Assessing the Initial Impact of the COVID-19 Recession on Establishments by Firm Size Class (3 of 3)

By Mustapha Hammida

In the first article of this series, we quantified the tremendous short-term effect of the COVID-19 recession on Minnesota businesses in March and April of 2020—a closure of 10,492 businesses. Furthermore, we identified that the number of job-creating businesses shrunk while the number of job-destroying businesses skyrocketed, with significant differences in levels and rates across industries. Since then we have extended the analysis of monthly business employment dynamics to investigate how the COVID-19 recession impacted Minnesota businesses of different size classes. The methodology and the results of this analysis are summarized in a set of three articles. This article, the last of the three, sheds light on the absence (or existence) of differences by employer size class in the initial impacts of COVID-19 on job-creating businesses and job-destroying businesses.

The results on the initial impact of the COVID-19 recession on employment by firm size are summarized in a separate article, referred to here as "Article 2 of 3" and accessible here: Assessing the Initial Impact of the COVID-19 Recession on Employment by Firm Size Class (2 of 3). In addition, a review of the methodology and the size distributions of firms, establishments, and employment is provided and referred to here: A Note on the Methodology Used to Assess the Initial Impact of the COVID-19 Recession by Firm Size Class (1 of 3). These three articles together provide a complete picture of how the COVID-19 recession impacted employment and businesses of different firm size classes.

The major finding in this article, though, is the strong and prevalent firm-size heterogeneity in how firms of different sizes responded to the pandemic during its first two months. For instance, the COVID-19 recession impact on the net establishments change became more severe as firm size became smaller. Moreover, how the COVID-19 recession impact on net establishments change came about varied across firm size classes. At very large firms, the entire impact occurred at closing establishments. The very large firms were able to add more opening establishments than pre-COVID. And as firm size decreased, the COVID-19 recession impact on opening establishments worsened. Understanding this heterogeneity is important in having a clear picture of the real damage of the COVID-19 recession and the effectiveness of policies put in place to deal with it.

This article is composed of five sections, each one devoted to a particular measure of monthly business employment dynamics, namely: net establishments change, expanding, opening, contracting, and closing establishments. Each section exposes this firm size heterogeneity in how the COVID-19 recession affected establishments by firm size. Results discussed in each section are summarized in Tables 1 and 2 and Figures 1.

Table 1 gives the COVID-19 recession impact on the count of expanding, opening, contracting, closing establishments, and the net change in establishments by firm size. The impacts by type of establishment capture the establishments that are associated with changes in employment discussed in "Article 2 of 3". However, the COVID-19 recession impact on net establishment change can't be associated to the impact on net employment change in its entirety because of the difference in the definitions of net employment change and net establishments change. While the net employment change is based on employment levels from all four types of establishments, the net establishments change includes only opening establishments and closing establishments. Thus, the statistics (e.g., count of employment or COVID-19 recession impact on employment) related to net employment change cannot be fully assigned to equivalent statistics (e.g., count of establishments or COVID-19 recession impact on establishments) related to net establishments change.

These absolute figures of the initial COVID-19 recession impact on the business dynamic measures are expressed relatively in firm size distributions and shown in Figure 1. Moreover, Table 2 gives different relative measures for

these figures classified by business employment dynamic measure and firm size. For a particular type of establishment, say closing establishments, these relative measures express the initial COVID-19 recession impact on the counts of closing establishments to the baseline level of closing establishments in March-April 2019, to the total number of establishments, and to the net establishments change.

Tables 1 and 2 and Figure 1 form the basis of our discussion about the impact of the COVID-19 recession on the number of establishments by business employment dynamics and firm size. In addition, we will also investigate how COVID-19 affected the pace of job creation at expanding and opening establishments and the pace of job destruction at contracting and closing establishments across firm size classes.

Five size classes are considered in this analysis: very small: 1 to 4 employees, small: 5 to 9 employees, Medium: 10 to 49 employees, large: 50 to 249 employees, and very large: 250 or more employees. Our unit of analysis for the monthly business employment dynamics is the establishment, but the business size class is defined at the level of the firm. (For more detail on methodology see Article 1 of 3).

Figure 1. Firm Size Distribution of Establishments and COVID-19 Impact on Establishments by Businesss Employment Dynamics

