

¹ This is according to calculations by Indeed using Comscore and Google Analytics data. For more information, see the [Indeed website](#).

² Indeed defines and uses the following sectors in its [Hiring Lab](#) analysis: accounting; administrative assistance; agriculture and forestry; architecture; arts and entertainment; aviation; banking and finance; business operations; chemical engineering; child care; civil engineering; cleaning and sanitation; community and social service; construction; creative activities; customer service; dental; driving; education and instruction; electrical engineering; food preparation and service; health care; hospitality and tourism; human resources; industrial engineering; information design and documentation; installation and maintenance; insurance; information technology operations and helpdesk; legal; loading and stocking; logistic support; management; marketing; mathematics; mechanical engineering; media and communications; medical information; medical technician; military; mining; nursing; personal care and home health; pharmacy, physicians and surgeons; production and manufacturing; project management; real estate; retail; sales; scientific research and development; security and public safety; social science; software development; sports; therapy; and veterinary.

³ **Chart A-1** in the Appendix shows that the evolution of total job postings follows that of new job postings (i.e., the number of jobs posted each day).

⁴ These definitions are in line with international standards. Statistics Canada classifies products in the Canadian Supply and Use Tables within the national accounts to obtain a measure of output and jobs associated with these activities.

⁵ Due to limitations in information about specific transactions, Statistics Canada classifies products as fully, partially or not related to the digital economy. We include sectors associated with products fully and partially related to the digital economy in each group.

- digitally delivered products—the provision of goods and services that can be consumed online, such as online advertising or education

Using these three definitions, we then group the sectors listed in the data from Indeed. Any sectors that do not fit into any of the three digital categories are considered non-digital. The category of digitally enabled infrastructure comprises sectors that are linked to the production of digital technologies. The categories of digitally ordered transactions and digitally delivered products both include sectors that can potentially use digital technologies; however, we cannot distinguish whether the jobs in these categories involve activities performed in person or online. **Table A-1** in the Appendix shows the detailed list of sectors included in each category. The share of job postings in the three digital categories is shown in **Chart A-4**.

Changes in the speed of the pandemic

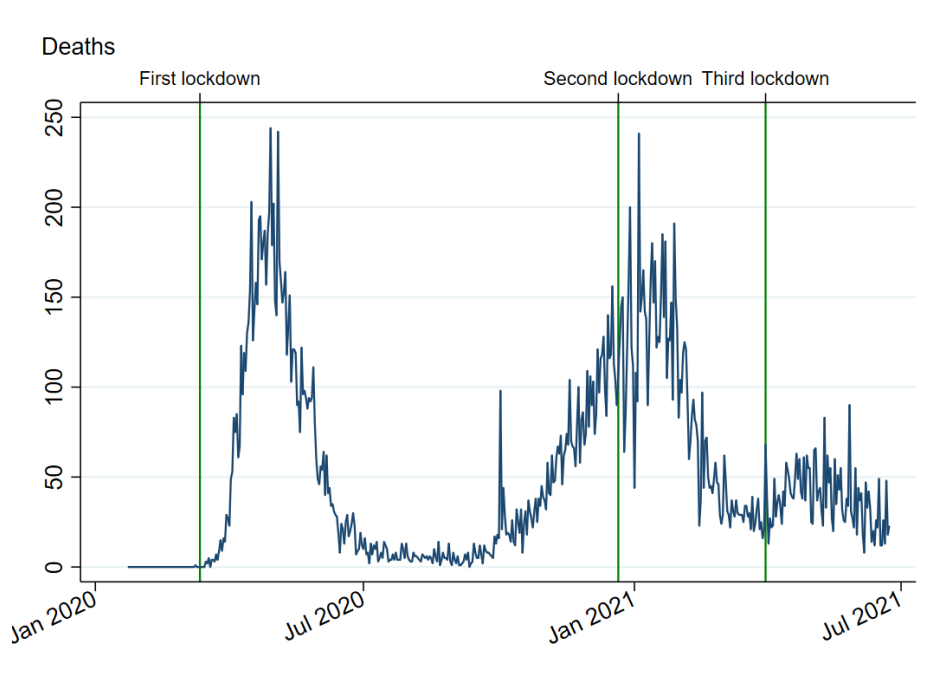
The COVID-19 pandemic has unfolded unevenly over time. The rate of disease spread and the subsequent pace at which policies were implemented have varied. We consider three instances that mark when changes in the speed of pandemic-related events took place (see **Chart 1** and **Chart A-5**):⁶

- first lockdown—began on March 12, 2020
- second lockdown—began on December 26, 2020
- third lockdown—began on April 1, 2021

Chart 2 shows the evolution of Indeed job postings, which mirrors the path of the economic crisis and the recovery. We see the drastic drop in growth of job postings during the first lockdown followed by sustained recovery throughout the reopening that followed in June 2020, although the level of year-over-year growth remained below zero. The reimposition of containment measures at the end of 2020 led to a short-lived decline in the growth of job postings. After this second lockdown, job postings steadily increased and exceeded their 2019 levels for most of the 2021 data, with a minor setback in April and May after the third lockdown.

⁶ These dates are based on events in Ontario and Quebec because these two provinces have the largest proportions of the Canadian population.

