

**THE DISTRIBUTION OF OCCUPATIONAL RISK DURING THE COVID-19 PANDEMIC: EVIDENCE
FROM THE REOPENING OF AUBURN UNIVERSITY**

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Abstract

We study the distribution of the risk of COVID-19 infection across instructors following the resumption of on-campus instruction at Auburn University during the 2020-2021 academic year. Although Auburn University did not implement a social distancing policy in the classroom, it did enforce an enrollment limit of 50% of normal classroom capacity. Our risk measure is constructed by comparing the actual enrollment in classes to the maximum number of students a classroom can hold and still maintain (CDC recommended) six feet of social distance. We find that approximately half of the face-to-face classes have enrollments that exceed the CDC social distancing capacity. In about one in five face-to-face classes, there are more students than twice the CDC capacity. Women and non-white instructors are more likely to teach in risky classrooms compared to their male and white colleagues, respectively. Instructors who hold higher ranks within the University hierarchy, such as the administrators, tenured and tenure-track professors, and staff, deliver their courses in safer classrooms relative to the contract instructors, graduate student instructors, and lecturers. Although the precautions taken by the University increased the share of CDC-compliant classes by 10-15 percentage points, these benefits were distributed unequally among the instructors. The greatest reductions in risk accrued to the white instructors and those of higher rank at the University, such as the administrators, staff, and professors. We also present a model that shows how the University could have benefitted at the expense of instructors by not widely advertising information on safe room capacities to the instructors.

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I. Introduction

The COVID-19 pandemic laid enormous burdens upon the financial, physical plant, and human resources of universities. The decision to return to campus continues to generate heated debate at colleges across the United States among faculty, administrators, students, civic leaders, and parents.¹ While universities are often the source of economic growth for their communities (see, e.g., Lane and Johnstone 2012; Goldstein and Drucker 2006), the concentration of students in many college towns led to those areas becoming hot spots for virus transmission during the early days of the pandemic.²

The U.S. Center for Disease Control’s (CDC) COVID-19 guidelines for university operations outline key policy considerations for testing, social distancing, and contact tracing.³ With respect to on-campus activities and social distancing, the CDC categorizes different strategies from “least” (no in-person learning) to “highest” (e.g., in-person classes and campus gatherings with no social distancing and/or mask requirements) risk.⁴ State governments have also instituted their own COVID-19 guidelines for university re-openings. For example, on May 21, 2020, Alabama Governor Kay Ivey issued a “Safer at Home” order, with specific instructions for the resumption of on-campus activities at the state’s universities.⁵ With respect to social distancing, the order states: “Schools *shall* take reasonable steps, where practicable, to maintain six feet of separation between persons of different households [emphasis added].”

Despite the Governor’s order, Auburn University’s plan to return to face-to-face instruction did not include any policy about maintaining a six feet distance between students within the classrooms. Instead, the University set an enrollment limit of 50% of the normal seating capacity in classrooms designated for the face-to-face teaching modality. In addition, no strict policy beyond the 50% limit concerning social distancing in the classroom was initiated. For example, there were no requirements for classrooms to have marked seating, no requirement for removal of seating, and professors are not allowed to enforce social distancing in their classes. Auburn returned to in-person instruction during the Summer of 2020 and has increased in-person instruction to approximately 73% of classes in Spring 2021. This is an increase from 12% in Fall 2020, and it reflects the University’s push toward more in-person classes in this academic year.

The University, through the Office of the Architect’s surveys of the classrooms, established the number of students that can be safely seated in each classroom. Specifically, these Classroom Capacity Analyses determine the maximum allowable enrollment to still maintain 6 feet of social distance, conditional on a room’s geometry and seating arrangement. The studies were conducted

¹ For an example, consider the discussions around the reopening of University of Florida and its [coverage in the local media](#).

² For more details, see [the New York Times’ COVID-19 tracker](#).

³ [Link to the relevant CDC web page](#).

⁴ [Link to the relevant CDC web page](#).

⁵ See Governor Ivey’s May 21st, 2020 “[Safer at Home Order](#).” Specifically, point 13 relates to universities. Also, see Governor Ivey’s January 21, 2021 [extension](#) of the order until March 5, 2021.

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at various times in mid to late 2020 and were completed in the first week of January 2021.⁶ We evaluated the “50% of the normal seating capacity” policy of the University by comparing it to the actual safe capacity in each classroom. Our analysis shows that setting a limit of half of the normal capacity causes 80% of all classrooms to be risky, in that the six feet separation between the students is not possible when all registered students attend. Despite the fact that this information was known before the Spring 2021 semester started, the University did not change its capacity policy in that semester. This, together with the University’s push for more in-person instruction, led a significant number of instructors to deliver their classes in risky classrooms.

We examine the distribution of this risk borne by the instructors who taught in-person classes during the reopening of Auburn University. Unlike other studies’ COVID-19 risk measures that use aggregate statistics of observed infections per capita, our metric proxies the risk of infection at a highly granular level. Specifically, we can objectively measure a classroom’s safe capacity, i.e., allowing six feet of social distancing between students and the number of students enrolled in that class. The number of registered students above or below the safe capacity is the basis of our risk measure.

We construct a rich data set from publicly available information, such as the University’s course schedule that is announced on its website, the salary/title database of its employees, and the studies of the classroom capacities from the Office of the University Architect. We identify the sex and race of the instructors using their first and last names. All of these data allow us to construct a number of risk measures. For example, we categorize classes as *Safe Classes*, *Risky Classes*, and *Very Risky Classes*. The number of students in *Safe Classes* is smaller than the safe capacity, i.e., the maximum number of students to maintain six feet of social distancing. *Risky Classes* contain more students than the safe capacity but less than twice the safe capacity. *Very Risky Classes* include those with at least twice as many students as the safe capacity. Note that *Very Risky Classes* produce a significant risk to the health of instructors and the students. This is because the number of students in the classroom would exceed the safe capacity even if the instructor splits the students into two groups and rotates their attendance on different days of the week.

We would like to highlight that the CDC claims 6-foot social distancing is *extremely important* in order to reduce the spread of COVID-19 infection. According to the CDC website, 6-foot social distancing is one of the three important ways to slow the spread of COVID-19, along with wearing a mask and avoiding crowds. According to the CDC, “COVID-19 spreads mainly among people who are in close contact (within about 6 feet) for a prolonged period. Spread happens when an infected person coughs, sneezes, or talks, and droplets from their mouth or nose are launched into the air and land in the mouths or noses of people nearby. The droplets can also be inhaled into the lungs. Recent studies indicate that people who are infected but do not have symptoms likely also play a role in the spread of COVID-19. Since people can spread the virus before they know they are sick, it is important to stay at least 6 feet away from others when

⁶ Particularly, surveys of approximately 110 classrooms were conducted before the Fall 2020 semester began. The University then stopped registering these surveys until late November. The full set of classroom studies were completed in the first week of January before the Spring 2021 semester began.