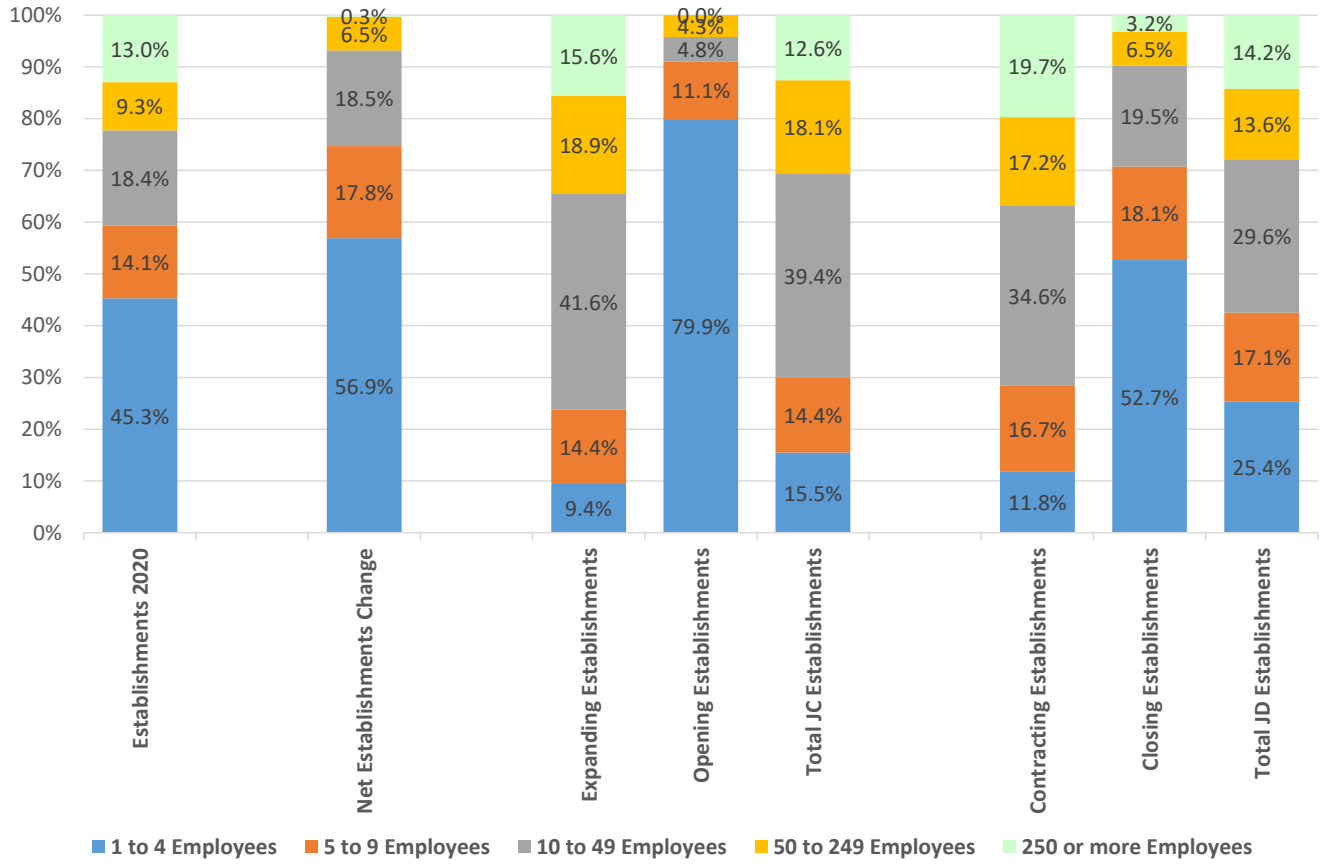

Table 1. Change in Monthly Establishment Levels By Firms Size Class, March - April 2020 Compared to March - April 2019

Firm Size Class		Job Creating Establishments		Job Destroying Establishments		Net Establishments Change
		Expanding Establishments	Opening Establishments	Contracting Establishments	Closing Establishments	
Very Small (1 to 4 employees)	2020	7,285	6,636	8,580	10,767	-4,131
	2019	8,550	7,594	6,097	5,242	2,352
	COVID Impact	**-1,265**	**-958**	**2,483**	**5,525**	**-6,483**
Small (5 to 9 employees)	2020	6,220	881	10,108	2,625	-1,744
	2019	8,160	1,014	6,593	729	285
	COVID Impact	**-1,940**	**-133**	**3,515**	**1,896**	**-2,029**
Medium (10 to 49 employees)	2020	11,154	546	21,132	2,487	-1,941
	2019	16,753	603	13,835	439	164
	COVID Impact	**-5,599**	**-57**	**7,297**	**2,048**	**-2,105**
Large (50 to 249 employees)	2020	5,570	132	11,193	917	-785
	2019	8,119	183	7,577	231	-48
	COVID Impact	**-2,549**	**-51**	**3,616**	**686**	**-737**
Very Large (250 or more employees)	2020	7,420	572	13,914	608	-36
	2019	9,524	274	9,760	271	3
	COVID Impact	**-2,104**	**298**	**4,154**	**337**	**-39**
Total	2020	37,649	8,767	64,927	17,404	-8,637
	2019	51,106	9,668	43,862	6,912	2,756
	COVID Impact	**-13,457**	**-901**	**21,065**	**10,492**	**-11,393**

Source: Author analysis of DEED's Quarterly Census of Employment and Wages.

Table 2. Rates of COVID-19 Initial Impact on Establishments By Business Employment Dynamics and Firms Size Class

Business Employment Dynamics and related statistics	Firm Size (employees)					
	Very Small (1 to 4)	Small (5 to 9)	Medium (10 to 49)	Large (50 to 249)	Very Large (250 +)	Total
Net Establishment Change (NEsC)						
1. Ratio NEsC to establishments (%)	-4.9	-5.0	-4.0	-2.7	-0.1	**-3.9**
Number of Expanding Establishments (NEEs)						
2. Rate of change from March-April 2019 (%)	-15	-24	-33	-31	-22	**-26**
3. Ratio of NEEs to establishments (%)	-1.0	-4.7	-10.5	-9.5	-5.6	**-4.6**
Number of Opening Establishments (NOEs)						
4. Rate of change from March-April 2019 (%)	-12.6	-13.1	-9	-28	109	**-9**
5. Ratio of NOEs to establishments (%)	-0.7	-0.3	-0.1	-0.2	0.8	**-0.3**
6. Ratio of NOEs to NEsC (%)	15	6.6	3	6.9	0	**8**
Number of Contracting Establishments (NCnEs)						
7. Rate of change from March-April 2019 (%)	41	53.3	52.7	48	43	**48**
8. Ratio of NCnEs to establishments (%)	2	9	14	13	11	**7**
Number of Closing Establishments (NClEs)						
9. Rate of change from March-April 2019 (%)	105	260	467	297	124	**152**
10. Ratio of NOEs to establishments (%)	4.2	4.6	3.8	2.5	0.9	**3.6**
11. Ratio of NClEs to NEsC (%)	85	93.4	97	93.1	100	**92**

Source: Author's analysis of DEED's Quarterly Census of Employment and Wages.

Note: Colors indicate COVID-19 impact: most severe least severe

Relationships between ratios: Ratio1 = Ratio5 - Ratio10, R6 + R11 = 100%

1. Net establishments change

As very small firms are the major contributor to net establishments change, they were hit hardest by the COVID-19 recession.

Net establishments change is the difference between opening and closing establishments. When it is positive it indicates that the economy or a sector of it opened more businesses than it closed, and when it is negative the opposite happens: more businesses closed than opened. During March-April 2019, Minnesota enjoyed an expansion in its universe of establishments adding 2,756 new establishments or one percent of total establishments. Then as COVID-19 brutalized businesses in March-April 2020, the state said goodbye to 8,637 establishments or about 3% of total establishments. Thus, the COVID-19 recession caused the state a loss of 11,393 establishments or approximately four percent of total establishments.

Breaking this loss and its two components, the net establishments change in 2019 and 2020, by firm size reveals that firm size heterogeneity is as strong as we discovered with employment (See Article 2 of 3). This heterogeneity was persistent: in pre-COVID, during COVID and consequently in the COVID-19 recession impact on net establishments change.

