ABSTRACT

Title of Dissertation:	WHITHER WONDER WOMEN? ESSAYS ON GENDER DIVERSITY IN IT-ENABLED PROFESSIONAL AND CREATIVE DOMAIN
	Yifei Wang, Doctor of Philosophy, 2023
Dissertation directed by:	Professor Jui Ramaprasad Department of Decision, Operations and Information Technologies, University of Maryland
	Professor Anandasivam Gopal Information Technology and Operations Management, Nanyang Technological University

Working towards equality and inclusion around gender and race in society is critically important. Despite the increasing number of conversations around these issues, more work is needed to evaluate the causes of unequal participation of men and women in organizations, markets, and economies. In particular, the lack of equity in terms of representation and participation within the important information technology (IT) sector has often been viewed as an ongoing problem. My dissertation focuses on this specific sector and explores potential remedies to enhance the participation and representation of women in specific segments of IT-enabled work, albeit in three different empirical contexts.

In my first essay, I investigate the unequal participation of women in IT labor markets and whether they are less willing to compete for complex and risky IT projects. Through multiple experiments on technically trained students, I find that women in the IT industry are more willing to participate in bidding for riskier projects, and their bids are higher than those of men. My second essay studies the issue of unequal representation by women within the digital music industry, where inequitable representation has been clearly noted. Women artists are often faced with less attention, respect, and market share. The study shows that TikTok dance challenges offer a low-cost, effective way to promote artists and increase visibility. The challenges are particularly beneficial for women music artists. My third essay examines the intersection of gender and race in digital music consumption after Floyd's death. I explore whether music can raise awareness of social justice issues and the role of Black artists as sensemaking agents. I find that hip-hop listeners increased after Floyd's death, particularly in less racially diverse cities. Black artists received more listenership across all genres, but consumption was skewed towards Black men artists, highlighting the underrepresentation of women in Black-dominated music genres. Collectively, the findings from these studies in my dissertation will provide valuable theoretical contributions, practical insights, and actionable solutions to bind the gender gap and make the digital markets more diverse and inclusive.

WHITHER WONDER WOMEN? ESSAYS ON GENDER DIVERSITY IN IT-ENABLED PROFESSIONAL AND CREATIVE DOMAIN

by

Yifei Wang

Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2023

Advisory Committee:
Professor Jui Ramaprasad,Chair
Professor Anandasivam Gopal, Co-Chair
Professor Guodong (Gordon) Gao
Professor Lauren Rhue
Professor Anna Alberini (Dean's Representative)

Acknowledgements

I would like to take this opportunity to express my gratitude to the many individuals who have supported and guided me throughout my journey presuming PhD degree in Information Systems.

First and foremost, I would like to thank my advisors - Professor Anand Gopal and Professor Jui Ramaprasad for their encouragement, guidance, and constant support on the dissertation and career direction throughout the doctoral program. I really appreciate the significant amount of time and effort they spent to help me, without which I would not be able to accomplish my dissertation and success the job market. I am truly grateful for their mentorship and dedication to my success.

I would like to express my appreciation to the members of my dissertation committee, Professor Gordon Gao, Professor Lauren Rhue, and Professor Anna Alberini for their constructive criticism and valuable insights that have significantly improved the quality of this work. The diverse perspectives and expertise greatly enriched my work. I want to truly thank my coauthors Professor Peng Huang, Professor Gorkem Ozer, Professor Nishtha Langer, and many others. I learned a lot from them, which contributed enormously to this dissertation.

I would like to thank my fellow PhD student colleagues at UMD, for their intellectual contributions, camaraderie, and support throughout my studies. Their insights and encouragement have been invaluable, and I have learned so much from their research and expertise.

I would like to thank Professor Alberto Espinosa, and many others at American University for their mentorship and encouragement over the years. I would also like to express my gratitude to my two dear friends: Lauren C'Debaca and Emily Mella Cedano for their support, love, and encouragement throughout my academy journey. Their emotional support and being great friends have been a constant source of strength and inspiration.