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possible, even if you—or they—do not have any symptoms. Social distancing is especially important for people who are at higher risk for severe illness from COVID-19.” Recently, the CDC issued advice regarding operational strategies for school re-openings. Among the first mitigation strategies listed to reduce the spread of COVID-19 in schools, immediately following universal mask-wearing, is the social distancing of at least 6-feet.⁷

Our preliminary results from a descriptive analysis suggest that approximately half of the face-to-face classes that were taught in Fall 2020 and Spring 2021 have enrollments that exceed the maximum for safe social distancing. About 20% of these face-to-face classes are *Very Risky*, presenting a potential risk to the health of instructors and students. Female instructors and Non-White instructors are more likely to be placed in riskier classes compared to their Male and White counterparts, respectively. Contract instructors, graduate student instructors, and lecturers were assigned the vast majority of COVID-19 risk in contrast to University administrators and tenure-track professors. We also find that although the University’s “half of the normal seating capacity” policy and the potential reorganization of the classes in the 2020-2021 academic year did not completely eliminate COVID-19 exposure risk, they helped reduce it. However, the reductions in risk concentrated on certain groups. For example, the White instructors benefitted more than their Non-White colleagues. Similarly, the risk in the classes taught by the instructors who are also administrators, staff members, and tenure-track professors is reduced by a larger extent than the risk in classes delivered by the instructors, lecturers, and the GTAs. Our findings suggest that *the larger burden of the COVID-19 pandemic is borne by the more vulnerable at Auburn University, and the COVID-19 policies of the University may be favoring some more than others.*

Our paper contributes to recent literature in the study of institutions, such as Acemoglu and Robinson (2008), as we are able to study the disaggregated behavior of elites in the allocation of health risk. Our findings are also consistent with past research, which argues that in extreme risk situations, such as those that involve life-and-death, the preferences of elites are expressed in the aggregate outcome (see Frey, Savage, and Torgler 2011).

Our paper also contributes to the new and growing literature on the distribution of occupational risk associated with COVID-19. Consistent with our findings, other recent studies demonstrate that this risk to be skewed toward females, minorities, and other disadvantaged groups. For example, in a recent working paper, Baylis et al. (2020) document COVID-19 risk for the Canadian population and find that women and the low educated bear a disproportionate amount of the risk. In another recent working paper, Chernoff and Warman (2020) find occupations held by females with mid to low levels of wages and education to be at the highest risk of viral infection and potential for automation. Another recent working paper by Mongey, Pilossoph, and Weinberg (2020) shows that workers in high-physical proximity jobs, which are also more economically vulnerable during the pandemic, tend to be less educated, of lower-income, have fewer liquid assets relative to income, and are more likely to be renters. Similar findings have been underlined consistently in fields outside of economics (Hawkins 2020; Hawkins 2020; Tai 2021; Yancy 2020)

⁷ See the CDC’s [COVID-19 web page](#), [Information Social Distancing](#), and [Operational Strategy for K-12 schools](#).

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and by popular media.⁸ In short, our preliminary findings offer a glimpse into what appears to be a widespread phenomenon.

Our paper is distinct from these contemporaneous working papers in two aspects. First, unlike these past studies that investigate the distribution of risk at an aggregate level, we are able to look into the hierarchy within one large organization. As a result, our findings are free from a potential bias that may arise due to heterogeneity in the attributes of the localities, industries, and occupational roles of those at risk. Second, ours is the first study that investigates the distribution of COVID-19 risk in the public sector.

Because of a number of reasons that we detail in the Institutional Background section, the majority of the instructors likely had a misperception of the risk of COVID-19 exposure. For example, instructors did not know the safe capacity of the classrooms to which they were assigned, as this information, to our knowledge, was not advertised by Auburn University until late in the Spring 2021 semester. Presumably, an instructor might have thought that she/he would be teaching in a safe classroom assigned by the chair of her/his department. However, as suggested by our descriptive analysis, the actual risk she/he is facing was greater than the perceived risk. In the second part of our paper, we present a simple model and describe the potential welfare losses associated with this misperception of the risk. The model implies that this misperception of risk by the instructors may have resulted in benefitting the University at the expense of the instructors.

The remainder of the paper is organized as follows: Section II provides the institutional background. Section III describes our data and its sources. In Section IV, we detail our empirical analysis. Section V discusses the theoretical framework, and Section VI concludes.

II. Institutional Background

Auburn University is a public R1 research university located in Auburn, Alabama. Originally established in 1856, the University comprises 206 academic buildings on 1,841 acres and has an undergraduate student population of about 24,500. It has over 5,000 full-time employees, of which administrative/professional personnel make up about half, faculty personnel make up about a quarter, and staff personnel the remaining quarter.⁹

During the Spring 2020 semester, the University ceased on-campus instruction following Spring Break, as the state of Alabama entered a mandatory lockdown period.¹⁰ During the Summer of 2020, preparations began to resume in-person instruction, with the goal of providing students as much face-to-face instruction as was safely possible.¹¹ Despite these preparations, within a few

⁸ See examples from popular outlets such as the [New York Times](#), [USA Today](#), and the [Wall Street Journal](#).

⁹ The details of these statistics can be found in this [link](#).

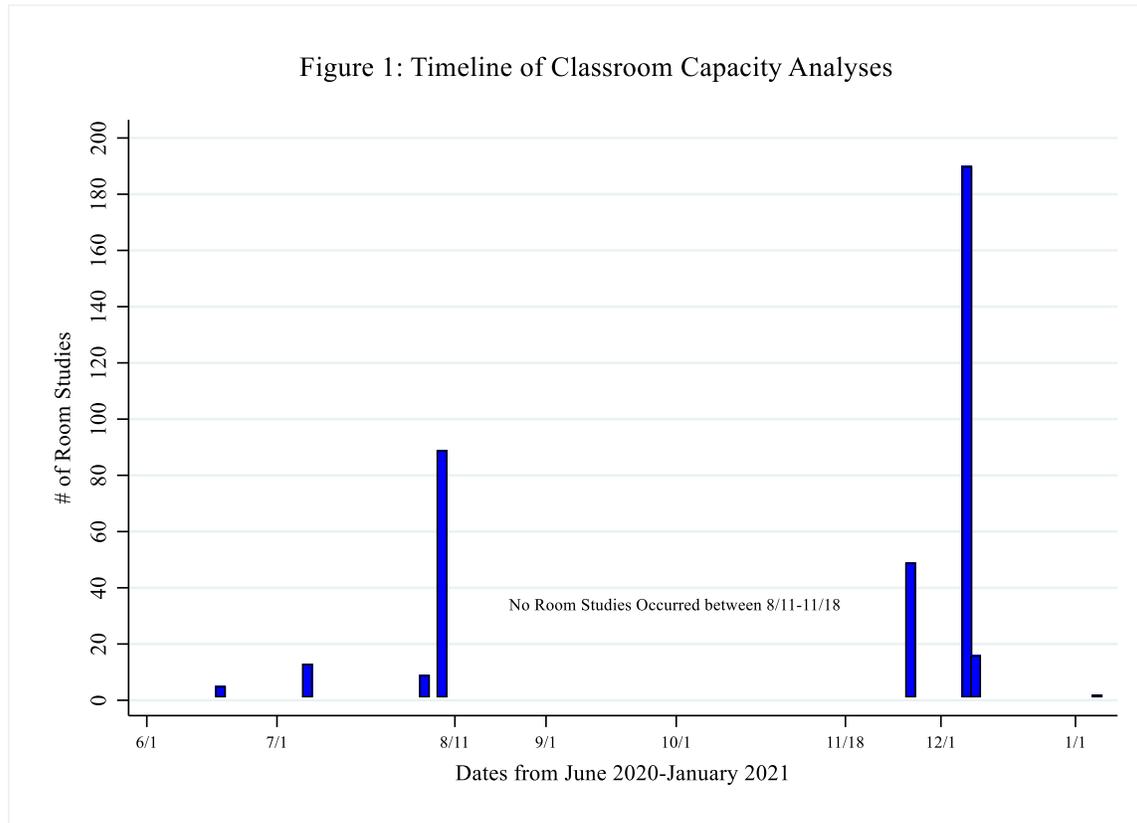
¹⁰ See the Governor's [Stay at Home Order](#).