Chart 1: Daily new COVID-19 deaths

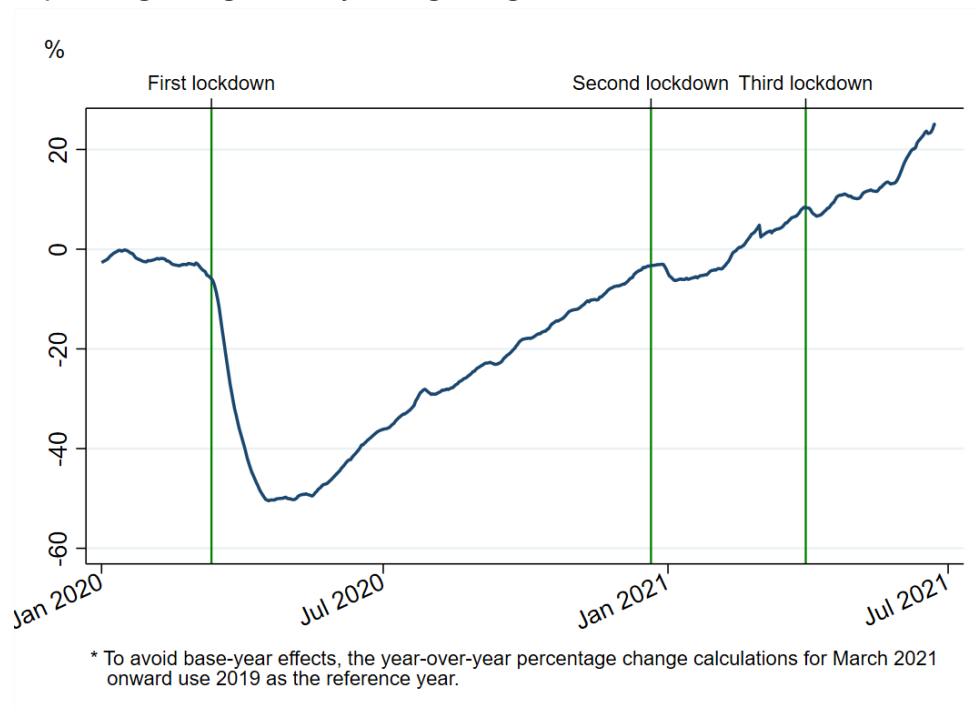


Source: John Hopkins University COVID-19 Data Repository

Last observation: June 23, 2021

Chart 2: Indeed job postings

Year-over-year percentage change* in 7-day moving average



Sources: Indeed and Bank of Canada calculations

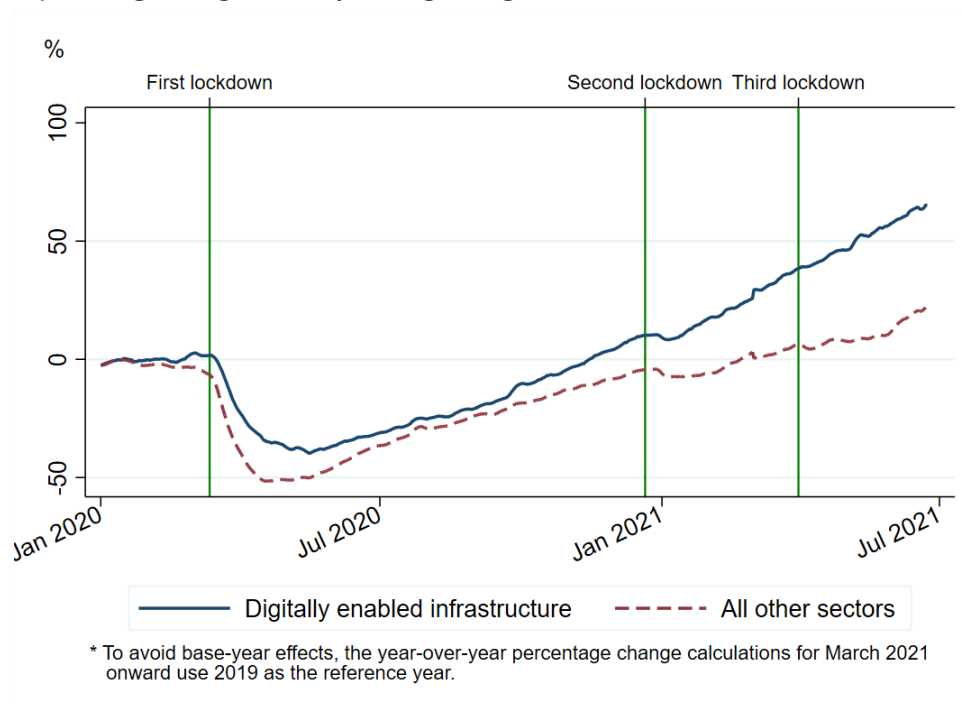
Last observation: June 23, 2021

Good performance of job postings linked to digital technologies

Chart 3 shows that Indeed job postings in sectors linked to digitally enabled infrastructure fell less (-40 percent) than all other sectors (-50 percent) during the initial lockdown in 2020. Since the reopening that followed the first lockdown, job postings in the digitally enabled infrastructure category have also recovered faster than all other sectors. In fact, the gap between the year-over-year growth rates began to widen after the containment measures were reinstated at the end of 2020 and has persisted in 2021 with the third lockdown in April 2021. By the end of May 2021, the gap in growth rates between job postings in sectors in the digitally enabled infrastructure category and those in all other sectors exceeded 40 percentage points. It is worth noting that no such gap existed before the onset of the pandemic (see **Chart A-6** for a longer series).

Chart 3: Indeed job postings in sectors related to digitally enabled infrastructure versus all other sectors

Year-over-year percentage change* in 7-day moving average



Sources: Indeed and Bank of Canada calculations

Last observation: June 23, 2021

A closer look: Job postings, digital technologies and deaths due to COVID-19

As shown in **Chart 2**, changes in total online job postings are associated with the evolution of the pandemic and containment measures over time. In general, the number of online job postings decreased when COVID-19 cases climbed in March and December 2020 and again in April 2021. And when cases receded and restrictions began to lift, the number of online job postings increased. Behind these aggregate fluctuations in total online job postings, we see that some sectors created more jobs than others.

To formally assess the relationship between the pandemic and job postings, we correlate changes in the number of online job postings to changes in disease spread. For job postings, we use the year-over-year percentage change of the seven-day moving average for each category's daily count of job ads, to abstract from seasonality. We measure disease spread as the daily number of new deaths (rather than the number of new cases) because this metric is not influenced by possible changes in COVID-19 testing capacity over time.⁷

To ease our analysis, we group the Indeed non-digital sectors into 10 categories, explained below **Table A-1**. **Table 1** shows the correlations between COVID-19 deaths and the growth in job postings by category since the pandemic began in Canada. It presents the categories and their growth rates in descending order. The table shows that the percentage change in the number of job postings in sectors linked to the production of digitally enabled infrastructure accelerated as the disease spread: these job postings grew 3.8 percentage points faster when COVID-19 deaths increased by 100 percent. Categories with above-average growth in job postings include logistics, manufacturing, professional services, and agriculture. On the other extreme, growth in job postings in sectors associated with digitally ordered transactions as well as in mining, housing, recreation, and business services had below-average growth.

Table 1: Indeed job postings, by category

Change in year-over-year growth rate of 7-day moving average when the number of daily deaths doubled

Category	Change in growth of job postings (percentage points)
Digitally enabled infrastructure	3.8***
Logistics	3.3***
Manufacturing	2.6***
Professional services	1.6**
Agriculture	1.5*
Digitally delivered products	1.4*
Health care	1.1*

⁷ Results using the number of cases are consistent with those presented here (see **Table A-3**).

Total job postings	1.0
Public administration	0.9
Business support	0.9
Recreation	0.1
Housing	-0.0
Mining	-0.4
Digitally ordered transactions	-0.9

Note: Results show coefficients of a regression of the year-over-year percentage change in job postings (7-day moving average) on the number of new deaths (in logs) per day.

*** Statistically significant at 1 percent. ** Statistically significant at 5 percent. * Statistically significant at 10 percent.

It is worth noting that these results do not depend on the specifications used to derive the correlations. We apply diverse variants of the specifications (see **Table A-2**), using:

- cases instead of deaths as a measure of disease spread
- 7- and 14-day lags in deaths
- changes in stringency measures—constructed by both Oxford (Hale et al. 2021) and the Bank of Canada (Cheung et al. 2021)—instead of deaths to proxy for changes in the pandemic
- measures of mobility as measured by Apple (2021) and Google (2021)⁸

Under most of these specifications, the growth rates of job postings in sectors comprising the digitally enabled infrastructure and in the logistics categories are among the five fastest when the disease spreads more rapidly. E-commerce (the digitally ordered transactions category) is one of five categories with the slowest growth rate in job postings. The only specification in which this is not the case is when we use Google mobility in workplaces and in grocery stores and pharmacies as a proxy for disease spread. This is likely because of a relationship—albeit weak—between this particular mobility measure and disease spread. The Google workplace mobility measure is connected to demand for those goods and services that require onsite (versus remote) workers and to essential activities, which are somewhat unaffected by the disease. Also, the relationship between disease spread and mobility in grocery stores and pharmacies is not clear cut.

We now consider changes over time in the co-movement of job postings and COVID-19 deaths. **Chart 4** shows that job postings in sectors linked to digitally enabled infrastructure behaved rather uniquely during the pandemic.⁹ They did not slow down as much as those in other sectors during the first lockdown in 2020: their year-over-year growth rate dropped 7.6 percentage points per a 100 percent increase in deaths,

⁸ Mobility tends to decline when the disease spreads faster and deaths, cases and stringency increase. Residential mobility is the exception, with the opposite pattern.

⁹ See **Chart A-7** for a comparison of the evolution of total job postings in relation to deaths.

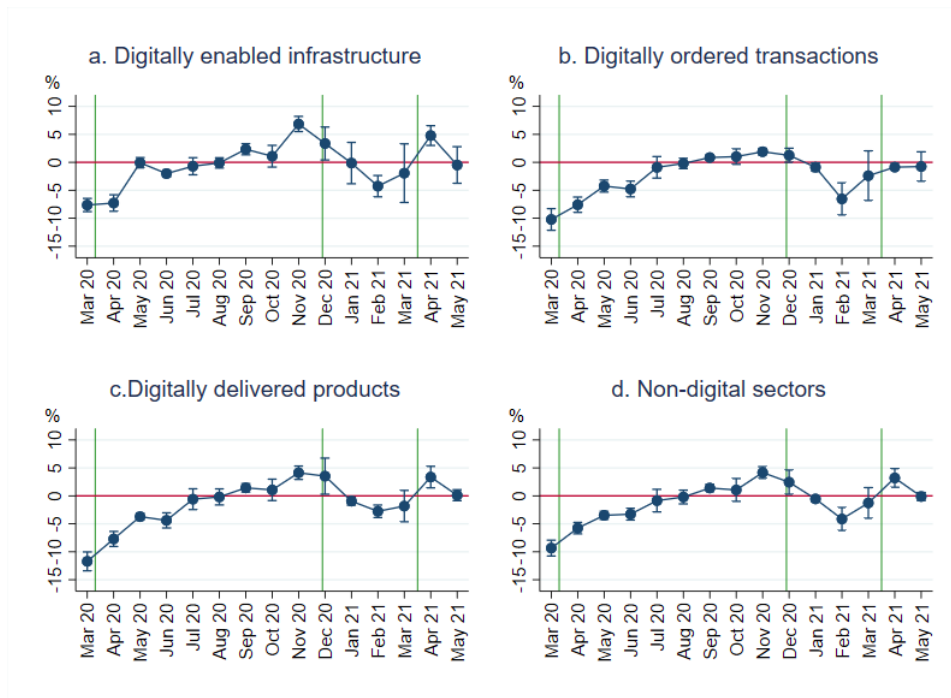
compared with a drop of more than 9 percentage points in non-digital sectors. They also recovered slightly faster after the reopening: the growth rate of job postings in sectors linked to digitally enabled infrastructure rose by nearly 7 percentage points in November 2020 and by almost 5 percentage points in April 2021, while postings in non-digital sectors grew by 4 and 3 percentage points in the same months, respectively, per a 100 percent increase in deaths. **Chart A-8** in the Appendix shows the coefficients of job postings in sectors related to digitally enabled infrastructure versus those of other sectors.

