NBER Digitization Tutorial Application

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I am an applied microeconomist interested in labor economics, discrimination, and digital economics. I will complete my Ph.D. in Economics at the University of Warwick in 2023. My dissertation committee members are Prof. Manuel Bagues, Prof. Mirko Draca and Dr. Ludovica Gazze.

My research lies in the intersection of digital economics and discrimination with applications to the behaviors of consumers and firms. Technological advancements have a significant potential to provide equitable and fairer outcomes for historically disadvantaged groups through different channels. For instance, algorithms are theoretically expected to be fairer by removing human bias in their decision-making, or digital platforms may provide easier access to markets, especially for individuals from disadvantaged groups. However, as pointed out by empirical evidence, whether technology reduces or exacerbates discrimination is unclear.

My work focuses on the role of information in overcoming discrimination in digital environments. Can removing group information such as race or gender alleviate bias in the algorithms? Can people from developing countries earn more by providing more information about their qualifications on global freelancing platforms? My research aims to provide a comprehensive understanding of information's role in reducing discrimination digitally. In another stream, I focus on a broader perspective and investigate how the availability of digital technologies affects individuals' and firms' behavior in various domains.

To address my research questions, I apply econometrics, causal inference, and machine learning methods in various quasi-experimental settings and use large administrative datasets, data extraction, web scraping, and content analysis. With the broad set of approaches and datasets, I aim to conduct research that produces both generalizable managerial insights and actionable policy recommendations. Below, I summarize my job market paper, working papers, and work in progress.

Job Market Paper: Can gender-blind algorithmic pricing eliminate the gender gap?

In my job market paper, I use a natural experiment to investigate the impact of gender-blind algorithmic pricing on consumers and firms. I focus on a recent policy change in California that prohibits using gender information in pricing algorithms for automobile insurance. I investigate how this policy affects the insurance premiums paid by male and female consumers and the pricing algorithms companies use.

I rely on the triple difference-in-differences strategy to study changes in the premiums, using data from the Consumer Expenditure Survey. As an industry practice, young male drivers are charged more than young females for car insurance in many countries, presumably because they are expected to be riskier. However, the gender gap does not exist among more experienced drivers. This setting allows me to use variation across age groups in identifying the causal effects of gender-neutral pricing policy on prices. I compare the gender gap among young people with the gap among older people in California. I find that the regulation has decreased 65 percent of the initial gender gap among young by increasing premiums for young females and decreasing them for young males. As an alternative identification strategy, I use other states with gender-based insurance pricing as a control group. As aligned with the findings from the analysis within

California, despite the decrease in the gender gap, the policy did not entirely eliminate the initial gender gap in California compared to other states.

Next, I investigate if the remaining gender gap results from the readjustments in the pricing algorithms with gender proxies receiving larger weights. I construct an extensive dataset on insurance pricing algorithms based on filings from a large insurance provider in California. This dataset includes three essential features of pricing: (i) a list of factors used in pricing algorithms such as age, marital status, car models, etc. (ii) weightings for each factor, i.e., how much it contributes to the pricing (iii) a pricing rule that combines price factors with their corresponding weights to determine a price. This setting allows me to estimate not only the changes in the insurance prices but also the changes in the price-generating processes. As the opaqueness of algorithmic processes is one of the main challenges in algorithmic bias literature, this dataset provides me a rare opportunity to study bias in algorithmic pricing transparently.

To analyze changes in the algorithm, I start with estimating which characteristics are most correlated with gender using a detailed consumer characteristics dataset with more than half a million drivers. Using different supervised machine learning models, I predict highly correlated features with gender. Then, I analyze how the pricing of these gender proxies changes in the algorithm. I find that the algorithms started to increase the weightings of car models associated with young males by 10 percent compared to before the policy. The insurance price of young male cars increases; hence any driver using these models starts to pay more for insurance after the policy. My findings show the limitations of anti-discrimination policies that impose group-blind pricing due to algorithms' reliance on correlations between banned variables and their correlates.

In future work on this agenda, I am interested in working on how to adopt fairer regulations in algorithmic decision-making processes. For instance, I am currently working on implementing alternative algorithmic regulations to alleviate the 'proxy' problem while keeping the predictive accuracy. This new framework can also potentially shed light on other sources of bias embedded in algorithms, such as racial bias. Additionally, the context of the pricing algorithms I study allows me to analyze different companies and states. Currently, I am extending my pricing algorithm dataset to other companies to study questions related to market structure and algorithmic pricing.