¹¹ These considerations were discussed in the [University Senate's meeting on June 16, 2020](#).

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weeks of the start of the Fall 2020 semester, Auburn University’s main campus experienced a large number of COVID-19 cases, 1,074, the fourth largest in the country.¹²

As part of its preparation for in-person teaching, in mid-June, the University started conducting surveys of its classrooms to determine their safe capacities. The timeline of these studies is depicted in Figure 1, which shows the number of classroom studies by week, according to the date stamps on the documents.



Notes: The blue bars tally the number of Classroom Capacity Analyses which were conducted by the Office of the University Architect each week between June 2020 and January 2021. All studies were completed as of January 6, 2021.

It is important to note that the full set of room studies were completed only prior to the beginning of the Spring 2021 semester, not before the start of the Fall 2020 semester.¹³ The

¹² This is based on [an analysis that appeared in the popular media](#). Also see [Auburn University historical data on infections](#).

¹³ It is possible that the decision by the University administration to forgo the 6-foot social distancing policy in the classroom is informed by measurements taken on a subset of classrooms during the Summer of 2020. For example, in a faculty meeting in late-October, an administrator who is responsible for the management of facilities suggested that “*In a classroom with fixed seating, the 6 feet recommendation is difficult to handle and still meet capacity needs. Movable furniture is easier to make work. We are working on this.*” Our data show that 105 out of the 114 classrooms, for which a study was available at the time of that meeting, hosted a class size above the safe capacity in Fall 2020. In Appendix Table A1, we list the ten classrooms that had the largest number of classes above the safe capacity in Fall 2020.

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timeline in Figure 1 also shows that the classroom studies stopped on August 11 before the Fall 2020 semester began, and they restarted near the end of the Fall semester (November 18).¹⁴ These classroom studies were not advertised to the campus community until the end of January 2021, in a weekly COVID update email, well after the start of the Spring 2021 semester.¹⁵ Given this timeline, it is likely that instructors had some misperception about the risk they were assigned. In Section V below, we analyze the welfare losses associated with such misperception of the risk.

Another important institutional detail that is relevant to our study is the University's push toward in-person instruction in Spring 2021. Specifically, instructors were urged to use a face-to-face modality in the spring unless they had an underlying condition that made them vulnerable to COVID-19 infection or they had strong pedagogical reasons.¹⁶ A number of instructors opted out of in-person teaching, but our analysis shows that the proportion of classes taught in-person increased drastically, from 12% in Fall 2020 to 73% in Spring 2021.¹⁷ Due to this push and the ineffectiveness of the University's classroom social distancing policy, a significant number of classes are taught in risky or very risky rooms. In the following sections, we study the distribution of this risk among the instructors.

III. Data

We compiled a data set from a number of publicly available sources. First, we obtained course information from the Dynamic Schedule on Auburn University's website. Specifically, from the Dynamic Scheduler, we gathered information about the course code (e.g., ECON), level (e.g., 2020), the college with which it is associated, its instructor of record, the classroom in which it is taught (e.g., Lowder Hall 125A), the capacity of the class, i.e., the maximum number of students that could enroll as allowed by the University, and the actual number of students registered for the class. Importantly, information about the mode of delivery (modality) was available for the classes listed in the Dynamic Schedule. These modalities were face-to-face (F2F), F2F flexible,

¹⁴ We investigated the reason behind the this stop and the abrupt restart of surveys, but we were unable to understand the rationale. It is noteworthy that the classroom surveys restarted on November 18, 2020, one day after the announcement by the University Senate that in an upcoming general faculty meeting, a vote of no-confidence in the Provost would be held. Supporting documents are available upon request.

¹⁵ The studies first appeared on a university web page on December 18, 2020. Nonetheless, anecdotal evidence suggests that instructors were largely unaware of them.

¹⁶ Instructors could choose between two F2F options for the Spring 2021 semester: F2F required or F2F flexible. F2F required courses are traditional F2F formats whereby student attendance is mandatory. For F2F flexible courses, student attendance is expected by the instructor, but the instructor may grant leniency if the student is not able to attend. Further information regarding Spring 2021 modalities can be found at this [web page](#).

¹⁷ When planning their courses for the Fall 2020 semester, instructors were allowed some leeway. Specifically, they were asked to choose the modality that they think best aligns with the course objectives. According to the instructors, in Fall 2020, only 12% of the classes were best taught with an in-person modality. The fact that the share of in-person classes increased dramatically suggests that some of the classes taught F2F in Spring 2021 are not delivered with the optimal modality. Further information regarding Fall 2020 modalities can be found at this [web page](#).

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F2F required, online, HyFlex, blended, blended flexible, blended required, and distance learning. Classes with a F2F component are the focus of this study.

We define a class as a section of a course. In total, we acquired information about 9,025 undergraduate classes (less than 5000-level) in Fall 2020 and Spring 2021 combined.¹⁸ We restrict our attention to the classes whose type is Combined Lecture and Lab, Combined Lecture and Studio, Laboratory, Lecture, Practicum, and Studio.¹⁹ After dropping classes with a delivery method that was not listed or could not be determined, our working data set is left with 6,609 classes. Table 1 presents the distribution of these classes by their modality:

Table 1: Distribution of Classes by Modality in 2020-2021 Academic Year

	Fall 2020	Spring 2021
N: # courses	N=3,433	N=3,176
F2F (Flexible Excluded)	11.51%	45.56%
F2F (Flexible Included)	11.51%	73.14%
Online	35.86%	18.26%
Mixed (HyFlex, Blended)	52.64%	8.60%

Notes: F2F (Flexible Excluded) is the share of traditional F2F classes whereby in-person attendance is mandatory. F2F (Flexible Included) is the share of all F2F classes, including those whereby in-person attendance is flexible. F2F Flexible courses were initiated for the Spring 2021 semester. Online courses are those which take place solely online. Mixed courses employ a mix of in-person and online formats.

About 11.5% of all classes in Fall 2020 are delivered with a F2F modality. In Spring 2021, the University separated F2F classes into two groups: F2F required and F2F flexible. The proportion of classes taught F2F required in Spring 2021 increased to 45.5%. When F2F flexible classes in Spring 2021 are accounted for, this share increases to 73%. Classes taught with a purely online modality decreased from 36% to 18% from Fall 2020 to Spring 2021. The share of classes delivered in mixed modalities (such as HyFlex and Blended) also decreased from over 50% to less than 10%.