Chart A-9 shows the correlations between COVID-19 deaths and year-over-year growth of job postings for the sectors within the digitally enabled infrastructure category. In May 2020, the correlations were negative for all sectors except two: electrical engineering and software development. In November 2020, the information technology operations and helpdesk sector—which offers support services for digital technologies—had the strongest positive correlation. As of May 2021, job postings in mathematics showed the highest correlation of all sectors linked to digitally enabled infrastructure. These observations are in line with the increased importance of digital infrastructure as remote work becomes a dominant strategy during the pandemic.

Job postings in sectors related to digitally ordered transactions and digitally delivered products followed a similar path as those in non-digital sectors in 2020, as shown in **Chart 4**. In 2021 so far, job postings in sectors related to digitally ordered transactions show a negative correlation with COVID-19 deaths, even in April, when job postings in other sectors co-moved positively. Looking at these sectors more closely in **Chart A-10** and **Chart A-11**, we note that retail and education are the only two sectors with negative correlations in November 2020—the month when overall correlations were highest. While job postings in retail appear to behave the same as those in the other sectors during 2021, job postings in education continue to move in the opposite direction of COVID-19 deaths. Both the retail and education sectors have been particularly affected by containment measures and have evolved by using digital technologies to maintain their operations (e.g., e-commerce and online learning). It is possible that these sectors reduced hiring after the first lockdown and may have established new ways of doing business, using technology to replace certain labour-intensive activities.

Job postings in some non-digital sectors behave similarly to those in sectors related to digitally enabled infrastructure. These are health care and nursing, which employ many essential workers (**Chart A-12**).

Chart 4: Monthly correlations between COVID-19 deaths and job postings, by digital category
Year-over-year percentage change in 7-day moving average



Note: Results show coefficients of a regression of the year-over-year percentage change in job postings (7-day moving average) on the number of new deaths (in logs) per day. The green lines in each panel indicate the start of the three lockdown periods.

Source: Bank of Canada calculations

Last observation: May 2021

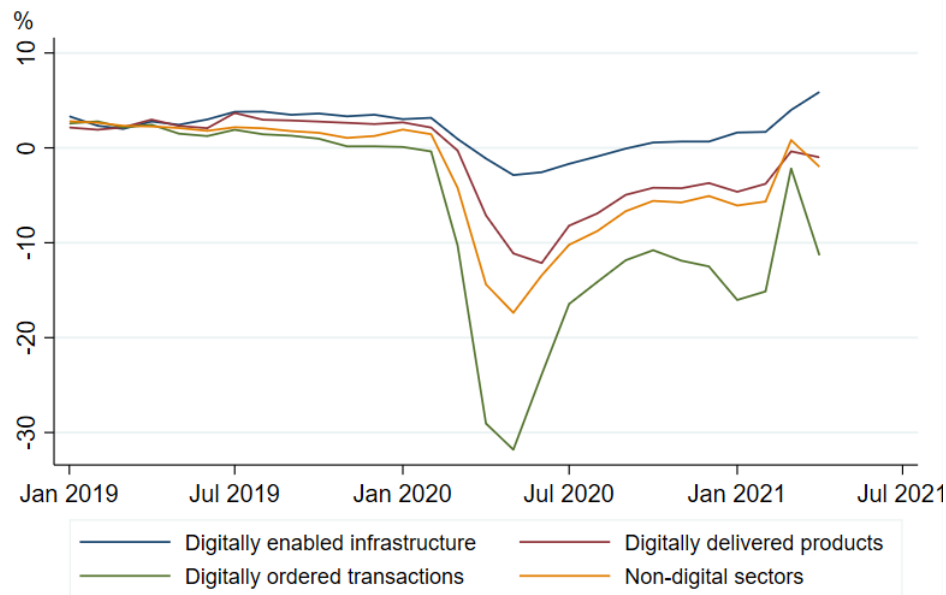
Looking at data from traditional sources

Although the data sources we use are non-traditional, we see similar patterns in traditional sources of employment data, which lends confidence to our results.

Statistics Canada's Survey of Employment, Payrolls and Hours (SEPH) collects data on a monthly basis and provides detailed information at the industry level mainly for the non-agricultural sector. We use the four-digit North American Industry Classification System (NAICS) codes to group SEPH employment data into our previously established categories (**Table A-1**). **Chart 5** shows a small, single-digit decline in employment during the initial lockdown in the digitally enabled infrastructure category, compared with double-digit drops in the other three categories. Interestingly, the largest employment change takes place in the category of digitally ordered transactions, where products can be purchased digitally through e-commerce. This category includes the retail sector, where in-person activity suffered during the pandemic, particularly at the time of lockdowns. It should be noted that while these retailers sell online, they also usually operate physical stores, and we do not have details on online versus in-person activities.

Chart 5: Employment data, by category

Year-over-year percentage change*



* To avoid base-year effects, the year-over-year percentage change calculations for March 2021 onward use 2019 as the reference year.

Note: Data are from the Survey of Employment, Payrolls and Hours.

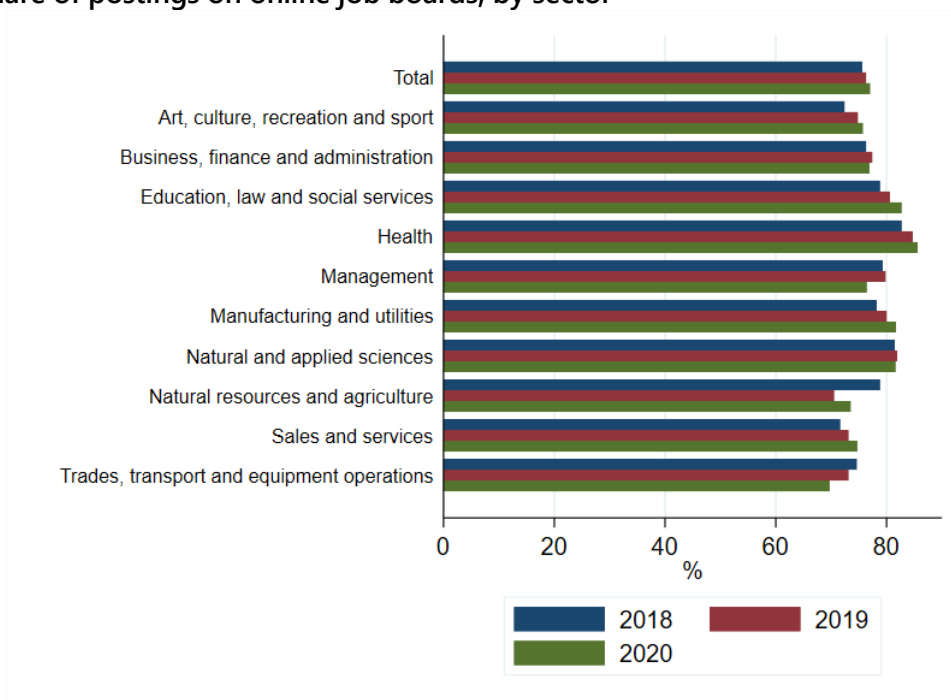
Sources: Statistics Canada and Bank of Canada calculations

Last observation: April 2021

We also examine trends in the proportion of vacancies posted in online job boards by broad occupation groups using data from the quarterly Job Vacancy and Wage Survey (Statistics Canada 2021c).¹⁰ The observed patterns in online job postings could be due to changes in the proportion of vacancy postings made online versus those made elsewhere. That is, we could observe online job postings in sectors related to digitally enabled infrastructure outpacing those in the remaining sectors only because the former sectors post more vacancies online than the rest do. But **Chart 6** and **Chart A-13** suggest that this is not the case. The total number of vacancies posted online has been increasing since 2018. However, vacancies in natural and applied sciences—an occupation group with most jobs concentrated in the digitally enabled infrastructure category—do not show a similar trend. Occupation groups with ongoing increases in the share of online vacancy postings include health care, social services, manufacturing and utilities, and recreation. Online job postings in natural resources and agriculture seem to have also increased in 2020 from 2019 levels. Finally, job postings in management and trades appear to be reducing their online presence. In sum, it is unlikely that an increase in online job postings (versus offline postings) is driving our finding of stronger growth of job postings in sectors linked to digitally enabled infrastructure than those in other sectors.

¹⁰ In its original quarterly version, the Job Vacancy and Wage Survey offered details about the proportion of vacancies posted in online job boards at the occupational level. Since October 2020, the monthly version presents industry-level information, which does not contain details about online versus offline postings of job vacancies.

Chart 6: Share of postings on online job boards, by sector



Note: Data are compiled from Statistics Canada's Job Vacancy and Wage Survey conducted from 2018Q4 to 2020Q4.
Source: Statistics Canada
Last observation: 2020Q4

Conclusion

Massive job losses followed by substantial job gains have become a common pattern during the pandemic. Strain has not been distributed equally across sectors, with some having been better positioned to create jobs than others. Using online job posting data provided by Indeed, we analyze how online vacancies in sectors related to digital technologies have evolved compared with online job postings in other sectors.