The first component of the loss involves the disappearance of the normal, yet heterogenous, act of adding new businesses. Examining the net establishments change in March-April 2019 shows that not all firm size classes participated in adding new businesses—the exception was large firms that closed a net of 48 establishments (Table 1). In addition, among the firm size classes that added businesses, all the shares in net new businesses were notably inconsistent with their shares in total establishments. The largest inconsistency was at very small firms that scored the biggest share in net new businesses, contributing 85% of the new businesses added in the state, or 2,352 businesses out of 2,756, while they supplied only 45% of all establishments. Another significant inconsistency was at very large firms which only contributed one-tenth of one percent, or a net of three new establishments, even though they held about one-seventh of total establishments.

The second component of the loss involves the actual reduction in the number of establishments in March-April 2020. As COVID-19 hit and net establishments change went south, all firm size classes participated with a portion uneven to their share in total establishments, except for large firms again. Very small, small, and medium firm size classes each contributed more than their shares in establishments, while the very large firms contributed much less than their share in establishments (only 0.4% compared to 13%). Close to half (48% or 4,131 establishments) of the net losses in establishments happened at the very small firms. An additional two-fifths (42% or 3,685 establishments) of the net establishments losses was shared almost equally between small and medium firms.

Given these intrinsic types of heterogeneity, it is easy to recognize that the combined invisible and visible effects of COVID-19 on establishments is also heterogenous across firm size classes (Figure 1, second stacked bar chart). In fact, nearly three-fifths (57%, or 6,483 out of 11,393 establishments) of the COVID-19 impact on net establishments change evolved at the very small firms, way higher than their share in total establishments. In contrast, the very large firms only contributed three-tenths of one percent (or 39 out of 11,393 establishments), way lower than their share in total establishments. Furthermore, large firms also contributed less than their share albeit not as disagreeing as with the very large firms. Although they account for almost one-tenth of all establishments, they suffered only about one-twentieth of the COVID-19 impact on net establishments change (or 737 out of 11,393 establishments).

This firm-size heterogeneity in COVID-19 impact on establishments can also be seen when we express the impact relative to the population of establishments in each firm size class (Table 2, Ratio 1). According to this metric, COVID-19 impact increased, loosely speaking, in severity as firm size decreased. While it was only one-tenth of one percent for very large firms, it reached one-twentieth for small and very small firms. Thus, both metrics suggest that COVID-19 impact on the count of net establishments was very severe for very small firms,

severe for small firms, moderate for medium firms, mild for large firms, and very mild for very large firms. This heterogeneity will become even more obvious once we peek into how COVID-19 impacted the two components of net establishments change, opening and closing establishments, later in the article.

2. Expanding establishments

The COVID-19 recession not only reduced the count of expanding establishments, but also their job creation capacity.

The first component of net establishments change is opening establishments, but before we analyze opening establishments, we need to consider expanding establishments even though they are not a player in net establishments change. Expanding establishments are the backbone of job creation in Minnesota, however. During March-April 2019, they comprised 84% of the job creating establishments and their two-months cumulative count reached 51,106 establishments that added 82%, or 147,383 jobs, of all jobs created. A year later, the COVID-19 recession diminished their numbers by more than one-fourth (or by 13,457) to 37,649 establishments, which amounted to about five percent of all establishments, and caused them a loss of 41,416 jobs. This reduction in number of establishments, however, doesn't tell the whole story of how COVID-19 affected expanding establishments. In other words, we can't attach the jobs lost at expanding establishments (41,416 jobs) entirely to these 13,457 "would-be" expanding establishments that disappeared.

The missing part is captured by what happened to the expanding establishments' rate of job creation. Indeed, the COVID-19 recession diminished, although slightly, this rate too. While an average expanding establishment added 2.88 jobs in March-April 2019, the rate slowed to 2.81 jobs a year later. While this drop appears tiny (0.07 jobs per establishment), statistically it accumulates to seven jobs lost from a group of 100 average expanding establishments and to 2,608 jobs lost from the 37,649 establishments that expanded in March-April 2020 but at the lower rate than normal. In real terms, the 2,608 jobs constitute six percent of the 41,416 jobs lost by expanding establishments due to the COVID-19 recession. The remaining 94% or 38,808 jobs captures jobs that were lost from the 13,457 expanding establishments that disappeared, each eliminating 2.88 jobs. Therefore, COVID-19 diminished not only the numbers of expanding establishments but also the rate of job creation at the surviving (those that expanded despite COVID-19) ones.

These two sources together give rise to the COVID-19 recession impact on employment at expanding establishments in March-April 2020. This can be succinctly articulated by the following equation:

$$\text{COVID-19 impact on employment} = [\text{COVID-19 impact on expanding establishments}] \times R_{2019} + [R_{2020} - R_{2019}] \times [\text{number of expanding establishments in 2020}] \quad (1)$$

where R_{2019} and R_{2020} denote the rate of job creation at an average expanding establishment in March-April 2019 and 2020, respectively.

The first part in the summation describes the effect on employment that results from COVID-19 reducing the count of expanding establishments. The second part describes the effect on employment that results from the change in the rate of job creation between 2019 and 2020. If the COVID-19 recession was able to do its damage to both the number of establishments and rate of job creation, then these two parts are negative and represent job losses. However, we cannot preclude that even during the pandemic it is possible for either or both of these two effects to be zero or positive if either (or both) the number of establishments or (and) the rate of job creation remained constant or improved, that is $[R_{2020} - R_{2019}]$ is zero or positive. As described above in the case of expanding establishments at the state level, that suffered the double blow of reduced number of establishments and rate of job creation, both effects enter equation 1 with negative signs.

COVID-19 reduced the count of expanding establishments in all size classes with the most damage in medium firms and the least damage in very small firms. Luckily, this double blow of the COVID-19 recession to the expanding establishments did not develop in all firm size classes. The first blow, however, the reduction in numbers of expanding establishments, hit all firm size classes but with different forces. Moving across the firm size distribution, the loss in the count of expanding establishments trace our familiar (seen in Article 2 of 3) inverted-V shaped pattern; that is, rising to a maximum at medium firms then falling back (Table 2, Ratio 2). The very small firms experienced the least damage to their stock of expanding establishments, losing 1,265 expanding establishments which amounted to 15% of their baseline levels of March-April 2019 and one percent of their total establishments. And out of the total loss in expanding establishments, very small firms participated with only nine percent, much less than their share of 45% in total establishments (Figure 1).