The changes in the distribution of class modalities from Fall 2020 to Spring 2021 reflect the University's directive to deliver more of the courses in person. The University administration required all instructors to teach their classes in pre-pandemic modalities unless they have an exceptional medical excuse or a compelling pedagogical counter reason. Statistics presented in Table 1 suggest that a vast number of instructors who taught their classes with an online or blended modality in Fall 2020 switched to a F2F modality in Spring 2021.

The second source of our data is the Office of the University Architect. From that office, we obtained Classroom Capacity Analyses, which were conducted between June 2020 and January

¹⁸ We dropped graduate classes (7,391) from our analysis.

¹⁹ This restriction leaves out research, independent study, thesis and dissertation classes, as well as special topic, distance education, internship, and field experience classes.

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2021.²⁰ These studies examine the geometric and spatial characteristics of each classroom and determine the number of students that can fit in each classroom and maintain the CDC prescribed six-foot social distance from the nearest student. To our knowledge, we obtained each and every classroom study that was conducted. For some classrooms for which no study was performed, we do not have an estimate for the number of students that can attend the class safely. Nevertheless, we could match 4,143 classes with the CDC capacities of their classrooms listed in Dynamic Scheduler.

We compared these CDC classroom capacities with the actual number of students enrolled in the classes, and we categorize these classes into three groups according to whether the number of enrolled students surpasses the safe capacity. Table 2 summarizes our classification.

Table 2: Definitions of Our Class Risk Measures

Risk Category	Definition
Safe Class	The number of enrolled students is less than the prescribed CDC capacity.
Risky Class	The number of enrolled students is greater than or equal to the safe capacity and less than twice the CDC capacity.
Very Risky Class	The number of enrolled students is greater than or equal to twice the CDC capacity.

Safe Classes are those in which the number of enrolled students is less than the prescribed CDC capacity of the classroom in which they are taught. In the *Risky Classes*, the number of enrolled students is greater than the CDC capacity but less than twice that CDC capacity. The students and the instructors of these classes are at risk of COVID-19 infection. We grouped classes for which the number of registered students is at least twice as many as the safe capacity as the *Very Risky Classes*. In these *Very Risky Classes*, the students and instructors are at risk even if the instructor divides the registered students into two separate groups and rotates their attendance on different days of the week.

Table 3 below presents the distribution of the F2F classes according to their risk categories. Statistics in this table reveal that *in more than half of the F2F classes in Fall 2020 and Spring 2021, a six feet distance between students could not be maintained*. Moreover, in a staggering 20-25% of the F2F classes, the number of enrolled students is at least twice as many as the safe capacity. The shares of the risky and very risky classes are even worse in the classes that utilize a mixed modality, although these classes do not meet as much as F2F classes do.²¹

The last column in Table 3 shows the distribution of riskiness according to the actual enrollment in the 2019-2020 academic year. Although COVID-19 was not a concern during the

²⁰ The studies can be accessed through this [link](#).

²¹ Specifically, Blended classes offer a mix of in-class and online learning. For these, remote learning replaces in-person seat time. Hyflex classes take place both online and in-person and allow individual students to choose their preferred modality.

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construction of the class schedules in that year, we categorized the classes according to their hypothetical risk that would have occurred under the safe capacities of the classrooms from this year. We find that, given these safe capacities of classrooms, about 70% of the classes in the past academic year would have been risky. On the other hand, in the current academic year, about 50% of the classes are risky. *The comparison suggests that the University’s policy of limiting classrooms to their 50% capacity helped reduce the COVID-19 risk* (assuming that the enrollment in the 2020-2021 year is similar to the 2019-2020 year). However, the fact that half of the F2F classes were in the risky category indicates that the University policy was not completely effective.

Table 3: Risk in Face-to-Face Classes 2019-2020 and 2020-2021 Academic Years

	F2F – 2020-2021 (Flexible Excluded) N=1,842	F2F – 2020-2021 (Flexible Included) N=2,718	F2F – 2019-2020 (All Classes) N=7,116
Safe Classes	47.00%	43.42%	30.24%
Risky Classes	30.66%	30.15%	30.76%
Very Risky Classes	22.34%	26.44%	39.00%

Notes: Safe Classes are those which have fewer students than the safe capacity. Risky Classes are those which have more students than the safe capacity but fewer than twice the safe capacity. Very Risky Classes are those which have more students than twice the safe capacity. Risk is hypothetical during the 2019-2020 academic year.

We augmented our data with a number of instructor attributes. For example, using instructors’ first and last names and the databases of the Social Security Records and the 2010 Census of Population, we imputed their race and sex.²² Ultimately, we could identify the race and sex of 98.2% and 99.3% of the instructors, respectively. Additionally, we obtained title and departmental information for the instructors in our sample from the Database of the Auburn University Employee Salaries and the People Finder on the University website.

Table 4 presents the descriptive statistics of the instructors in our sample. There are more than 1,600 instructors that teach the classes we include in our sample. On average, an instructor taught (or is scheduled to teach) approximately four classes in total in the 2020-2021 academic year. The majority of these courses are taught with a F2F modality. An average instructor had 35 students enrolled in her/his class that they teach in a classroom with a safe capacity of 22. That is, on average, instructors teach in classrooms where the number of registered students exceeds 1.6 times the safe capacity. Only a small share (30%) of their classes are scheduled in a safe classroom.

Slightly less than half of the instructors in our sample are female. About one in five of them are Non-White. We also categorized the instructors according to their job titles. Administrators (department heads/chairs, directors, deans, and provosts) make up about 4% of the instructors. 46% are either Full, Associate, or Assistant professors. Staff Members (such as academic advisors, coordinators, administrative support staff, and technicians), Lecturers, and Instructors account for

²² Specifically, we use given names from [Social Security birth records](#) to assign a gender to the instructors in our sample. We use [surname information from the 2010 US Census](#) to impute the race of the instructors. For some instructors which we were not able to match, i.e., those with first names or last names which are not common in the US, [other sources](#) were used.

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about 10% each. Finally, 16% of the instructors, a non-negligible amount, are GTAs (Graduate Teaching Assistants). We were not able to identify/categorize titles of 3% of the instructors.

Table 4: Descriptive Statistics of the Instructors in 2020-2021 Academic Year

Variable	Fall 2020 & Spring 2021 Combined	Fall 2020 Only	Spring 2021 Only
Number of Unique Instructors	1,602	1,362	1,219
No. Classes Taught	4.13	2.52	2.61
F2F (Excluding Flexible)	1.15	0.29	1.19
F2F (Including Flexible)	1.70	0.29	1.91
Online	1.13	0.90	0.48
Mixed	1.30	1.33	0.22
Enrollment per class taught	34.72	36.02	35.21
Average safe capacity in classes taught	22.04	21.31	22.69
Enrollment / Safe Capacity	1.66	1.68	1.63
Share of Safe Classes	0.30	0.28	0.32
Share of Risky Classes	0.40	0.40	0.37
Share of Very Risky Classes	0.31	0.32	0.30
Female	0.45	0.46	0.42
Non-White	0.20	0.19	0.19
Administrator	0.04	0.04	0.04
Full Professor	0.14	0.14	0.14
Assoc. Professor	0.15	0.15	0.15
Assistant Professor	0.17	0.15	0.18
Staff Member	0.10	0.11	0.08
Lecturer	0.10	0.11	0.12
Instructor	0.09	0.10	0.11
GTA	0.16	0.16	0.16

Notes: Descriptive statistics provided for the representative instructor during the 2020-2021 academic year.