Reducing discrimination with information:Evidence from online freelancing platforms

In this paper, I study country-based discrimination in online labor markets. Freelancing platforms connecting millions of employers and freelancers worldwide have become enormously popular. These online labor markets enable workers worldwide to supply their labor by reducing transaction and search costs. Although online platforms reduce certain costs by making global labor markets more accessible, some information asymmetries also persist in these markets. For instance, employers can have limited information about job applicants' skills, giving them an incentive to use easily observable characteristics such as country of origin to infer workers' productivity. Such informational frictions may disadvantage freelancers from developing countries, particularly when employers are from high-income countries. As a result, information asymmetries can lead to lower wages or worse hiring outcomes for freelancers in developing countries.

I study the wage gap between freelancers from high-income and developing countries in an online freelancing platform and explain the mechanisms driving this gap. By collecting data from one of the largest freelance platforms, I construct a dataset including freelancer profiles for different job categories for almost a year. These profiles provide information about freelancers' individual characteristics such as name, location, education, skills, and online labor market activities, including hourly wage, earnings, total hours worked, and reputation scores visible on the platform. I find that freelancers from developing countries earn 31 percent less than developed

countries' freelancers after controlling for individual and job characteristics. However, the penalty on wages decreases as contractors provide information about themselves. Experience, reputation scores, information on educational background, or test scores benefit freelancers from developing countries more.

My findings suggest that even a small amount of information, such as experience up to 20 hours or taking an online skill test, improves outcomes significantly for freelancers from developing countries. This may be of particular significance for freelancers from developing countries having difficulty getting a job or setting higher wages on digital platforms. Therefore, my findings have implications for designing more inclusive digital labor platforms to alleviate disparate outcomes across freelancers from different countries. As a future work in this agenda, I aim to combine the secondary data I used in this paper with an experiment to analyze further the mechanisms behind different job market outcomes across groups. Specifically, in this experiment, I plan to investigate whether making people more informed about workers' quality and aware of their own beliefs that may be inaccurate in some cases can change their hiring behavior or not.

Hybrid vs. In-person: How does online access to lectures affect student success?

In another project with Manuel Bagues, we study the impact of online education technologies on student behavior. Online education technologies are becoming increasingly common in higher education. One widely used method is recording lectures during face-to-face teaching of on-campus classes. Access to online lectures allows students to review the content, whereas knowing that the lecture recordings will be available online may decrease incentives to attend class. Besides, lecture recordings can have heterogeneous impacts on certain groups of students. For instance, it can be helpful for non-native speakers as a revision tool but disincentivize low-motivated students to attend lectures regularly. Therefore, the overall effect of online education in the hybrid setting is not easy to predict. We study the impact of access to recorded lectures on student performance, attendance, and satisfaction. We use a difference-in-differences strategy by exploiting the staggered implementation of the recorded lecture system in different courses in a top UK university. We find that (i) online lectures decrease the performance gap between native and non-native speakers significantly, and (ii) they increase the achievement of high-performer students and decrease for low-performers. (iii) they reduce attendance to the main lectures and have no statistically significant impact on student satisfaction. Our findings have important implications for designing policies on access to distance learning technologies.

Do online food platforms help or harm restaurant business?

In one of my ongoing projects, I focus on online food delivery platforms and the way they affect firms in the restaurant industry. Today, the notion of eating out is rapidly evolving with changing consumer eating habits. The advent of user-friendly food delivery platforms has enormously helped this transformation. Recently, the global pandemic has also given food delivery platforms an important boost. However, despite their rapid growth, the economics of these platforms and their impact on the restaurant business are still evolving. In this study, I focus on whether the availability of food delivery platforms helps or harms the restaurant business. I use an extensive geospatial dataset containing four million different geographic features in the UK. This dataset allows me to observe all restaurant businesses, their location, capacity, and together with their neighborhood properties. I use a difference-in-difference strategy by exploiting the staggered entry of online food platforms in each postcode. I analyze how restaurant locations and store sizes have changed over time as an online food delivery company has started to serve in the same postcode as the restaurant.