Firms in small and very large size classes suffered moderate COVID-19 recession damage to their count of expanding establishments. Their shares in COVID-19 damage and its relative measures are all within reasonable ranges of share in establishments and the respective relative measures of COVID-19 recession damage for all firms. For example, the number of expanding establishments of very large firms dwindled by 22% from their baseline (vs. 26% statewide) and represented 16% of all reductions in expanding establishments (vs. 13% for all establishments). In absolute terms, this translates into a reduction of 2,104 establishments from 9,524 to 7,420 expanding establishments between March-April of 2019 and 2020 (Table 1).

Shifting to serious COVID-19 recession impacts, the most damage occurred at firms that possess the largest number of expanding establishments: the medium firms.
They lost 5,599 establishments, or a third of their baseline stock of expanding establishments that stood at 16,753 establishments in March-April 2019. Viewed from a different angle, these losses represent over one-tenth of all establishments of medium firms, a rate twice as large as that for all firms (Table 2, Ratio 3). Moreover, medium firms contributed more than double their fair share to the total loss in expanding establishments, over two-fifths (42%) even though they only have about one-fifth (18%) of total establishments (Chart 1).

After medium firms, large firms suffered the second most damage to expanding establishments. Large firms lost 2,549 expanding establishments which is nearly a third of their baseline stock of expanding establishments and nearly one-fifth of the total loss in expanding establishments while having only about one-tenth of all establishments. Therefore, most of the COVID-19 damage (61%) to the number of expanding establishments was concentrated among the medium and large firms.

As firm size increases, job creation of expanding establishments increases.
In addition to the effect on the number of establishments, we need to explore how the COVID-19 recession affected the rate of jobs added by an average expanding establishment across firm size. But first, how does this rate differ between different firm size classes? Table 3 lists the rates of job creation per expanding establishment, among other rates, in March-April 2019 and March-April 2020 and the resulting changes between these two periods.

Naturally, there is a sizable difference in the capacity of expanding establishments to create jobs by firm size. In general, as firm size increases job creation intensifies (Table 3, Statistics 1 and 2). For instance, in March-April 2019 an average expanding establishment of very small firms added 1.41 compared to 4.71 jobs at very large firms. And even as COVID-19 hit this monotonic relationship between job creation rate and firm size endured.

COVID-19 only reduced job creation of expanding establishments in very small and very large firms.
Constricting these job creation intensities, the other blow of the COVID-19 recession, occurred only at the very small and the very large firms (Table 3, Statistic 3: which is negative for these two size classes). This constriction was soft at the very small firms but hard at the very large firms. At the very small firms, the COVID-19 recession lowered the number of jobs added by an average expanding establishment to 1.39 jobs, a drop of 0.02 jobs. Applying equation 1 and collecting this small drop from all 7,285 expanding establishments that added jobs at this slower rate in March-April 2020 adds up to six percent of all jobs lost at expanding establishments of very small firms. The other 94% of job losses are attributed to the withdrawal of 1,265 expanding establishments and their ensuing loss of the potential to add 1.41 jobs each.

The reduction in job creation of expanding establishments was intense in very large firms.
The situation is much more somber for very large firms. At these firms, expanding establishments were only able to add 4.32 jobs per establishment when COVID-19 hit, a drop of .39 job from their baseline level. Putting this effect alongside the drop in the count of expanding establishments in equation 1 allows us to comprehend how the COVID-19 recession caused the loss of 12,868 jobs at expanding establishments of very large firms. One cause is attributed to the lower job creation rate experienced during March-April 2020 and responsible for 2,949 jobs lost or 23% of the total. The other one is attributed to the disappearance of 2,104 expanding establishments and consequently their potential average of 4.71 jobs created per establishment piling up to 9,919 jobs or 77% of the total loss.

Table 3. Rates of Job Creation and Destruction By Business Employment Dynamics and Firms Size Class

Business Employment Dynamics and related statistics	Firm Size (employees)					
	Very Small (1 to 4)	Small (5 to 9)	Medium (10 to 49)	Large (50 to 249)	Very Large (250 +)	Total
Expanding Establishments (EE)						
1. Rate of jobs created per EE - 2020	1.39	1.73	2.65	4.23	4.32	2.81
2. Rate of jobs created per EE - 2019	1.41	1.70	2.54	4.18	4.71	2.88
3. Change in rate of jobs created per EE	-0.02	0.03	0.11	0.05	-0.39	**-0.07**
4. Percent change in rate of jobs created per EE	-1.2%	1.5%	4.3%	1.1%	-8.4%	-2.4%
Opening Establishments (OE)						
5. Rate of jobs created per OE - 2020	1.54	4.67	11.07	15.58	7.16	3.03
6. Rate of jobs created per OE - 2019	1.54	4.88	11.26	21.24	16.88	3.30
7. Change in rate of jobs created per OE	0.00	-0.21	-0.19	-5.66	-9.72	**-0.27**
8. Percent change in rate of jobs created per OE	0%	-4%	-2%	-27%	-58%	-8%
Contracting Establishments (CnE)						
9. Rate of jobs destroyed per CnE - 2020	1.34	2.11	4.85	9.82	11.82	6.31
10. Rate of jobs destroyed per CnE - 2019	1.20	1.50	2.12	3.79	4.39	2.69
11. Change in rate of jobs destroyed per CnE	0.14	0.61	2.73	6.03	7.43	**3.62**
12. Percent change in rate of jobs destroyed per CnE	11%	40%	129%	159%	169%	134%
Closing Establishments (ClE)						
13. Rate of jobs destroyed per ClE - 2020	1.72	6.00	15.41	20.54	11.47	5.66
14. Rate of jobs destroyed per ClE - 2019	1.53	5.43	13.10	18.48	14.76	3.76
15. Change in rate of jobs destroyed per ClE	0.19	0.57	2.31	2.06	-3.29	**1.90**
16. Percent change in rate of jobs destroyed per ClE	13%	10.6%	18%	11.2%	-22%	50%

Source: Author's analysis of DEED's Quarterly Census of Employment and Wages.
Note: Colors indicate COVID-19 impact: most severe | least severe | Not an impact

The overall impact of the COVID-19 recession on expanding establishments was softened in small, medium, and large firms through improved job creation rates.
Firms in the middle section of the firm size distribution that includes small, medium, and large firms, oddly, escaped the harm of the COVID-19 recession to the pace of job creation. Surprisingly, these firms saw a gain, on

average, in the number of jobs created per establishment (Table 3, Statistic 3: which is positive for these classes). This gain in the rate of job creation is wonderful news for these firms because it offered a cushion of jobs created that mitigated the overall effect of the COVID-19 recession on the number of expanding establishments. In other words, in equation 1 the term $[R_{2020} - R_{2019}]$ is positive making the second term in the summation positive.