We find that sectors linked to the production of digital technology (e.g., software, hardware and information technology support) were recruiting more intensively than all other sectors in times of higher disease spread. Furthermore, sectors in which digital technologies have become more prominent during the pandemic (e.g., education and retail) have decreased their recruiting. Worker displacement due to the adoption of technology may be contributing to this trend.

We verify that our findings also hold with traditional employment data sources, such as Statistics Canada's Survey of Employment, Payrolls and Hours. Also, data from Statistics Canada's Job Vacancy and Wage Survey on the proportion of vacancies posted online seem to confirm that our results are not driven by more intense online recruiting in digital sectors.

Long-term consequences of this seemingly intensified use of digital technologies amid the COVID-19 pandemic are still to be seen. This note merely scratches the surface of the ongoing discussion on the acceleration of digitalization throughout the pandemic.

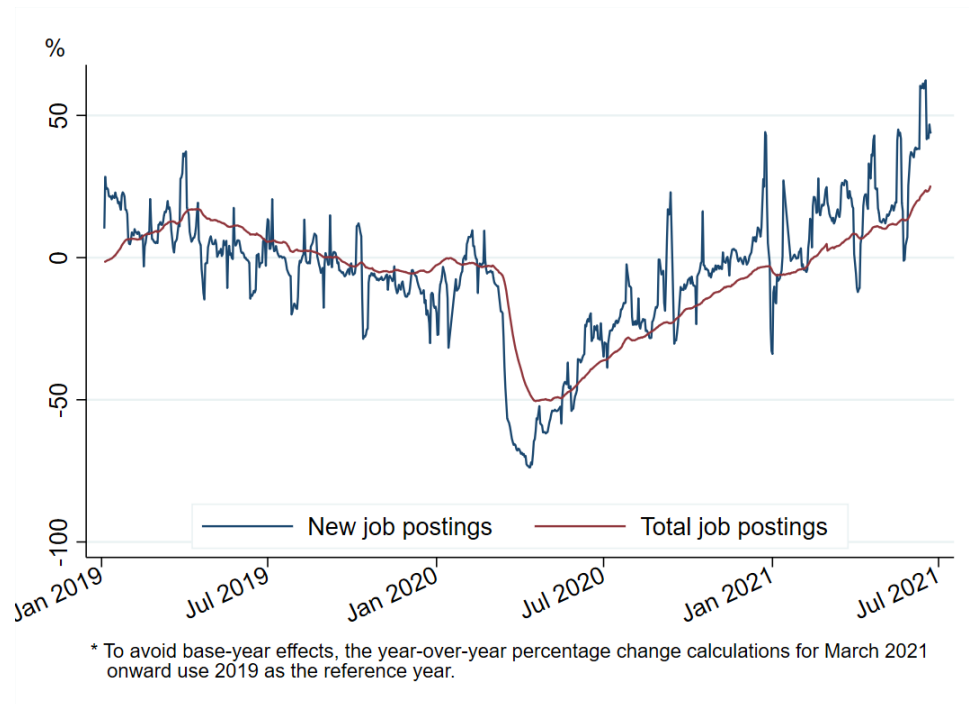
References

- Apple. 2021. "[Mobility Trends Reports](#)." Last updated June 4, 2021.
- Cheung, C., J. Lyons, B. Madsen, S. Miller and S. Sheikh. 2021. "[The Bank of Canada COVID-19 Stringency Index: Measuring Policy Response Across Provinces](#)." Bank of Canada Staff Analytical Note No. 2021-1.
- Google. 2021. "[COVID-19 Community Mobility Reports](#)." Last updated June 4, 2021.
- Hale, T., N. Angrist, R. Goldszmidt, B. Kira, A. Petherick, T. Phillips, S. Webster, E. Cameron-Blake, L. Hallas, S. Majumdar and H. Tatlow. 2021. "[A Global Panel Database of Pandemic Policies \(Oxford COVID-19 Government Response Tracker\)](#)." *Nature Human Behaviour* 5: 529–538.
- Statistics Canada. 2019. "[Measuring Digital Economic Activities in Canada: Initial Estimates](#)." *Latest Developments in the Canadian Economic Accounts* (May 3).
- Statistics Canada. 2021a. [Table 14-10-0287-01 Labour force characteristics, monthly, seasonally adjusted and trend-cycle, last 5 months](#). DOI: <https://doi.org/10.25318/1410028701-eng>.
- Statistics Canada. 2021b. [Table 14-10-0201-01 Employment by industry, monthly, unadjusted for seasonality](#). DOI: <https://doi.org/10.25318/1410020101-eng>.
- Statistics Canada. 2021c. [Table 14-10-0328-01 Job vacancies, proportion of job vacancies and average offered hourly wage by selected characteristics, quarterly, unadjusted for seasonality](#). DOI: <https://doi.org/10.25318/1410032801-eng>.
- TalentNest. 2020. "[2019 Applicant Analysis: Descriptive Study on Job Applicants Across North America](#)."
- Zadikian, M. 2020. "[COVID-19 Jobs Tracker: Layoffs, Furloughs and Hiring During the Pandemic](#)." *BNN Bloomberg* (July 7).

Appendix

Chart A-1: Total versus new Indeed job postings

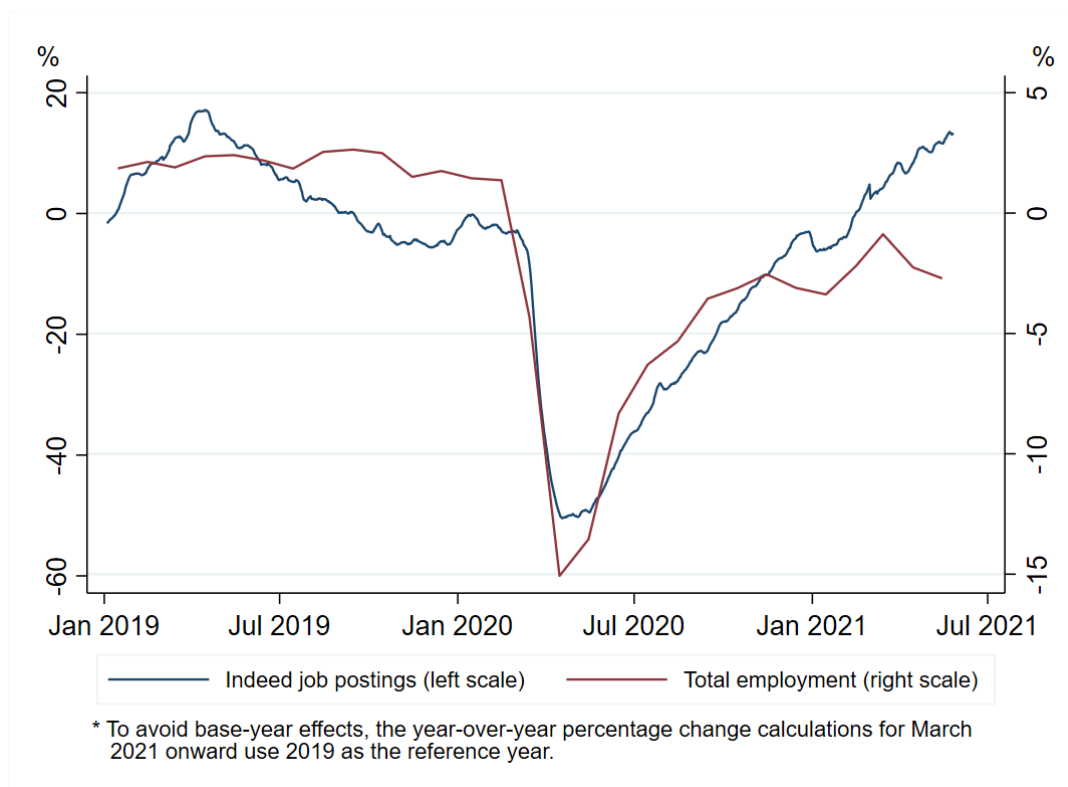
Year-over-year percentage change* in 7-day moving average



Sources: Indeed and Bank of Canada calculations

Last observation: June 23, 2021

Chart A-2: Indeed job postings and total employment
Year-over-year percentage change*