IV. Descriptive Empirical Analysis

In this section, we investigate how the risk of COVID-19 infection is distributed across instructors. Specifically, we compute the shares of *Safe*, *Risky*, and *Very Risky Classes* in a number of categories and compare these shares. Note that our comparison of the unconditional means across categories does not necessarily imply causality, and we do not claim such. Instead, they are associational. In this current version of our paper, we only aim to present a portrayal of the risk in

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the F2F classes taught in Fall 2020 and Spring 2021. In our analysis below, we include all F2F classes (required or flexible).²³

Is Risk Concentrated on Certain Demographic Groups?

We begin our analysis with a study of risk according to the race and sex of the instructor. We group classes according to whether they are taught by one of the following groups: a. White-Men; b. Non-White Men; c. White Women; d. Non-White Women. Table 5 below shows the share of risky versus non-risky classes within each category.

Table 5: Distribution of Risk by Race and Sex in F2F Classes in 2020-2021 Academic Year

	White Men	Non-White Men	White Women	Non-White Women
# Classes: N	N=1,101	N=201	N=629	N=100
Safe Classes	50.32%	39.80%	34.02%	26.00%
Risky Classes	28.34%	34.83%	30.37%	41.00%
Very Risky Classes	21.34%	25.37%	35.61%	33.00%

Notes: Safe Classes are those which have fewer students than the safe capacity. Risky Classes are those which have more students than the safe capacity but fewer than twice the safe capacity. Very Risky Classes are those which have more students than twice the safe capacity. N represents the number of classes led by each instructor category.

Table 5 reveals that among the 1,101 courses are delivered by White Men, 50% are taught in *Safe* classrooms (where the number of enrolled students is smaller than the safe capacity that is required to maintain a 6-foot distance between the students). White Men taught 28% and 21% of their classes in risky and very risky classrooms, respectively. Recall that in (*Very*) *Risky Classes*, the number of registered students is greater than the safe capacity and less than (more than) twice the safe capacity. White Women delivered 629 F2F courses in Fall 2020 and Spring 2021. Approximately one-third of these classes were in *Safe* classrooms. That is 16 percentage points smaller than White Men’s risk. While White Women and White Men teach about the same share of their classes in *Risky Classes*, White Women’s classes are more likely to be taught in *Very Risky* classroom arrangements compared to their White Men counterparts. A similar difference in risk appears in comparison of Non-White Men versus Women.

Using class data from the pre-pandemic 2019-2020 academic year, we also classify classes taught by the same race-sex groups according to how risky they would have been if the safe capacities of this year applied back then. We compare this distribution, presented in Table 6, to that in Table 5, in order to understand on whom the risk would have fallen if no changes in classroom allocation were to take place before the 2021 academic year.

The comparison of the statistics in Table 6 to those in Table 5 shows that, for every demographic group, classes are safer in the 2020-2021 academic year compared to what we would

²³ We also investigated whether the distribution of risk concentrated on certain colleges, departments, and classroom buildings at Auburn University. These results, which are presented in Appendix Tables A2, A3, and A4, show the high variation of risk across the units of the University.

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expect if classrooms were assigned in the exact same manner as the previous academic year. For example, in 2019-2020, 67% of classes led by White Men and 77% of classes led by White Women fall into what we would classify as *Risky* or *Very Risky* classroom arrangements. However, thanks to the University’s “half of the normal seating capacity” policy, and perhaps the reshuffling of classroom assignments, the share of *Risky* and *Very Risky Classes* taught by White Men and White Women decreased to 50% and 66%, respectively. Note that the “winners” from this reshuffling tend to be White instructors whose proportions of *Safe Classes* increased by more than ten percentage points. On the other hand, Non-White individuals had the lowest increases in their shares of *Safe Classes* during the 2021 academic year, gaining only about 2.5 percentage points.

Table 6: Distribution of Risk by Race and Sex in All Classes in 2019-2020 Academic Year

	White Men	Non-White Men	White Women	Non-White Women
# Classes: N	N=2546	N=475	N=1,713	N=380
Safe Classes	32.80%	37.26%	22.71%	23.42%
Risky Classes	27.73%	29.05%	35.49%	37.63%
Very Risky Classes	39.47%	33.68%	41.80%	38.95%

Notes: Risk is hypothetical during the 2019-2020 academic year. Safe Classes are those which have fewer students than the safe capacity. Risky Classes are those which have more students than the safe capacity but fewer than twice the safe capacity. Very Risky Classes are those which have more students than twice the safe capacity. N represents the number of classes led by each instructor category.

The analysis in this section suggests that *Men, compared to Women, have borne a smaller COVID-19 risk in their classes in the 2020-2021 year.* The evidence also indicates that *White instructors’ risk has been smaller in relation to Non-White instructors.* We also find that *the University policy and potentially the reorganization of the classes improved the safety of the White instructors much more compared to that of the Non-White instructors.*

Does the Rank Within the University Hierarchy Influence the Risk Distribution?

We could identify about 97% of the instructors’ titles, and we categorized them according to their titles as described in the Data section. In Table 7, we present the distribution of risk by rank. Out of the 74 classes taught by the administrators (department chairs/heads, directors, various deans, or people from upper administration), close to 60% are classified as *Safe Classes* in Fall 2020 and Spring 2021. The share of *Safe Classes* for the tenure-track professors (Full, Associate, and Assistant), who teach between 200-300 classes each, is slightly lower, just shy of 50%. The proportion of classes delivered in Safe classrooms decreases even further for Lecturers (40%), Instructors (30%), and GTAs (20%). We observe a similar (reverse) pattern for *Risky Classes* and the *Very Risky Classes*. Administrators and tenure-track professors teach about 20% of their classes in *Very Risky* classroom arrangements. This share is much higher for the Staff, Lecturers, Instructors, and the GTAs.

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Table 7: The Distribution of Risk by Rank in F2F Classes (2020-2021 Academic Year)

	Admin.	Full Prof.	Assoc. Prof.	Assist. Prof.	Staff	Lecturer	Instructor	GTA
# Classes: N	N=74	N=238	N=287	N=293	N=331	N=331	N=297	N=184
Safe Classes	58.11%	48.32%	49.83%	46.76%	56.50%	39.88%	29.63%	20.65%
Risky Classes	24.32%	33.19%	30.31%	32.76%	16.31%	30.51%	29.29%	48.91%
Very Risky	17.57%	18.49%	19.86%	20.48%	27.19%	29.61%	41.08%	30.43%

Notes: Safe Classes are those which have fewer students than the safe capacity. Risky Classes are those which have more students than the safe capacity but fewer than twice the safe capacity. Very Risky Classes are those which have more students than twice the safe capacity. N represents the number of classes led by each instructor category.