To illustrate this, consider the medium firms where the number of expanding establishments was reduced by 5,599 establishments and the number of jobs lost was 13,116. Normally with an average of 2.54 jobs created per establishment, the resulting total jobs eliminated from the vanished establishments would have been 14,244 jobs. However, the improvement in the number of jobs created per establishment of 0.11 jobs generated 1,128 jobs from the 11,154 expanding establishments present in March-April 2020. Combining these two effects together yields the 13,116 jobs eliminated by the COVID-19 recession from expanding establishments of medium firms. Then, we can attribute jobs lost by expanding establishments of small, medium, and large firms fully to the drop in their count of expanding establishments.

Thus, these results provide further evidence for the considerable heterogeneity in how firms of different sizes responded to the COVID-19 recession through their job creation at expanding establishments[1].

3. Opening establishments

COVID-19 struck the count of opening establishments and their job creation capacity with equal forces.
During March-April 2019, Minnesota had 9,668 opening establishments representing 16% of the job creating establishments and adding 31,936 new jobs. Then, as the COVID-19 recession hit, the state only saw 8,767 opening establishments and 26,548 new jobs in March-April 2020. That is, the state lost 9% or 901 establishments from its baseline level, or establishments that would have opened had the pandemic never started and lost 5,388 new jobs.

In addition, and like what happened to the expanding establishments, the COVID-19 recession trimmed the capacity of opening establishments to add new jobs to the economy, but more forcefully. An average opening establishment was able to add 3.30 new jobs in March-April 2019, but only 3.03 new jobs in March-April 2020. This is a significant drop, and it is behind 45% of the COVID-19 recession impact on employment at the opening establishments. In other words, out of the 5,388 jobs lost at opening establishments, 45% or 2,412 jobs were lost as a result of the lower job creation rate at the 8,767 establishments, and 55% or 2,976 jobs vanished because 901 establishments were withdrawn from the baseline pool of opening establishments. This deconstruction is obtained by adapting equation 1 to opening establishments.

Most of the reduction in the number of opening establishments was in very small firms.
Looking at the distribution of opening establishments and their reactions to the COVID-19 recession by firm size unveils a large degree of heterogeneity. First, most of the COVID-19 impact on opening establishments belong to the very small firms with nearly four-fifths of opening establishments (Figure 1). This leaves only one-fifth for all the other size classes and half of it is in the small firms. In other words, about 90% of the COVID-19 recession impact on opening establishments belong to firms with no more than 10 employees.

Very large firms enjoyed a surge in their numbers of opening establishments.
Second, not all firm size classes reduced their count of opening establishments in March-April 2020. Exceptionally, the very large firms more than doubled their counts of opening establishments going from 274 establishments in March-April 2019 to 572 establishments a year later[2]. Thus, the very large firms were able to add new establishments to the economy despite the hindering forces of COVID-19.

Third, in the other firm size classes that saw declining numbers in opening establishments, the rate of decline was not the same. Although medium and large firms had almost an equal drop in the count of opening

establishments (57 and 51 establishments, respectively), the severity of the decline was incomparable because of the wide difference in their baseline levels. While the medium firms experienced a light fall of only 9%, the lowest rate, the large firms had a strong fall at 28%, the highest rate. In fact, according to the different metrics considered for opening establishments, medium firms were the least affected by the COVID-19 recession (Table 2, Ratios 4 - 6).

On the other hand, the stock of opening establishments of very small firms was the most affected. The rate of decline in their opening establishments was the highest at 0.7% of all establishments more than double the state average of 0.3%. In addition, their share of the drop in the count of opening establishments in the net establishments change was by far the highest of all firm size classes. About 15% of the net establishments change for very small firms was caused by the reductions in their opening establishments.

Fourth, the rate of job creation per opening establishment is significantly different by firm size (Table 3, Statistics 5 and 6). In March-April 2019, it consistently climbed from a low of 1.54 jobs at the very small firms to a high of 21.24 jobs at the large firms before it came down to 16.88 jobs at the very large firms. This configuration was also visible in March-April 2020.

Opening establishments of very small firms maintained their job creation power during the COVID recession and escaped further damage to their employment.
Fifth, not all firm size classes suffered a reduction in the intensity of job creation by opening establishments (Table 3, Statistic 7). One firm size class that escaped this misfortune was the very small firms, which is a fantastic boon given their sizable share in opening establishments. In fact, in this size class the average number of jobs added per opening establishment remained "virtually[3]" constant at 1.54 jobs during March-April of both 2019 and 2020. This means that in equation 1 the factor $[R_{2020} – R_{2019}]$ is zero and the second term in the summation drops out. Therefore, "almost" all jobs lost from opening establishments of very small firms (1,458 jobs) can be attributed mainly to the reduction in the numbers of opening establishments.

Job creation capacity of opening establishments contracted faster as firm size increased from small to very large firms.
Lastly, in the size classes that suffered a reduction in the pace of job creation by opening establishments, this reduction became worse as firm size became larger. At small and medium firms, the rate shrank by only about 0.20 jobs. However, the deceleration in job creation capacity was massive at large and very large firms slowing by 5.66 and 9.72 jobs per opening establishment, respectively.

But how did the very large firms end up suffering only a loss of 529 jobs from opening establishments? They were able to achieve this by increasing the number of opening establishments over their levels of March-April 2019. This allowed them to offset some of the job losses that resulted from the large drop in the rate of job creation. If this was not the case, then the very large firms would have had serious job losses from opening establishments. This is basically what happened at the large firms that made them severely impacted by the COVID-19 recession. They were not able to escape both blows of COVID-19 that resulted in a loss of 1,830 jobs of which 59% were caused by lower numbers of opening establishments and 41% by the lower job creation rate.