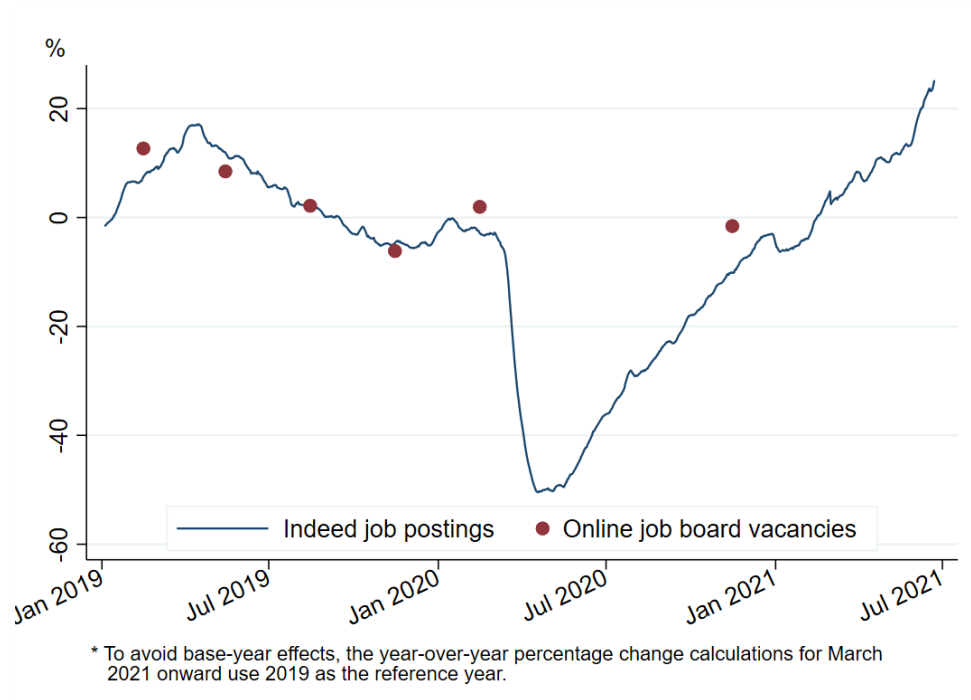
Note: Indeed job postings data show year-over-year percentage changes in the 7-day moving average. Total employment data are from Statistics Canada's Labour Force Survey.

Sources: Indeed, Statistics Canada and Bank of Canada calculations

Last observation: June 23, 2021

Chart A-3: Indeed job postings and online job board vacancies

Year-over-year percentage change*



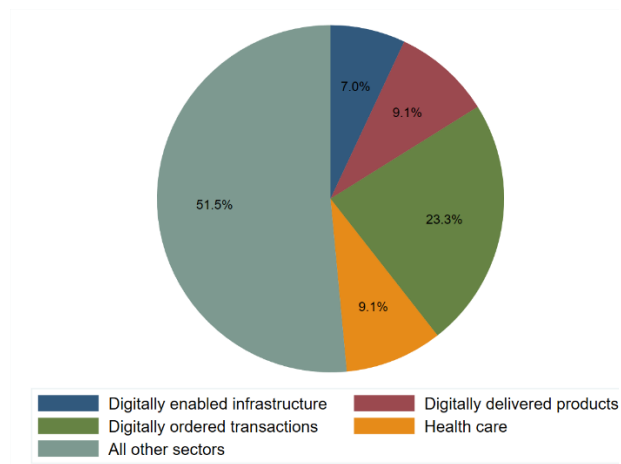
Note: Indeed job postings data show year-over-year percentage changes in the 7-day moving average. Online job board vacancy data are from Statistics Canada's Job Vacancy and Wage Survey.

Sources: Indeed, Statistics Canada and Bank of Canada calculations

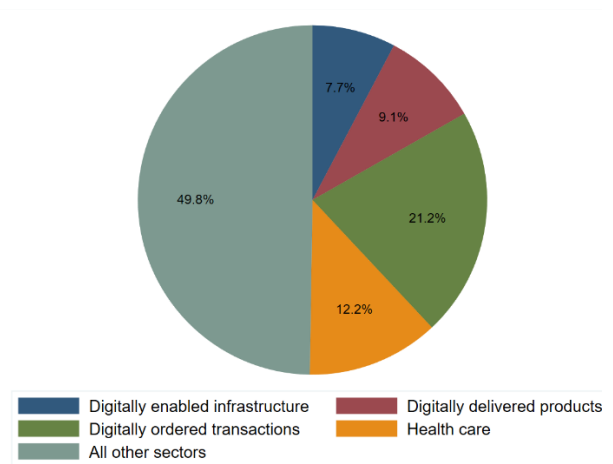
Last observation: June 23, 2021

Chart A-4: Composition of Indeed job postings

a. Postings in 2019



b. Postings in 2020

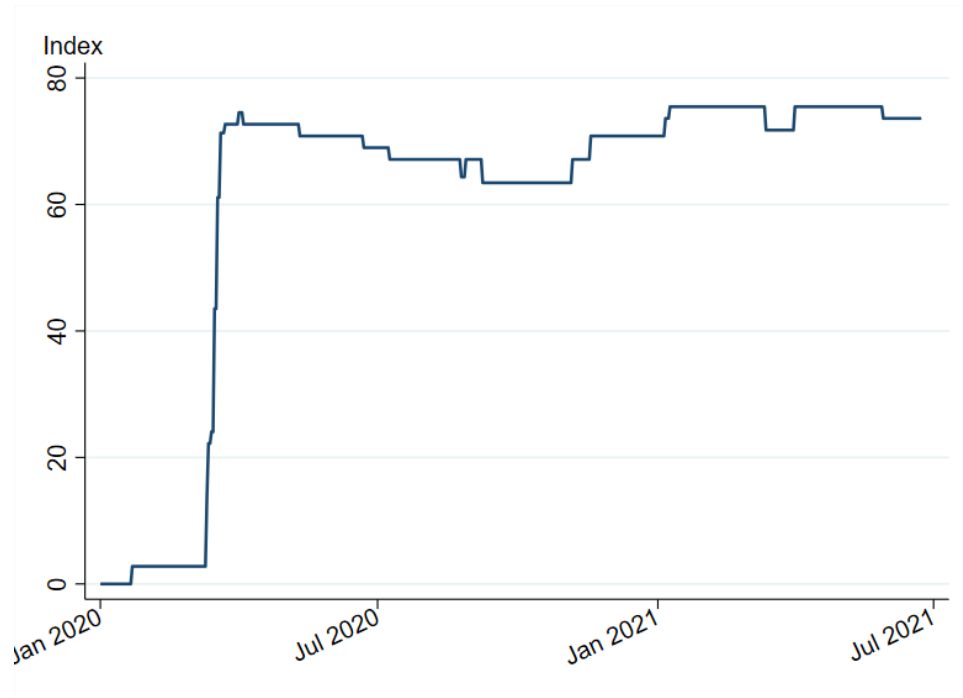


Sources: Indeed and Bank of Canada calculations

Last observation: June 23, 2021

Chart A-5: Selected indicators of Canada's response to the COVID-19 pandemic

Index: January 2020 = 0



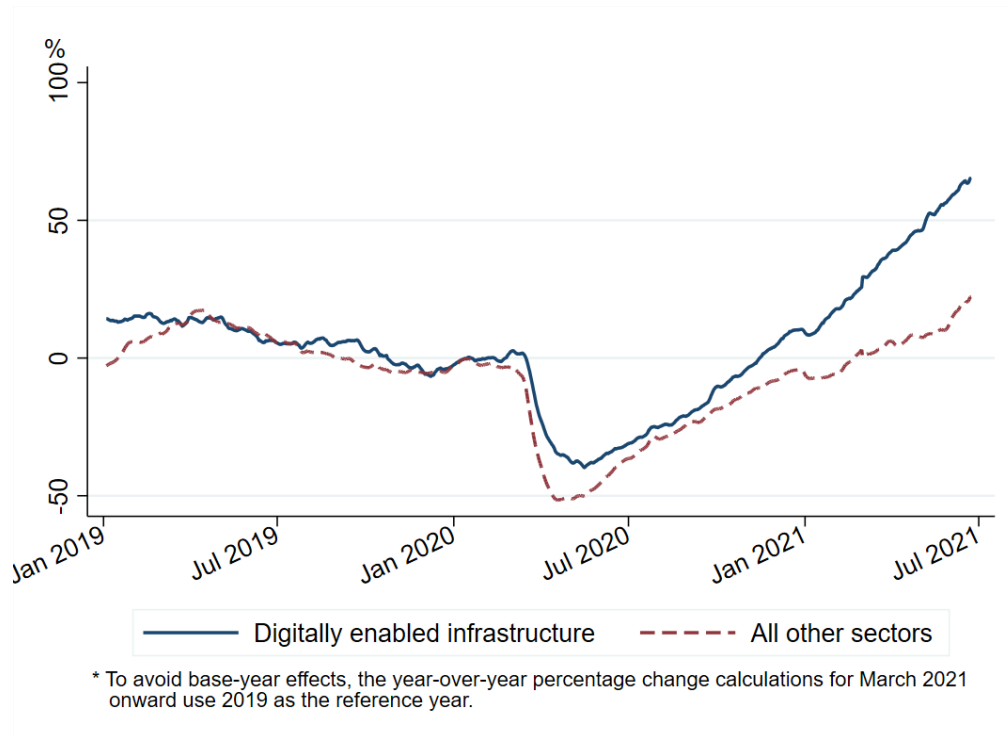
Note: Data are from the Oxford COVID-19 Government Response Tracker stringency index for Canada.