To investigate how the University policies impacted instructors in various ranks, we construct the hypothetical risk distribution in the same fashion as described above. We present the result of this exercise in Table 8. Again, the goal is to determine if those with higher ranks achieve greater safety gains due to the reshuffling of the classroom assignment that took place prior to the 2020-2021 academic year.

Table 8: The Distribution of Risk by Rank in All Classes in 2019-2020 Academic Year

	Admin.	Full Prof.	Assoc. Prof.	Assist. Prof.	Staff	Lecturer	Instructor	GTA
# Classes: N	N=152	N=659	N=706	N=597	N=578	N=944	N=533	N=576
Safe Classes	36.84%	46.28%	35.27%	33.17%	19.55%	30.08%	19.89%	10.76%
Risky Classes	24.34%	22.61%	33.29%	37.52%	24.57%	23.83%	32.83%	42.01%
Very Risky	38.82%	31.11%	31.44%	29.31%	55.88%	46.08%	47.28%	47.22%

Notes: Risk is hypothetical during the 2019-2020 academic year. Safe Classes are those which have fewer students than the safe capacity. Risky Classes are those which have more students than the safe capacity but fewer than twice the safe capacity. Very Risky Classes are those which have more students than twice the safe capacity. N represents the number of classes led by each instructor category.

Comparing the statistics in Tables 7 versus 8 shows that, across all ranks, the proportion of *Safe Classes* increased relative to the shares that would have been observed if the University did not take any precautions. The groups that gained the least in terms of classroom safety are the GTAs, Contract Instructors, and the Lecturers, who are ten percentage points more likely to teach *Safe Classes* thanks to the University policies. On the other hand, the likelihood that Administrators, tenure-track professors, and Staff instructors teach *Safe Classes* increased by 15-25 percentage points.²⁴

The analysis in this section points to an unequal distribution of risk across the ranks within the University hierarchy. *Administrators and the tenure-track faculty deliver their classes in less risky rooms relative to instructors with a lower rank, such as the lecturers, instructors, and the GTAs.* Similar to the results in the earlier sections, findings in this section indicate that the

²⁴ We do not observe large gains in terms of the share of *Safe Classes* for Full Professors, however this is likely due to the very high share of *Safe Classes* that they begin with in the 2019-2020 academic year.

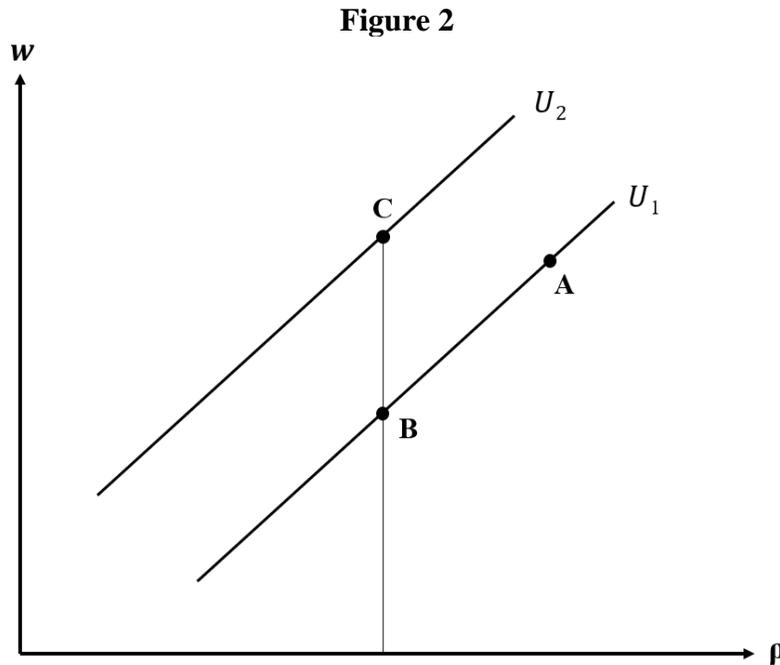
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University’s “half of the normal seating capacity” policy and others reduced the risk on all instructors. However, the gains from the University’s preventative actions are distributed unequally. *GTAs, Contract Instructors, and lecturers acquired smaller gains in classroom safety compared to their higher-ranked counterparts.*

V. A Simple Model of Compensating Differentials

Information in the Institutional Background section suggests that instructors might have had a misperception of risk in the classrooms to which they were assigned. In this section, we explore the potential consequences of this misperception and the incentives of administrators to maintain the information asymmetry.

We sketch a simple textbook model of compensating differentials where instructors and the department chairs/heads interact in a “market” for face-to-face instruction (see Cahuc, Carcillo, and Zylberberg 2014, ch. 3). Assume the representative instructor maximizes her/his utility function $U = U(w, \rho)$, where w represents the wage rate per course to the instructor, ρ represents the continuous risk associated with teaching that course. $\frac{\partial U}{\partial w} > 0$ and $\frac{\partial U}{\partial \rho} < 0$, such that ρ is a “bad” and w , which represents the consumption one can buy with earnings, is a “good.” Because of these conditions, instructors must be compensated for the additional risk to remain indifferent between a marginally riskier class and a safer alternative.



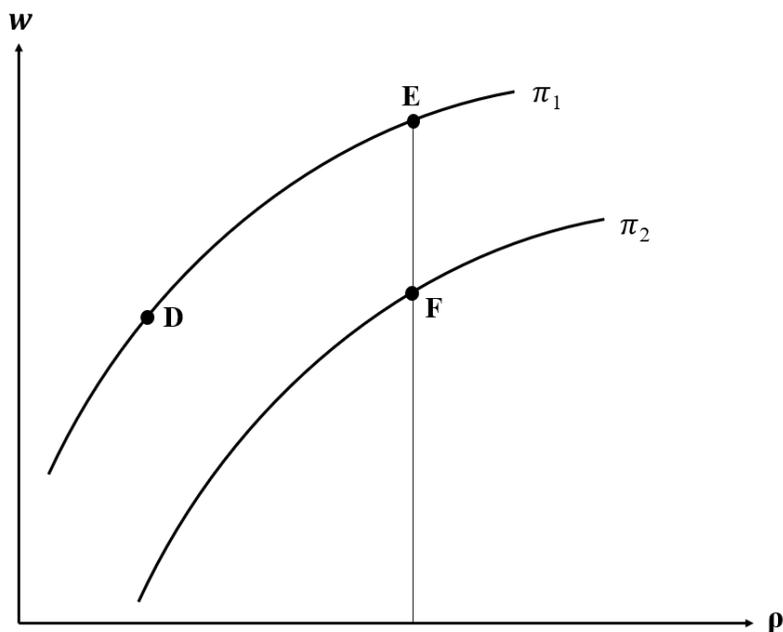
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The preferences of the instructor can be depicted using indifference curves. In Figure 2, U_1 and U_2 represent two separate indifference curves. For simplicity, they are depicted as linear. On a specific indifference curve, the instructor is indifferent between any point. For example, considering the options on the indifference curve U_1 , the instructor is equally happy teaching a class with high risk and high pay (such as point A) and another class with lower pay and lower risk (such as point B). However, the instructor would prefer to be teaching in a class such as the one at point C compared to B. This is because, at C, the wage rate is greater than B, and the level of risk is identical in these classes. Thus, the instructor would prefer to be teaching more to the north-west of the diagram depicted in Figure 2. Her/his goal of maximizing utility involves trying to move to an indifference curve in that direction.