Moreover, the increase of opening establishments at the very large firms in March-April 2020 has another softening effect. It made the overall number of opening establishments lost due to the COVID-19 recession a little less dramatic. Excluding the very large firms, the number of opening establishments was reduced by 1,199 "would-be" new businesses in March-April 2020. But, owing to the very large firms that added 298 new businesses on top of their normal levels of March-April 2019 the state only lost 901 "would-be" new businesses in March-April 2020.

Therefore, the two blows sustained by the opening establishments stack more evidence in favor of the inequality in the vulnerability of firms to the damaging forces of the COVID-19 recession. Except for the very large firms, all size classes were not able to keep adding new businesses at the same, normal pace as they did pre-COVID-19. Furthermore, the average number of jobs added per opening establishment was not the same either, it worsened as firm size increased.

4. Contracting establishments

Comparable to the role of expanding establishments in job creation, contracting establishments is where most of job destruction occurs. Of all establishments that cut jobs in March-April 2019, contracting establishments constituted 86%, totaling 43,862 establishments. As COVID-19 hit, the universe of contracting establishments swelled to 64,927 establishments increasing by 21,065 establishments or 48%. Besides brining more establishments to the ranks of contracting establishments, COVID-19 also led to a massive jump in the jobs terminated per average contracting establishment. In fact, in March-April 2020 an average contracting establishment terminated 6.31 jobs compared to 2.69 jobs in March-April 2019. In other words, COVID-19 pushed contracting establishments to cut jobs more than twice as fast as under normal circumstances.

Clearly, driving up the number of contracting establishments and the rate at which they terminate jobs are the main drivers behind the 291,480 jobs lost at these establishments due to COVID-19. How these job losses transpired can be explained by adapting equation 1 above to job destroying establishments.

COVID-19 impact on employment = [COVID-19 impact on contracting establishments] × R_{2020} +

$[R_{2020} - R_{2019}]$ × [number of contracting establishments in 2019] (2)

where R_{2019} and R_{2020} denote the rate of job destruction at an average contracting establishment in March-April 2019 and 2020, respectively.

Aside from the type of establishment considered, equations 1 and 2 are equivalent. However, there are some subtle differences. One difference involves the signs of both sides of equation 2 which are positive whenever COVID-19 leads to higher numbers of contracting establishments and rate of job destruction. The other difference involves the factors entering the terms in the summation. In equation 2, the first term in the summation uses the rate of job destruction in March-April 2020, and the second term in the summation uses the number of contracting establishments in 2019.

Aside from these differences, the interpretation of the two terms is identical. The first term describes the effect on employment that results from the expansion in the count of contracting establishments. The second term describes the effect on employment because of the rise in the rate of job destruction between 2019 and 2020.

Applying equation 2 to the 291,480 jobs lost as a result of the COVID-19 recession impact on employment at contracting establishment shows that 132,879 jobs or 46% were lost at the additional 21,065 establishment each terminating 6.31 jobs and 158,601 jobs or 54% were lost at the 43,862 establishments that each suffered the additional 3.62 jobs over and above the rate of 2019[4]. Thus, the COVID-19 recession impact on employment was almost equally driven by the surges in the numbers of contracting establishments and in the jobs terminated per average contracting establishment.

Most contracting establishments are in medium, large, and very large firms.

Before we analyze how COVID-19 affected contracting establishments by firm size, it is useful to explore how these establishments are distributed by firm size and whether their distribution conforms to the firm size

distribution of all establishments. In March-April 2019, medium and very large firms shared over half of all contracting establishments while they held about one-third of all establishments. Medium firms assumed the highest share (almost a third) of contracting establishments, roughly twice their share in total establishments.

Large firms also participated with a share (17%) that is twice their share of total establishments. Only small firms participated in contracting establishments at a rate (15%) that is commensurate to their share in total establishments. This leaves the very small firms that assumed the smallest share (14%) despite their dominance in total establishments. This distribution of contracting establishments by firm size was almost unchanged under the pandemic in March-April 2020. Therefore, there is significant heterogeneity in the incidence of contracting establishments by firm size. And undoubtedly, this heterogeneity prevails in how COVID-19 affected contracting establishments by firm size.

The COVID-19 recession impact on the number of contracting establishments was strongest in medium firms and weakest in very small firms.

In fact, the COVID-19 recession did not spare any size class from the damage of its two strikes and the damages were not comparable. The first strike, the increase in the number of contracting establishments, was weakest at the very small firms and strongest in the medium firms. Out of the total increase in the number of contracting establishments, the very small firms assumed 12% and the middle firms 35% (Figure 1). These shares are especially noteworthy considering the shares of very small firms and medium firms in total establishments. Furthermore, in terms of total establishments the pace of the increase in contracting establishments was slowest at 2% for very small firms and fastest at 14% for medium firms (Table 2, Ratio 8).

Between these two bounds, the increase in the number of contracting establishments was significant in large and very large firms, accounting for close to two-fifths of the total COVID-19 impact. Additionally, their rate of increase in the number of contracting establishments were remarkably high at 13% and 11% in large and very large firms, respectively, compared to 7% for all firms. Thus, as more establishments were forced to join the ranks of contracting establishments in all size classes, the pace was much faster at medium, large and very large firms than at small and very small firms. And this suggests that COVID-19 impact on raising the number of contracting establishments was very severe at medium firms, severe at large and very large firms, moderate at small firms, and very mild at very small firms.

The rate of job destruction per contracting establishment increases with firm size and the COVID-19 recession expanded this rate at an increasing pace with firm size.

Next, we consider how the COVID-19 recession transformed the rate of job destruction of each firm size, but before that let's review how job destruction varies across firm size classes. Just as we discovered with the rate of job creation of expanding establishments, the relationship is monotonic here too, as firm size increases, job destruction increases in both periods pre-pandemic and amidst the pandemic (Table 3, Statistics 9 and 10). For instance, during March-April 2019, job destruction at an average contracting establishment varied from a low of 1.20 jobs at the very small firms to a high of 4.39 jobs at very large firms.