Source: University of Oxford, Blavatnik School of Government

Last observation: June 23, 2021

Chart A-6: Indeed job postings since 2019 in sectors related to digitally enabled infrastructure versus all other sectors

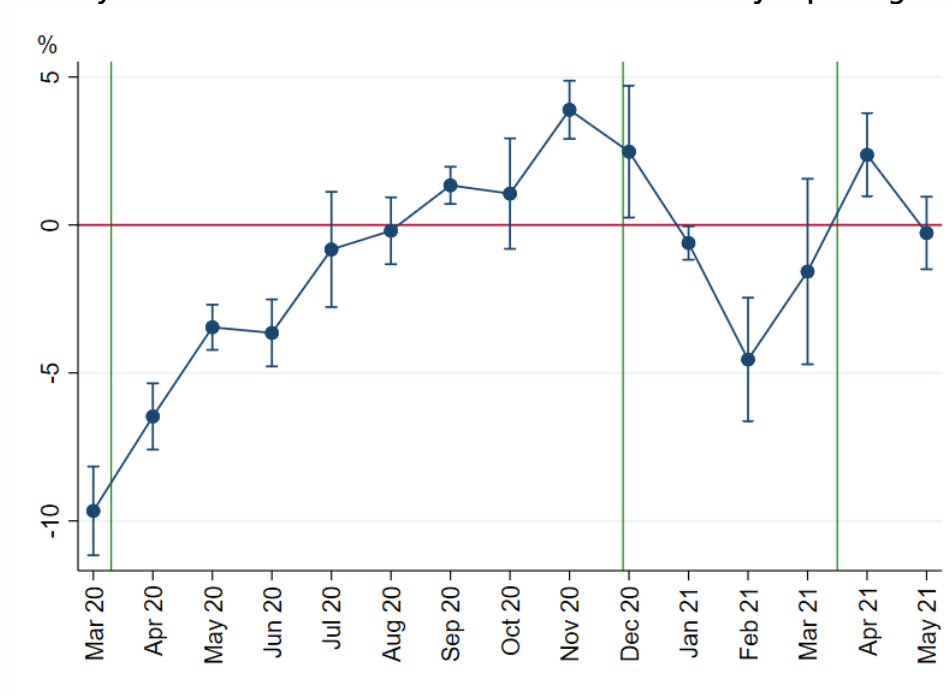
Year-over-year percentage change* in 7-day moving average



Sources: Indeed and Bank of Canada calculations

Last observation: June 23, 2021

Chart A-7: Monthly correlations between COVID-19 deaths and total job postings

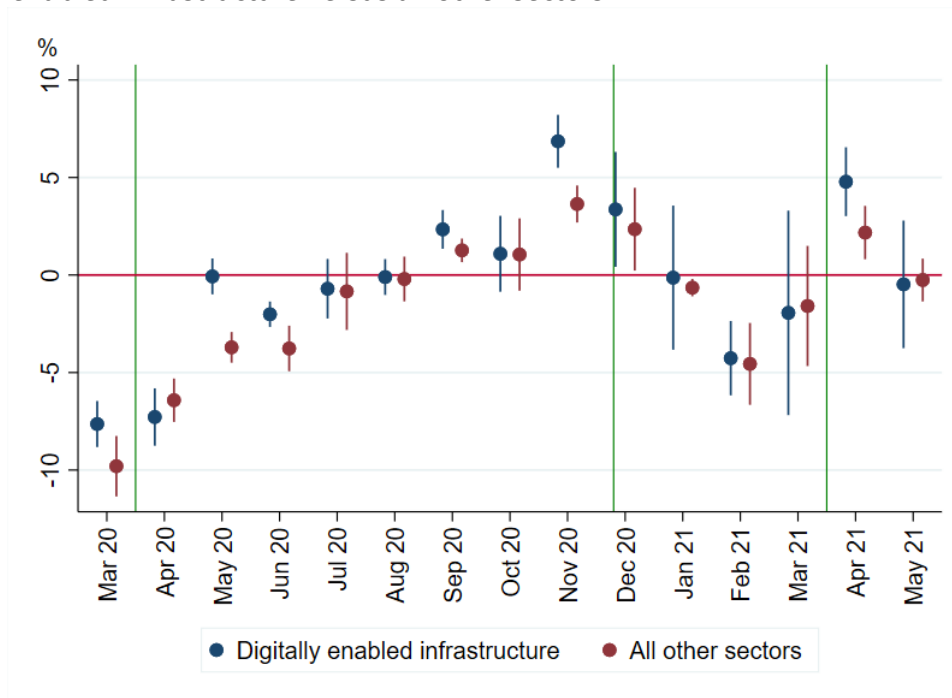


Note: Results show coefficients of a regression of the year-over-year percentage change in job postings (7-day moving average) on the number of new deaths (in logs) per day. The green lines indicate the start of the three lockdown periods.

Source: Bank of Canada calculations

Last observation: May 2021

Chart A-8: Monthly correlations between COVID-19 deaths and job postings in sectors related to digitally enabled infrastructure versus all other sectors

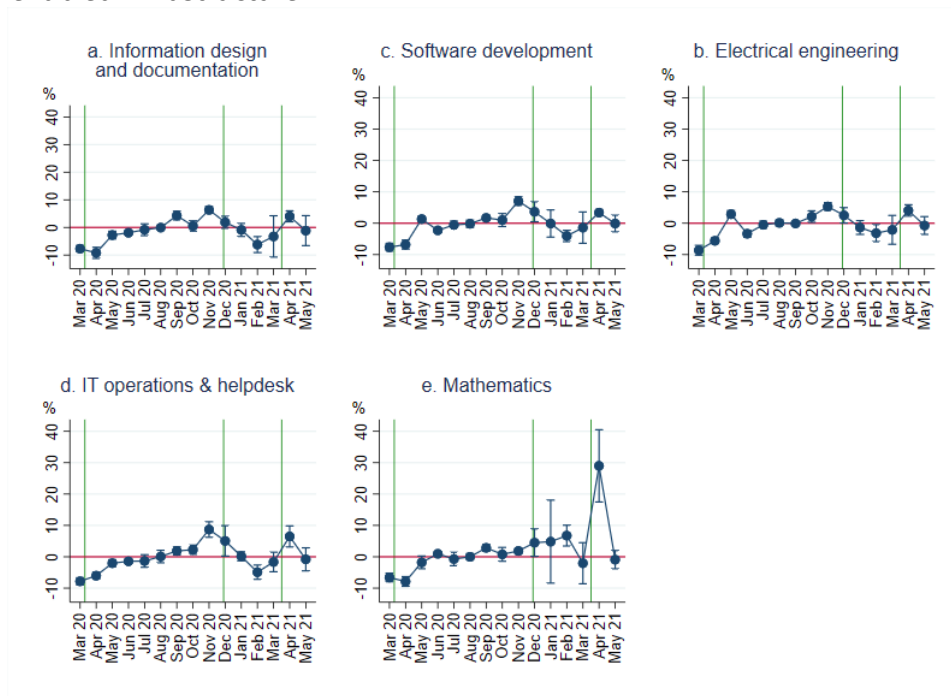


Note: Results show coefficients of a regression of the year-over-year percentage change in job postings (7-day moving average) on the number of new deaths (in logs) per day. The green lines indicate the start of the three lockdown periods.

Source: Bank of Canada calculations

Last observation: May 2021

Chart A-9: Monthly correlations between COVID-19 deaths and job postings in sectors related to digitally enabled infrastructure

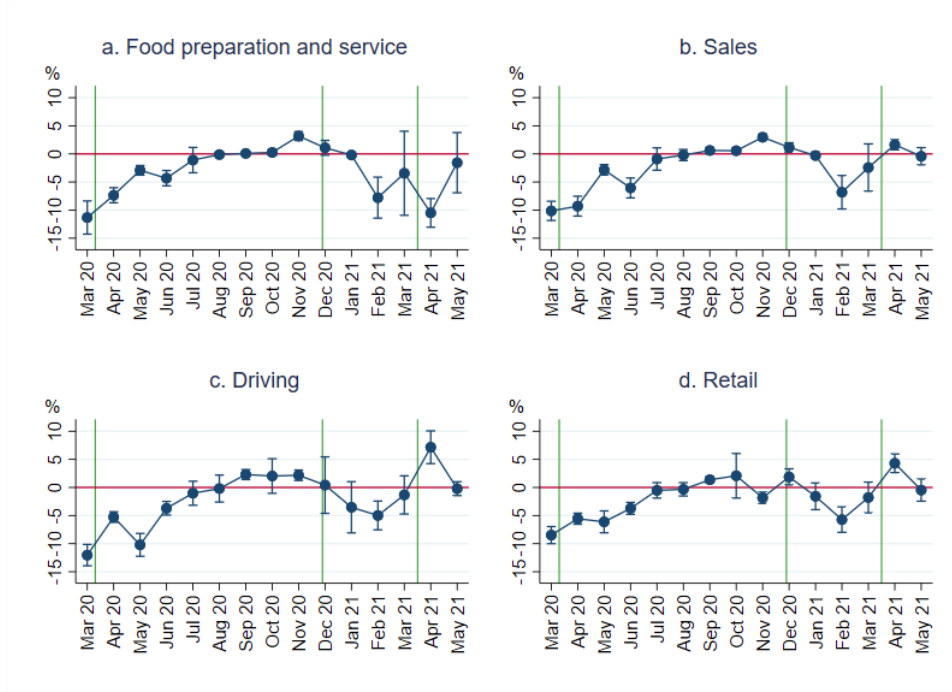


Note: Results show coefficients of a regression of the year-over-year percentage change in job postings (7-day moving average) on the number of new deaths (in logs) per day. The green lines in each panel indicate the start of the three lockdown periods.