I would like to thank Professor Rebecca Hann and Justina Blanco for taking great care of the doctoral students and provide a supportive and intellectually stimulating office environment.

Finally, I would like to dedicate this dissertation to my family, who supported me in countless ways during this process. Their support and encouragement gave me the strength to persevere and overcome obstacles, and I am forever grateful for them.

I am deeply grateful to everyone who has played a role in making this dissertation a reality. Thank you for your support, encouragement, and guidance.

Table of Contents

List of Tables

Table for Chapter 2

Table for Chapter 3

Table for Chapter 4

List of Figures

Figure for Chapter 2

Figure for Chapter 3

Figure for Chapter 4

Chapter 1: Introduction and Overview

The representation of women within many high-paying and traditionally men-dominated sectors has improved substantially in recent years. These gains notwithstanding, there still remain significant sources of inequity in their participation, promotion, and performance within these technology-enabled industries. Even in contexts where technology is utilized but not central to economic activity, such as in music and the arts, women tend to be under-represented compared to men. The literature provides multiple reasons for the low participation of women in these particular sectors. A common explanation pertains to gender-based biases that prevent high-quality talent from being hired, promoted, and succeeding in their career. Other reasons include organizational constraints and processes in corporate or organizational settings reflecting systemic hurdles that seem difficult to overcome for women (Fernandez-Mateo and Kaplan 2018; Ozkazanc-Pan and Clark Muntean 2018).

Furthermore, women are stereotypically viewed as poor fits for positions, activities, or product categories associated with masculine characteristics (Chan and Wang 2018; Trauth et al. 2010b; Trauth et al. 2009). Even if individual decision-makers are not biased against hiring or promoting women, coordinating with fellow decision-makers in the organization often leads to conventional choices based on gender or race status (i.e., Bertrand and Mullainathan 2004). Furthermore, research also has documented that women shy away from opportunities that appear risky - for example, opportunities that require self-promotion (i.e., Bosak et al. 2018) or come with high competition (i.e., Croson and Gneezy 2009). Despite extensive research into the sources of women's underrepresentation, strategies for their mitigation remain under-

explored and even less understood. This issue spans multiple domains, including technical areas like software development, analytics, and technology contexts as well as creative domains, such as in music and the creative arts. The context of music is particularly noteworthy since the advent of technology as well as the interacting influences of gender and race have created many problems for women artists that have not been addressed fully in the literature. Furthermore, societal events pertaining to gender and race, such as the Me Too movement (Luo and Zhang 2022) and the Black Lives Matter movements (Agarwal and Sen 2022) have benefitted from the effects of technology to a great extent, leading to significant changes in how the traditional gender and race gap is perceived and even bridged in recent years. Building on these gaps in the literature, my dissertation provides three essays that aim to explore different mechanisms to mitigate the gender gap, and to enhance overall diversity and inclusion in the digital markets, while spanning across domains and empirical contexts.

The first essay examines the issue of unequal participation by women in IT labor markets. Though the gender gap in hiring and promotion is well documented in the literature (Langer et al. 2020; Levina and Xin 2007). I question whether the IT industry suffers from a "*pipeline problem*", where more women choose not to participate because of the competitive and complex nature of IT work. To test my research questions, I mimic a competitive online IT work bidding environment to understand how these project risk factors may affect the decision to bid for a project and the wage expectation across female and male graduate students. In particular, I capture IT project risk by identifying three factors – task complexity, boundary-spanning requirements, and the presence of competition. Contradicting what past