And as COVID-19 attacked, many firms reduced their workforces, but they did it with increasing rates as firm size increased (Table 3, Statistics 11 and 12). The rate of job destruction at an average contracting establishment increased by only 0.14 jobs (or 11%) at very small firms while it swelled by 7.43 jobs (or 169%) at very large firms. This means that the COVID-19 recession inflated the rate of job termination at significantly different rates between firms of different sizes and these inflation rates increased monotonically with firm size.

Of course, these divergent effects of the COVID-19 recession, both in numbers of establishments and rates of job destruction, on firms of different sizes emerge in how the damage to employment progressed in each firm size class. Making use of equation 2, the ratio of these two causes changed dramatically and monotonically by firm size. For very small firms that lost 4,126 jobs due to the COVID-19 recession, 80% of these jobs were caused

by the additions of contracting establishments over the baseline of March-April 2019 and 20% were caused by the jump in the rate of job destruction over the baseline level; thus, a ratio of 80:20. As firm size increased, the extent of job destruction shifted from the higher numbers of contracting establishments to the higher rates of job destruction, yielding ratios of 65:35, 48:52, 44:56, and 40:60 for small, medium, large, and very large firms, respectively. Thus, not only firm size made a large difference in the severity of COVID-19 damage to contracting establishments, but it also made a sharp contrast in how job destruction evolved due to the inherent firm size heterogeneity in job destruction.

5. Closing establishments

Our last type of establishment is the closed establishments. The COVID-19 recession drove the count of closed establishments to increase by an astounding factor of 1.52, three times what happened to contracting establishments, and was responsible for the closure of 10,492 establishments representing 92% of COVID-19 impact on net establishments change and eliminating 72,452 jobs. Furthermore, the COVID-19 recession worsened the pace at which jobs were eliminated per average closing establishment, raising it by 1.90 jobs from 3.76 jobs in March-April 2019 to 5.66 jobs in March-April 2020. Using these rates and adapting equation 2 to closing establishments allows us to break the 72,452 jobs lost by their origins. In fact, 82% or 59,338 jobs were terminated by the additions of 10,492 closed establishments at the higher job destruction rate, and 18% or 13,114 jobs were terminated because of the jump in the rate of job destruction over the baseline level.

Over half of the COVID-19 recession impact on closing establishments was in very small firms.

As we have seen with the previous three types of establishments, the distribution of the impact of the COVID-19 recession on closing establishments by firm size is very closely related to the firm size distribution of closing establishments. So, more than half of the closing establishments and the COVID-19 impact on closing establishments belonged to the very small firms. And considering small and medium firms too, about 90% of the closing establishments and the COVID-19 recession impact occurred at these three firm size classes. Surprisingly, the very large firms only accounted for 3% of all closing establishments and the COVID-19 recession impact on closing establishments (Figure 1).

The severity of the COVID-19 recession on counts of closing establishments by firm size varied depending on metric considered.

Further evidence on the firm size heterogeneity in COVID-19 recession impact on closing establishments is revealed through our three metrics (Table 2, Ratios 9 – 11). The first metric, a ratio of the COVID-19 impact on closing establishments to the baseline number of closing establishments, shows that medium firms were severely hurt as their counts of closing establishments swelled by 465% from 439 to 2,487 closing establishments. And relatively, the least impacted firms were very small and very large firms that saw their counts of closing establishments more than doubled.

Looking at the COVID-19 recession impact on closing establishments from another dimension, relative to all establishments or the second metric, indicates that small firms were closing establishment at the highest clip of 4.6% compared to 3.6% for all firms. In addition, very large firms were by far the least affected closing only about one percent of their establishments (Table 2, Ratio 10). Finally, the third metric, COVID-19 impact on closing establishments out of total COVID-19 on net establishments change, indicates that all of the COVID-19 recession impact on net establishments came from closing establishments at very large firms. Conversely, at the very small firms, closing establishments contributed the lowest portion (85%) to total COVID-19 impact on net establishments change (Table 2, Ratio 11). Thus, although these metrics provide different orderings on the severity of the COVID-19 recession impact on hiking the number of closing establishments, generally the impact was severe at medium and small firms, moderate at large, moderate at small firms, and mild at very small and very large firms.

The COVID-19 recession also impacted and in varying degrees the rate at which closing establishments terminated jobs. But first let's examine how job destruction operates across firm size. The rate of job destruction per closing establishment is significantly different by firm size (Table 3, Statistics 13 and 14). Generally, it is lowest at very small firms and increases as size class increases up to large firms then it drops for very large firms. We have seen this configuration before with opening establishments. For instance, during March-April 2019 an average closing establishment terminated 1.53 jobs at very small firms and 18.48 jobs at large firms.

Closing establishments of very large firms lowered their job destruction despite COVID.
As COVID-19 forced some establishments to close their doors, not all firm size classes suffered a jump in the rate of job destruction by closing establishments (Table 3, Statistic 15). Amazingly, the very large firms escaped the COVID-19 strike to job destruction and witnessed a drop in their rate of job destruction from 14.76 to 11.47 jobs in March-April of 2019 and 2020, respectively. This, of course, softened the impact of the COVID-19 recession on terminated jobs from closing establishments of very large firms and explains why they suffered the smallest number of jobs terminated (2,977 jobs). The added 337 closing establishments due to the COVID-19 recession terminated 3,867 jobs at the lower rate of 11.47, but the slowdown in the job destruction rate provided for a reduction of 890 jobs in jobs terminated from the baseline count of closing establishments (applying equation 2).

In the other four size classes that saw jumps in the rate of job destruction, COVID-19 pushed it at different rates. The highest jump occurred at the medium firms that suffered an increase of 2.31 jobs or 18% while the lowest jump was 0.19 jobs in very small firms or 13%. And considering how these changes in the rate of job destruction affected employment, we find minor differences between firm size classes. Out of the COVID-19 impact on employment, between 3% and 10% is attributed to the higher rate of job destruction and the remainder is coming from the jump in the count of closing establishments.

Thus, firm-size heterogeneity was also a determinant factor in how COVID-19 affected closing establishments. Except for the very large firms, all size classes sustained, although with different intensities, jumps in both the number of closing establishments and the rate of job destruction. The strongest CVOID-19 impact was inflicted on medium firms and weakest on very small firms.