The department chair maximizes her/his net revenue, which, for clarity of exposition, we will simply call profit, $\pi = \pi(w, \rho)$, where w is the wage rate she/he offers to an instructor and ρ is the level of the risk in a given classroom. The higher wages she/he offers, the smaller the profits are ($\frac{\partial \pi}{\partial w} < 0$), and the higher the risks in a classroom, the larger the profits are ($\frac{\partial \pi}{\partial \rho} > 0$). This is because, reduction of risk from classrooms is costly. Therefore, the department chair offers higher (lower) wages with higher (lower) risk classrooms to the instructors in order to maintain a particular level of profit.

Note that when constructing this simple model, we consider the fact that the department chair is an administrator at a public University, which is a nonprofit institution. In the context of this study, it is conceivable, and perhaps likely, that financial consequences still played a large role in the organizational decisions that were made. This framework provides us with the tractability required to analyze these decisions.

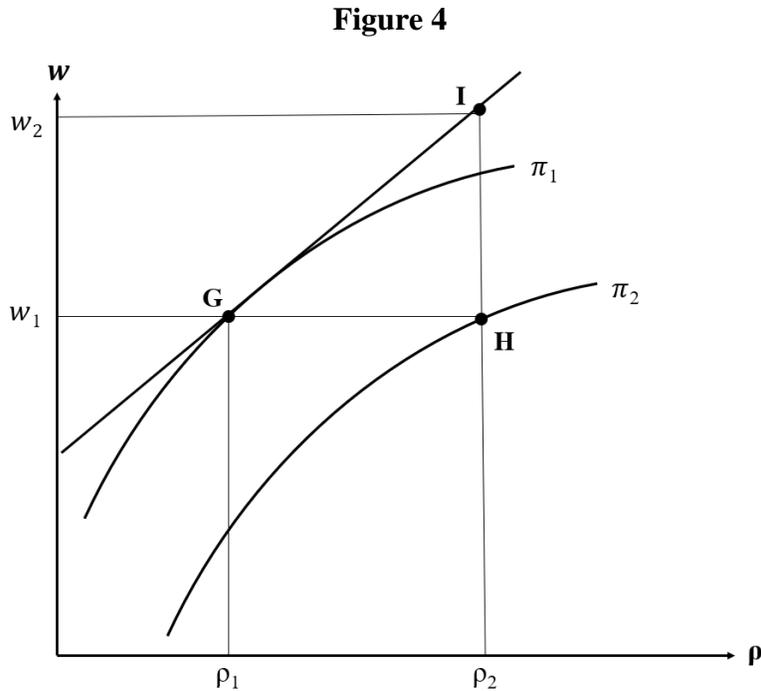
Figure 3



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The graphs in Figure 3 present the preferences of the department chair over her/his wage-risk offers. π_1 and π_2 are iso-profit curves. That is, on each individual iso-profit curve, the department's profits are the same. For example, the chair is indifferent between offering high wages for teaching in high-risk classrooms (such as point E) and offering low wages to teach in a safe classroom (as in point D). This is because, wage-risk offers at points D and E result in the same level of profits for the department. On the other hand, the University prefers to be at point F relative to E. This is because, at F, the chair offers instructors a lower wage than in E, but the risk levels of the classrooms are the same. Thus, the chair prefers to be on iso-profits that are more toward the south-east of Figure 3, as these wage-risk offers are more profitable. In other words, the chair's profit maximization problem requires the University to move in that direction as much as possible.

Within the model, instructors and the department chairs negotiate. A department chair offers a wage (w_1) with a certain teaching risk level (ρ_1) that the instructor accepts. This is depicted at point G in Figure 4.



Recall, in the Institutional Background section and in our descriptive analyses, we provided evidence that suggests the risk advertised by the University administration is different from the actual teaching risk. Specifically, we have shown that in more than 50% of the classes, teaching is high (in the highest risk category under the CDC guidelines). An instructor may agree to teach at a level of risk (ρ_1 in Figure 4) that is acceptably safe enough given her/his wage. However, if the

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actual risk level is greater, for example, at a level such as ρ_2 in Figure 4, then the instructor is unknowingly at H rather than at G, and thus she/he is worse off than she/he perceives. Had the instructor known the true risk ρ_2 , then she/he would have asked for a higher wage w_2 , an offer that the department chair is unwilling to make. The department chair earns greater profits due to the misperception of risk by the instructor. For example, they are at a better iso-profit curve (π_2 rather than π_1). In this example, the department chair, and the University in the aggregate, earns higher profits by offering high-risk classes with low wages. The instructors teach in risky classrooms, presumably without being compensated for the difference in extra risk ($w_2 - w_1$).

The analysis in this section suggests that when the instructors misperceive their teaching risk, and they are allocated in classrooms that are riskier than they believe, they are worse off. Their utility loss can be compensated with higher pay. Yet, if they are not compensated, then the instructors experience welfare loss, and the University earns a higher profit. Put briefly, *the misperception of teaching risk by instructors benefit the University at the expense of the instructors.*

VI. Summary and Conclusion

Auburn University partially returned to in-person instruction in the 2020-2021 academic year. The push by the University administration to provide as many face-to-face classes as possible, together with the absence of a policy that imposes CDC-prescribed six feet distance between students in classrooms, exposed instructors to the potential danger of COVID-19 infection. We study the distribution of this risk over university instructors.

Our measure of risk is constructed by comparing the number of students registered to a class to the capacity which the classroom can hold safely, i.e., by adhering to the CDC's six-foot social distancing rule. Thus, our risk measure is class-specific. Besides being highly granular, our measure of risk is free from contamination due to occupational or geographical differences. This is because all instructors at the University perform the same task (teaching), and they are all located in the same city (Auburn, AL). Our access to a risk measure with such attributes distinguishes our paper from other contemporaneous working papers that also study the distribution of occupational risk associated with COVID-19 (Chernoff and Warman 2020; Baylis et al. 2020; and Mongey, Pilosoph, and Weinberg 2020). In addition, ours is the first paper to investigate how occupational risk is distributed within a public institution.

We find that at least 50% of the classes that are taught face-to-face in Fall 2020 and Spring 2021 are held in classrooms where the six-foot social distance between students cannot be maintained when all registered students attend. The non-parametric evidence shows that female and non-white instructors are more likely to be assigned to teach in classrooms with enrollment above the CDC implied maximums, compared to their male and white counterparts, respectively. We also show that COVID-19 risk was disproportionately assigned among the University hierarchy. Instructors who also hold high ranks, such as the administrators, professors, and staff, are more likely to deliver their classes in safe rooms (where the enrollment is lower than CDC

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maximum) compared to their colleagues who are ranked lower, such as the lecturers, contract instructors, and the graduate teaching assistants (GTAs).