literature has suggested, i.e., women are more risk aversion and thus more likely to shy away from competing with equally qualified men (i.e., Buser et al. 2014), I actually find women to respond with greater alacrity to competitive environments and environments with greater needs for coordination relative to men. My experiments also find interesting differences between South and East Asian women - South Asian women are more likely to bid and bid higher, all else being equal. This essay has significant implications for making the IT labor markets more inclusive and attractive to women by identifying specific factors affecting women's participation and wage expectations. It also contributes to the literature by identifying specific factors affecting women's participation and wages in the context of IT. This work provides two clear takeaways. First, when focused on trained women in IT contexts, any hypothesized notions of forbearance or risk aversion seem to disappear relative to samples where no such prior grounding in the IT context is observed. Second, given the discrepancy in participation rates observed in middle management and upper echelons of the IT industry between men and women, I surmise that it is not an intrinsic lack of competitiveness that may be holding women back but rather a combination of environmental and organizational factors that may be leading to the lack of equitable participation. In effect, I observe evidence of the "leaky pipeline" problem typically studied in the context of gender within the IT industry (Buckles 2019).

My second essay studies how a new form of technology-driven phenomenon enhances women's representation in the digital music industry. Prior research has focused on postulating why gender disparity exists in the music industry, including systematic discrimination, discounting of women artists' abilities, and unwanted

stereotyping and sexualization (i.e.,Smith et al. 2020). Other than these external reasons, scholars have also found that, across multiple contexts, women are subject to a backlash effect from promoting their work or abilities compared to equally talented men, both offline and online (Exley and Kessler 2022; Wotanis and McMillan 2014). I argue that *hashtag dance challenges* (HDCs) available on TikTok represent, at their core, virtual advertisements for the corresponding music artist whose work is used in the HDC. Since users primarily generate HDC, the penalty of self-promotion for women should be eased. By collaborating with a digital music analytics company, I examine the phenomenon of an HDC on an artist's popularity in Spotify, the largest music streaming platform. I show that the presence of an HDC has a positive impact on artists' daily follower growth on Spotify. I further show that female artists benefit significantly more than male artists. There is no difference in their effectiveness on artist popularity between artist-initiated and user-initiated HDCs. I explain these effects using theory in role incongruency and self-promotion. This essay extends the literature by addressing how artists may use social media platforms to gain visibility and traction and, more importantly, how female artists can leverage HDC as a viable way to promote music without experiencing significant backlash.

While the first two essays focus on exploring different IT mechanisms that help enhance or explain the representation of women within specific industry segments, my third essay expands the scope and discusses the interaction of gender *and* race, set within the context of the intersection of a triggering societal incident and digital music consumption. The focus of my empirical strategy, the viral video of the killing of George Floyd by a White police officer, circulated widely on social media, generated

shock and confusion among Americans who had long assumed that attitudes towards race were changing since the emergence of the Black Lives Matter (BLM) movement (Ray 2022). Against the backdrop of the ongoing Covid-19 pandemic and its associated economic impact, this incident may have exacerbated frustration and anger among the general population, leading individuals to search for explanations to make sense of the situation around them (Weick 1988). As individual Americans seek greater understanding of the circumstances around the viral video and the ongoing societal conflict, I argue that they are likely to turn to music as a sense-making device, and in particular, the genre of Hip-Hop.

Music has long served as a medium for artistic expression and social commentary within social movements. Hip-hop music, in particular, has deep roots in the African American community and a history of addressing social and political issues (Harlow and Benbrook 2019). In the wake of Floyd's death, individuals in the United States may have turned to music, particularly hip-hop, as a source of information and a means of participating in discussions related to the incident. As such, I examine music consumption as a proxy for awareness of the need for race-based social justice within the United States (Elias 2020). Furthermore, I explore the role of Black artists as agents of the sensemaking process, given that music produced by Black artists has a higher level of perceived legitimacy and authenticity, especially with regard to representing Black culture and experiences (Johnson et al. 2006). Importantly, I examine heterogeneities based on the artist's gender. I test whether the impact of the BLM movement spurred by Floyd's death varied by artist gender, both within the community of Black artists and across races. Using a dataset of music streaming patterns from

Spotify, I found a significant increase in hip-hop listeners following Floyd's death, relative to the genres that are traditionally White dominated (i.e., folk, country), more so for less racially diverse cities. At the artist level, I found Black artists received more listenership across all sampled genres, and the consumption skewed towards Black men artists compared to Black women artists, speaking to the skewed presence of women artists even in Black-dominated music genres. I explained these effects through the theoretical lens of sensemaking. This essay contributes to the literature studying the societal impact of the digital music platform and how the music made by Black artists, both male and female, may serve as a source of information and discourse, helping individuals to make sense of events related to racial inequality and anti-Black police violence in the U.S.