Most of the closed establishments were very small.
As these COVID-19 impacts are related to firm size, it is worthwhile to also explore the size distribution of the closing establishments. Table 4 shows how closed establishments were distributed across firm size classes. Several results from Table 4 are worth mentioning. First, almost all (99%) of closed establishments due to COVID-19 were very small or small or medium, i.e., with 1 to 49 jobs. And about three-fifths of closed establishments were very small, much higher than their share in total establishments (45%). Second, not all very small closed establishments belonged to very small firms. In fact, about 7% of very small closed establishments were in the other four firm size classes with half in the very large firms.

Third, the correspondence between firm size and establishment size of closing establishments is strong only at very small, small, and medium firms. As expected, all closing establishments in the very small firm size class are themselves very small. Most of the closing establishments are of the same size as their firms in the small and medium firm size classes. However, as firm size gets bigger in the large and very large size classes, the correspondence between firm size and establishment fades with firm size. Closing establishments that belong to the same size class as their firms accounted for 21% and only 1% in large and very large firms, respectively.

Fourth and lastly, most of the closing establishments in the very large firms were very small. Out of the 337 closing establishments attributed to COVID-19, three-fifths were very small. Furthermore, only three percent of the closing establishments in the very large firms were large or very large.

Table 4. Change in Closing Establishments By Firms and Establishment Size Classes, March - April 2020 Compared to March - April 2019

Firm Size Class (Employees)		Establishment Size Class (Employees)					
		Very Small (1 to 4)	Small (5 to 9)	Medium (10 to 49)	Large (50 to 249)	Very Large (250 or more)	Total
Very Small (1 to 4)	2020	10,767	0	0	0	0	10,767
	2019	5,242	0	0	0	0	5,242
	COVID Impact	**5,525**					**5,525**
		100%					100%
Small (5 to 9)	2020	29	2,596	0	0	0	2,625
	2019	7	722	0	0	0	729
	COVID Impact	**22**	**1,874**				**1,896**
		1%	99%				100%
Medium (10 to 49)	2020	116	122	2,249	0	0	2,487
	2019	35	12	392	0	0	439
	COVID Impact	**81**	**110**	**1,857**			**2,048**
		4%	5%	91%			100%
Large (50 to 249)	2020	207	247	276	187	0	917
	2019	90	51	48	42	0	231
	COVID Impact	**117**	**196**	**228**	**145**		**686**
		17%	29%	33%	21%		100%
Very Large (250 or more)	2020	342	96	143	21	6	608
	2019	141	36	77	14	3	271
	COVID Impact	**201**	**60**	**66**	**7**	**3**	**337**
		60%	18%	20%	2%	1%	100%
Total	2020	11,461	3,061	2,668	208	6	17,404
	2019	5,515	821	517	56	3	6,912
	COVID Impact	**5,946**	**2,240**	**2,151**	**152**	**3**	**10,492**
		57%	21%	21%	1%	0%	100%

Source: Author analysis of DEED's Quarterly Census of Employment and Wages.

Conclusions

This article discussed how the COVID-19 recession impacted Minnesota businesses of different size classes using monthly business employment dynamics. Some of the main conclusions are:

- There is significant firm size heterogeneity in how firms responded to the pandemic during its first two months.
- In terms of net establishments change, the COVID-19 recession impact on the count of establishments was very severe for very small firms, severe for small firms, moderate for medium firms, mild for large firms, and very mild for very large firms.
- COVID-19 diminished not only the numbers of expanding establishments but also their rate of job creation. Very small firms were least impacted from both effects. Strongest COVID-19 impacts on the numbers of expanding establishments were in medium firms and on the rate of job creation was in very large firms.
- Similarly, COVID-19 diminished not only the numbers of opening establishments but also their rate of job creation. Strongest COVID-19 impacts on the numbers of opening establishments were in very small firms and weakest impact on medium firms. The COVID-19 impact on rate of job creation by opening establishments became worse as firm size became larger.
- COVID-19 caused jumps in both the numbers of contracting establishments and the rate of job destruction. COVID-19 impact on raising the number of contracting establishments was very severe at medium firms, severe at large and very large firms, moderate at small firms, and very mild at very small firms.

- The COVID-19 impact on rate of job destruction by contracting establishments became worse as firm size became larger. And as firm size increased, the extent of job destruction shifted from the higher numbers of contracting establishments to the higher rates of job destruction.
- Similarly, COVID-19 caused jumps in both the numbers of closing establishments and the rate of job destruction. The strongest impact was at medium firms and weakest impact on very small firms.
- Most of the closing establishments were very small. And most of the closing establishments at very large firms were very small.

These results underscore that while average or overall measures are important to have a general appreciation of how COVID-19 (or any other shock) impact employment, understanding heterogeneity (how different businesses, as by size, are affected) is important in having a clear picture of the real damage of the shock and the effectiveness of policies put in place to deal with it. The business employment dynamics uncover the many variation that are inherent in the labor market and are missed in the standard measures such as net employment change. Moreover, these variations are certainly driven by further heterogeneity in other factors, such as industry, occupations, wages, race and gender of the workforce, access to capital, among others.

Assessing the Initial Impact of the COVID-19 Recession on Minnesota Businesses: Executive Summary

A Note on the Methodology Used to Assess the Initial Impact of the COVID-19 Recession by Firm Size Class (1 of 3)

Assessing the Initial Impact of the COVID-19 Recession on Employment by Firm Size Class (2 of 3)

Assessing the Initial Impact of the COVID-19 Recession on Establishments by Firm Size Class (3 of 3)

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[1] Note that here we are talking about the rate of job creation at an average firm. A better and comprehensive but intensive approach would develop this rate from an analysis of job creation at each establishment.

[2] Table 1 shows that COVID-19 effect on opening establishments of very large firms is a (positive) 298 establishments. Clearly, it can't be an impact, nevertheless we'll call it a misnomer.

[3] If we increase the numbers' precision one degree of magnitude, then the jobs created by an average opening establishment of very small firms increased from 1.540 to 1.542 between March-April 2019 and 2020.

[4] The first term in equation 2 that captures the effect on employment resulting from the expansion of contracting establishments includes a portion that is due to the joint effect of higher number of contracting establishments and higher rate of job destruction. However, for simplicity sake the joint effect is assigned to the higher number of contracting establishments where their effect on employment is evaluated at the higher rate of job destruction.