Although the University did not implement a six-foot distance classroom policy, it limited the number of students in a classroom to half of the normal seating capacity. Despite coming short of completely eliminating the risk, this policy led to an improvement in the share of safe classes. Our back-of-the-envelope calculations suggest that the University's "half of the normal seating capacity" policy increased the proportion of classes that conform to CDC's six-foot social distancing guidelines by 10-15 percentage points compared to the scenario where the University did not adopt any policy at all. However, the benefits of the improvements in the safety of classes are acquired by certain groups. The winners were the white instructors (as opposed to the non-white) and those with senior positions within the University, such as the administrators, professors, and staff (relative to the lecturers, contract instructors, and GTAs). In this context, our paper contributes to the literature on the behavior of elites (Acemoglu and Robinson 2008) as to how elites choose to distribute risk to non-elites during a crisis.

Our paper provides a snapshot of the risk distribution at Auburn University. The vulnerable groups seem to have borne a greater share of the risk. Our paper documents that the COVID-19 pandemic widened the, perhaps existing, inequalities within this organization, and it shows that the most disadvantaged individuals might have been hurt the most even at a prestigious academic institution, such as Auburn University.

These results are preliminary, and we will update this working paper as more results become available. Our plan is also to supplement the administrative data with survey data from the population of instructors and students.

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Appendix Table A1: Classrooms Which Violated Safe Capacities in Fall 2020

Classroom	Total Number of Classes in Fall 2020	Number of Classes Above the Safe Capacity
Haley Center 2182	12	12
Haley Center 2228	13	12
Lowder Hall 19	13	12
Haley Center 2206	13	11
Lowder Hall 10	14	11
Haley Center 2312	11	10
Haley Center 2334	12	10
Haley Center 2324	12	10
Lowder Hall 9	13	10
Haley Center 3220	13	10

Notes: The top ten classrooms according to the number of violating classes held in the Fall 2020 semester. For these classrooms, Classroom Capacity Analyses were available prior to the start of the Fall 2020 semester.

Appendix Table A2: Distribution of Risk in F2F Classes Across Colleges

	No. Students	N	Safe	Risky	Very Risky
Coll of Business	10836	162	14.20%	21.60%	64.20%
Coll of Arch, Dsgn & Const	2338	92	17.39%	61.96%	20.65%
Coll of Liberal Arts	16764	594	34.85%	33.84%	31.31%
Coll of Human Sciences	2118	64	45.31%	35.94%	18.75%
Sch of Nursing	782	16	50.00%	37.50%	12.50%
Coll of Sciences & Math	12444	443	52.82%	25.06%	22.12%
Coll of Engineering	7664	286	60.84%	23.78%	15.38%
Coll of Education	1781	117	64.10%	31.62%	4.27%
Coll of Agriculture	1986	96	64.58%	17.71%	17.71%
Sch of Forestry & Wildlife Sci	476	25	68.00%	28.00%	4.00%

Notes: Colleges are sorted according to the share of safe F2F classes they offer. No. Students column indicates the number of students who take classes in that college. This is not the unique number of students. Each student is counted as many times as she/he takes a class. N column represents the number of F2F classes. Safe Classes are those which have fewer students than the safe capacity. Risky Classes are those which have more students than the safe capacity but fewer than twice the safe capacity. Very Risky Classes are those which have more students than twice the safe capacity.

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Appendix Table A3: Distribution of Risk in F2F Classes Across Departments

	No. Students	N	Safe	Risky	Very Risky
Accounting	2771	30	3.33%	36.67%	60.00%
Finance	2194	29	3.45%	13.79%	82.76%
Communication and Journalism	2658	118	6.78%	44.07%	49.15%
Philosophy	1219	41	7.32%	34.15%	58.54%
McWhorter School of Bldg Sci	1139	49	12.24%	79.59%	8.16%
Chemistry & Bio-Chemistry	3260	97	12.37%	25.77%	61.86%
Psychology	1204	21	14.29%	33.33%	52.38%
Marketing	1217	28	14.29%	28.57%	57.14%
Supply Chain Management	1399	27	14.81%	11.11%	74.07%
Mathematics and Statistics	2522	56	16.07%	51.79%	32.14%
English	1157	55	21.82%	30.91%	47.27%
Management	1080	24	25.00%	29.17%	45.83%
Economics	2391	41	26.83%	31.71%	41.46%
Political Science	1060	33	27.27%	60.61%	12.12%
Systems & Technology	2165	25	28.00%	16.00%	56.00%
History	2134	37	40.54%	24.32%	35.14%
Computer Sci & Software Engr	1412	35	45.71%	31.43%	22.86%
Dept of Animal Sciences	1077	44	50.00%	25.00%	25.00%
Civil Engineering	1130	49	63.27%	16.33%	20.41%
Mechanical Engineering	1737	53	64.15%	11.32%	24.53%
Biological Sciences	5634	237	67.93%	10.13%	21.94%
Electrical & Computer Engr	1110	75	72.00%	20.00%	8.00%

Notes: Departments are sorted according to the share of safe F2F classes they offer. We present only the departments that teach at least 1,000 students. No. Students column indicates the number of students who take classes in that department. This is not the unique number of students. Each student is counted as many times as she/he takes a class. N column represents the number of F2F classes. Safe Classes are those which have fewer students than the safe capacity. Risky Classes are those which have more students than the safe capacity but fewer than twice the safe capacity. Very Risky Classes are those which have more students than twice the safe capacity.

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Appendix Table A4: Distribution of Risk in F2F Classes Across Campus Buildings

	No. Students	N	Safe	Risky	Very Risky
TICHENOR	1472	61	6.56%	24.59%	68.85%
LOWDER	13785	212	14.62%	23.11%	62.26%
HALEY	8564	305	30.82%	38.36%	30.82%
SPIDLE	1380	53	33.96%	52.83%	13.21%
CHARLES	1086	38	39.47%	28.95%	31.58%
MELL	2625	72	43.06%	51.39%	5.56%
SHELBY	1950	57	43.86%	31.58%	24.56%
SCIENCE	6691	289	49.83%	11.76%	38.41%
HORTON-HARDGRAVE	1141	36	50.00%	38.89%	11.11%
ROUSE	1341	50	54.00%	32.00%	14.00%
CHEMISTRY	1548	32	56.25%	34.38%	9.38%
PARKER	2435	88	59.09%	22.73%	18.18%
BROUN	1622	83	62.65%	21.69%	15.66%
BROWN-KOPEL	2041	62	64.52%	33.87%	1.61%
FOY	1728	27	70.37%	7.41%	22.22%

Notes: Buildings are sorted according to the share of safe F2F classes they offer. We present only the buildings that house at least 1,000 students in F2F classes. No. Students column indicates the number of students who take classes in that building. This is not the unique number of students. Each student is counted as many times as she/he takes a class. N column represents the number of F2F classes. Safe Classes are those which have fewer students than the safe capacity. Risky Classes are those which have more students than the safe capacity but fewer than twice the safe capacity. Very Risky Classes are those which have more students than twice the safe capacity.