Across all three essays, my research provides valuable theoretical and empirical contributions to the extant literature while also helping managers and policymakers with pointed prescriptions for ways to enhance the participation of women within these sectors. In essence, my work first shows that the IT industry cannot simply shrug and pass off the lack of women in IT as a pipeline problem (Saujani and Bdeir 2019). The industry needs to reflect on how the policy goals aimed at increasing the presence of women within IT labor markets and, by extension to STEM professions, need to be suitably repositioned. My work further suggests an actionable remedy rooted in short-form social media to help creative women artists gain more public traction for their artistic work. As short-form video platform providers look to increase platform diversity and inclusion, they need to reflect on leveraging technology-driven mechanisms to increase women artists' presence. Lastly, my research understands how

societal incident impact music genre listening patterns and how music artists help to shed light on the sensemaking process, providing a framework for understanding how such incidents may lead to similar changes in other settings. When an incident like Floyd's death reveals social and economic issues that resonate with a broad range of stakeholders, it can inspire changes that go beyond narrow fixes focused solely on the event's immediate problems. The implication of my study thus goes beyond the music industry and may instigate changes of a greater magnitude by a broader set of individuals and organizations. Notably, the findings informed that structural barriers or biases might limit the visibility and recognition of Black women artists in the music industry. Addressing these structural barriers and biases is necessary by creating more inclusive and equitable spaces for Black women music artists.

Collectively, the findings from these studies in my dissertation will provide valuable theoretical contributions, practical insights, and actionable solutions to bind the gender gap and make the digital markets more diverse and inclusive.

Chapter 2: Where Angels (Do Not) Fear to Tread? On the Propensity of Women to Compete in Information Technology Work[1]

2.1. Introduction

Is the lack of women in the Information Technology (IT) industry a pipeline problem? The constraints faced by women within competitive labor markets have been well documented in recent years. These constraints have been particularly true within the STEM fields such as IT, which are human capital intensive and where arguably technical merit should be the main consideration, yet women seem to fall behind (Ozkazanc-Pan and Clark Muntean 2018). Industry studies cite gender-based discrimination and biased hiring that appear to be holding women back within IT (Hawlett and Sherbin 2014; O'Leary and Shames 2015). The academic literature shows that men and women do experience differential labor market outcomes in hiring, promotions, and wages within the IT industry (Ahuja 2002; Langer et al. 2020; Levina and Xin 2007). Not surprisingly, women make up only 23.1% of U.S IT labor market (Bureau of Labor statistics 2015) and are even more underrepresented globally. Some factors that affect this lower rate of participation may involve organizational factors (Ahuja 2002; Ibarra 1997; Trauth et al. 2009). However, it may also be the case that the decision to participate may differ between men and women, given that IT work is often perceived to be masculine(Chan and Wang 2018; Trauth et al. 2010a; Trauth et al. 2009) can be complex and uncertain, making it riskier to accomplish tasks and finish

[1] This chapter is co-authored work with Nishtha Langer and Anandasivam Gopal.

projects. Additionally, the IT industry itself is hyper-competitive (CompTIA 2020), requiring a willingness to engage head-on with competitive peers. Prior work suggests that relative to men, women are more risk averse and may be less willing to participate in more complex or competitive work (Buser et al. 2014, Croson and Gneezy 2009). Therefore, in this paper, I ask: are women more deterred by the inherent riskiness of IT work, in the form of task and coordination complexity or increased competition than men? At a macro level, I question whether the IT industry suffers from a pipeline problem, where more women choose to forbear from participation because of the competitive and complex nature of IT work?