Source: Bank of Canada calculations

Last observation: May 2021

Chart A-10: Monthly correlations between COVID-19 deaths and job postings in sectors related to digitally ordered transactions

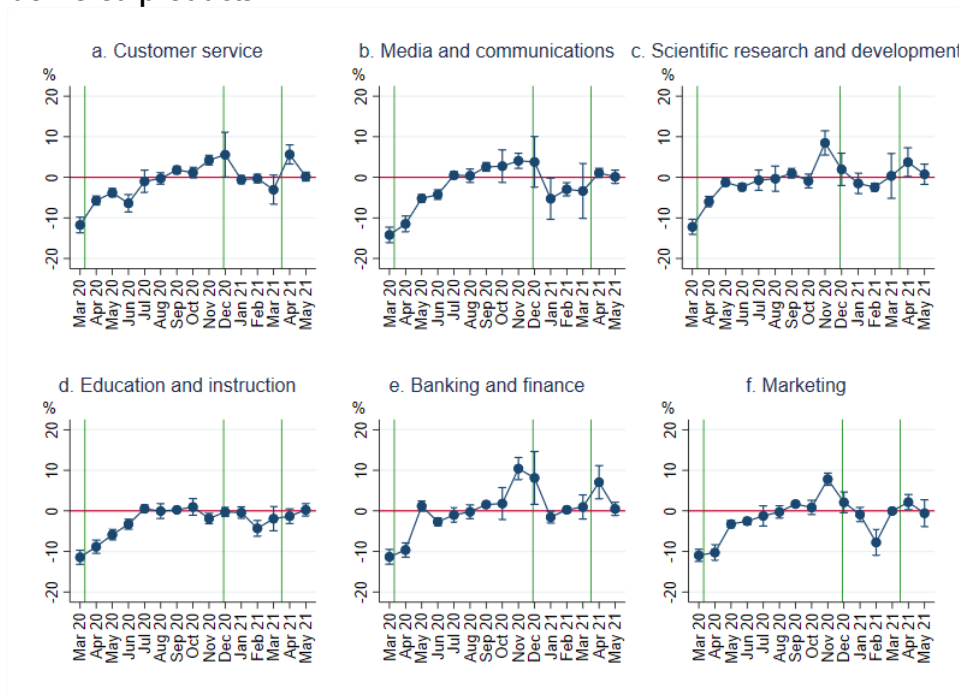


Note: Results show coefficients of a regression of the year-over-year percentage change in job postings (7-day moving average) on the number of new deaths (in logs) per day. The green lines in each panel indicate the start of the three lockdown periods.

Source: Bank of Canada calculations

Last observation: May 2021

Chart A-11: Monthly correlations between COVID-19 deaths and job postings in sectors related to digitally delivered products

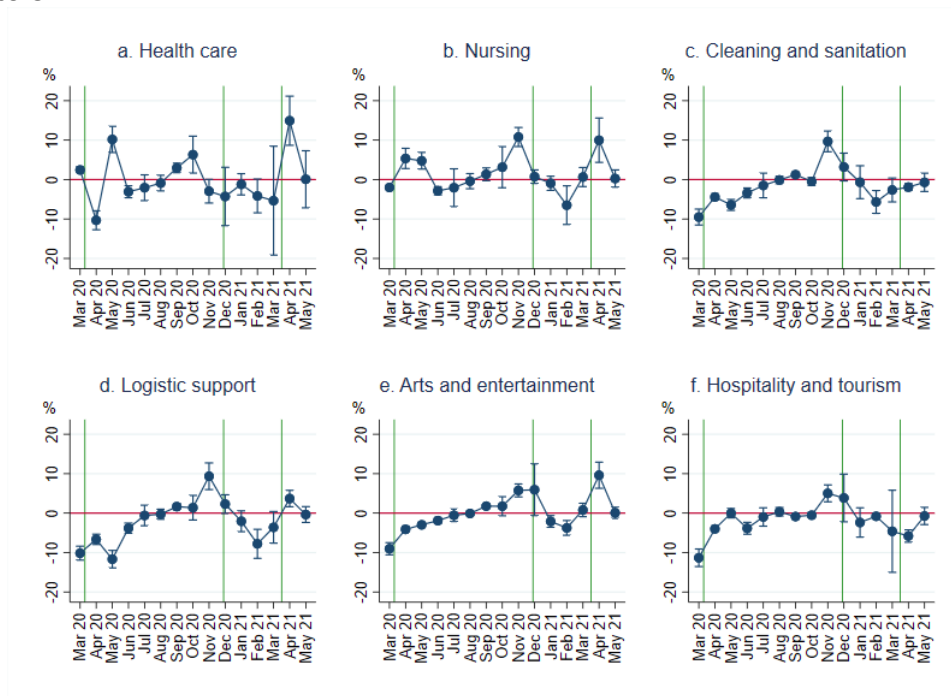


Note: Results show coefficients of a regression of the year-over-year percentage change in job postings (7-day moving average) on the number of new deaths (in logs) per day. The green lines in each panel indicate the start of the three lockdown periods.

Source: Bank of Canada calculations

Last observation: May 2021

Chart A-12: Monthly correlations between COVID-19 deaths and job postings in selected non-digital sectors

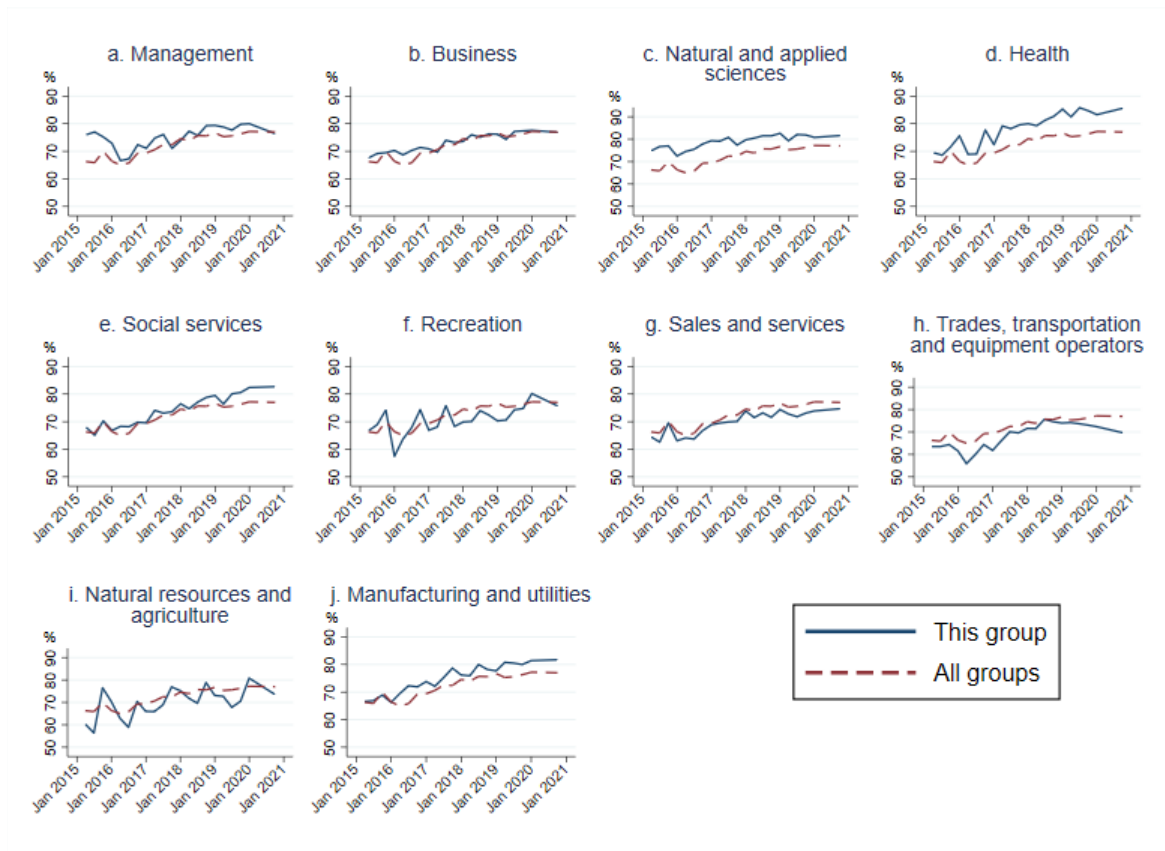


Note: Results show coefficients of a regression of the year-over-year percentage change in job postings (7-day moving average) on the number of new deaths (in logs) per day. The green lines in each panel indicate the start of the three lockdown periods.

Source: Bank of Canada calculations

Last observation: May 2021

Chart A-13: Share of job postings on online job boards



Note: Data are compiled from Statistics Canada's Job Vacancy and Wage Survey.

Sources: Statistics Canada and Bank of Canada calculations

Last observation: 2020Q4

Table A-1: Indeed sectors and SEPH industries, by category

Category	Indeed sector	SEPH sectors and industry groups ¹¹
Digitally enabled infrastructure	• Software development • Electrical engineering • Information design and documentation • IT operations and helpdesk • Mathematics	• Computer and electronic product manufacturing [334] • Electrical equipment, appliance and component manufacturing [335] • Computer and communications equipment and supplies merchant wholesalers [4173] • Software publishers [5112] • Telecommunications [517] • Data processing, hosting and related services [518] • Computer systems design and related services [5415] • Electronic and precision equipment repair and maintenance [8112]
Digitally ordered transactions	• Driving • Food preparation and service • Retail • Sales	• Wholesale trade [41] except 4173 • Retail trade [44-45] • Taxi and limousine service [4853] • Food services and drinking places [722]
Digitally delivered products	• Banking and finance • Customer service • Education and instruction • Marketing • Media and communications • Scientific research and development	• Publishing industries [511] except 5112 • Motion picture and sound recording industries [512] • Broadcasting (except internet) [515] • Finance and insurance [52] • Management, scientific and technical consulting services [5416] • Scientific research and development services [5417] • Advertising, public relations, and related services [5418] • Educational services [61]
Non-digital	• Remaining sectors, explained below	• Agriculture, forestry, fishing and hunting [11] • Mining, quarrying, and oil and gas extraction [21] • Utilities [22] • Construction [23] • Manufacturing [31-33], except 334 and 335 • Transportation and warehousing [48-49] except 4853 • Real estate and rental and leasing [53] • Professional, scientific and technical services [54] except 5415, 5416, 5417, 5418 • Management of companies and enterprises [55] • Administrative and support, waste management and remediation services [56] • Health care and social assistance [62] • Arts, entertainment and recreation [71] • Accommodation services [721]

¹¹ For our classification of SEPH sectors and industry groups, we drew inspiration from the definitions of the digital economy by Statistics Canada and from C. Lamb and M. Seddon, "The State of Canada's Tech Sector, 2016," Brookfield Institute (July 2016).

		• Other services (except public administration) [81], except 8112 • Public administration [91]
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Note: SEPH is Statistics Canada's Survey of Employment, Payrolls and Hours.

Indeed remaining sectors—grouped into categories:

- **Health care**
 - Personal care and home health
 - Pharmacy
 - Child care
 - Dental
 - Medical information
 - Therapy
 - Nursing
 - Medical technician
 - Physicians and surgeons
 - Health care
- **Business support**
 - Administrative assistance
 - Business operations
 - Human resources
 - Insurance
 - Management
 - Project management
- **Professional services**
 - Accounting
 - Architecture
 - Chemical engineering
 - Civil engineering
 - Industrial engineering
 - Mechanical engineering
 - Legal
 - Social science
 - Veterinary
- **Recreation**
 - Art and culture
 - Creative activities
 - Beauty and wellness
 - Sports
 - Hospitality and tourism
- **Public administration**
 - Security and public safety
 - Military
 - Community and social service

- **Logistics**
 - Loading and stocking
 - Logistic support
 - Aviation
- **Housing**
 - Cleaning and sanitation
 - Construction
 - Installation and maintenance
 - Real estate
- **Agriculture**
 - Agriculture and forestry
- **Manufacturing**
- **Mining**

Table A-2a: Indeed job postings, by category

Change in year-over-year growth rate of 7-day moving average when the variables in the specifications increase by one unit

Category	Specification 1: Disease spread		Specification 2: Deaths lagged		Specification 3: Stringency measure	
	Log deaths (benchmark)	Log cases	7-day lag in log deaths	14-day lag in log deaths	Log Stringency Oxford	Log Stringency Bank of Canada
Digitally enabled infrastructure	3.8***	6.1***	4.3***	4.8***	1.5***	1.2***
Logistics	3.3***	5.9***	3.8***	4.2***	2.4***	1.8***
Manufacturing	2.6***	5.6***	3.1***	3.4***	1.0**	0.9***
Professional services	1.7**	3.8***	2.3***	2.8***	-3.3***	-2.6***
Agriculture	1.5*	3.8***	2.0**	2.4***	-2.7***	-0.5
Digitally delivered products	1.4*	3.5***	2.0**	2.5***	-3.5***	-2.8***
Health care	1.2*	4.9***	1.0	0.8	1.0***	0.3
Total job postings	1.0	2.9***	1.5**	1.9***	-3.2***	-2.8***
Public administration	0.9	2.7***	0.8	0.6	-3.4***	-2.8***
Business support	0.9	2.9***	1.2*	1.5**	-4.0***	-3.5***
Recreation	0.2	0.7*	0.6	1.0**	-4.8***	-3.6***
Housing	-0.0	3.4***	0.5	1.0	-2.0***	-1.7***
Mining	-0.4	4.7***	-0.2	-0.1	-1.5**	-1.6***
Digitally ordered transactions	-0.9	0.7	-0.4	0.0	-6.3***	-5.6***

Note: Results show the coefficients of a regression of the year-over-year percentage change in job postings (7-day moving average) on variants of the specifications of disease spread, lags of deaths, and stringency measure. The coefficients are sorted according to the benchmark for log deaths, in descending order.

*** Statistically significant at 1 percent. ** Statistically significant at 5 percent. * Statistically significant at 10 percent.

Table A-2b: Indeed job postings, by category

Change in year-over-year growth rate of 7-day moving average when the variables in the specifications increase by one unit

Category	Specification 4: Apple Mobility measure			Specification 5: Google Mobility measure					
	Walking	Driving	Transit	Grocery stores and pharmacies	Parks	Residential	Recreation	Transit	Workplaces
Digitally enabled infrastructure	0.14***	0.02	0.24***	0.65***	-0.06***	-0.47**	0.21***	-0.24***	0.34***
Logistics	0.14***	0.06	0.17***	0.43***	-0.07***	-0.54***	0.20**	-0.19***	0.35***
Manufacturing	0.17***	0.08**	0.25***	0.59***	-0.05***	-0.66***	0.29***	-0.12**	0.37***
Professional services	0.18***	0.07*	0.44***	0.68***	-0.04**	-0.82***	0.37***	0.02	0.41***
Health care	0.16***	0.07*	0.35***	0.51***	-0.06***	-0.79***	0.33***	0.03	0.41***
Digitally delivered products	0.18***	0.07*	0.44***	0.64***	-0.06***	-0.89***	0.40***	0.07	0.44***
Public administration	0.16***	0.09***	0.21***	0.46***	-0.04***	-0.57***	0.27***	-0.10**	0.29***
Total job postings	0.16***	0.07**	0.39***	0.55***	-0.04***	-0.79***	0.35***	0.07	0.38***
Business services	0.14***	0.06**	0.35***	0.47***	-0.05***	-0.71***	0.33***	0.09**	0.34***
Agriculture	0.17***	0.07**	0.44***	0.63***	-0.04***	-0.87***	0.40***	0.11**	0.41***
Housing	0.10***	0.04*	0.34***	0.30***	-0.04***	-0.64***	0.26***	0.16***	0.29***
Recreation	0.22***	0.14***	0.39***	0.62***	-0.02*	-0.97***	0.44***	0.09*	0.42***
Digitally ordered transactions	0.32***	0.20***	0.50***	1.00***	0.03	-1.11***	0.56***	0.00	0.43***
Mining	0.19***	0.11***	0.51***	0.57***	-0.02	-0.99***	0.45***	0.24***	0.39***

Note: Results show the coefficients of a regression of the year-over-year percentage change in job postings (7-day moving average) on variants of the measures of mobility. The coefficients are sorted according to the benchmark for log deaths, in descending order.

*** Statistically significant at 1 percent. ** Statistically significant at 5 percent. * Statistically significant at 10 percent.