Answering this question while removing any organizational constraints or pressures can help address one of the reasons why women participate less within the IT, and by extension, STEM industries. While other factors that affect women in the workplace, such as biased hiring, evaluations and lack of mentoring (Hawlett and Sherbin 2014) are certainly relevant, it may well be the case that women are simply less willing to participate in IT projects because of the enhanced complexity and competition. Thus, the low availability of women professionals in the IT sector may commence from the participation decision itself, which is further exacerbated by organizational and field-level factors. This specific question has not been addressed in the literature, which tends to focus on gender issues within organizational and institutional contexts when the decision to participate or not has already been taken.

I use experimental methods with a sample of IT professional graduate students, to examine whether women choose to compete on riskier and competitive projects at a rate that is significantly different from men. I address these hitherto unexamined

research questions using a multi-factor randomized experimental design, using as my setting a competitive online work environment that resembles popular online labor markets such as *Upwork* and *FreeLancer.com*. This setting allows to divert attention away from any organizational context and focus it on task attributes. Thus, the decision to bid for the project at hand demonstrates the desire of the individual (men or women) to participate in IT work and the expected wages.

Through the experiment, I manipulate various aspects of the proposed IT project to elicit responses from subjects. A specific component of IT work pertains to the uncertainty of the IT project itself, instigated by the complexity of the task at hand, the boundaries that need to be managed to accomplish a task, and the overall competitive environment. IT projects are often characterized by variations on these dimensions, each of which may contribute to the level of uncertainty and complexity in the project. Task complexity pertains here to the technical complexity of the project, in terms of the technical requirements of the work required and the interdependent elements of the technical environment that need to be managed. All IT projects require coordinating across boundaries between the developer and the client – these represent technical as well as language and cultural boundaries that need to be bridged (Gopal and Gosain 2010). The presence of these boundaries enhances the risk of the project, since prior work has shown how inadequate management of these boundaries can lead to project failure (Levina and Vaast 2005). Finally, the notion that women may choose to forgo competitive environments has been tested in the literature. Prior research has posited that men may be more competitive than women (Buser et al. 2014; Croson and Gneezy 2009; Flory et al. 2015; Gneezy et al. 2009; Niederle and Vesterlund 2007).

Through random manipulation of these three factors, I am able to study how women may be dissuaded from participating on the market, either in terms of their decisions to bid for projects or in terms of the wages they demand, relative to men.

In my experiments, I focus on how gender as well as the randomly manipulated project factors play out across two dimensions – *willingness to participate* and *expected wages*. While the literature tends to focus on wages and compensation, I argue that considering the willingness to participate is equally important since paid wages only result in when agents choose to participate. The results from my experiments thus have implications for the effective functioning of IT labor markets where a good deal of human capital is likely wasted if women choose to not even participate. My experimental results find that women are significantly more likely to bid for IT projects compared to their male counterparts, as a baseline, but are deterred by high complexity. In addition, I find that women are more likely to bid for projects that require them to be boundary spanners: navigating, communicating across, and managing multiple domains, technological, functional, and geographical boundaries. Surprisingly, I find that women are also ***less*** deterred by the presence of competition compared to men. When shorn of organizational and team conflicts, my analysis shows that women are no less keen on participation in complex and competitive projects than men and may be more so.

The subject pools of my experiments consist of a high proportion of graduate students from South and East Asia, allowing me to examine potential variations between these two communities as well. I find that South Asian women bid more aggressively overall and East Asian women respond positively to higher boundary

spanning requirements and increased competition. The notion of gender differences in collectivist cultures, where women are considered to be less aggressive and less risk-seeking, is not supported in my analyses (Adya 2008; Lu et al. 2020). These diverse and somewhat counter-intuitive findings, reflective of the current global nature of the IT labor markets, are even more important from managerial and policy making perspectives.

My work here contributes to IS literature in multiple ways. First, this study addresses the critical issue of unequal participation in the IT sector by women, by focusing attention not just on salaries but also on the earlier decision to enter these markets. Contrary to prior research, I find that women are more likely to participate and even more so for competitive projects, but less likely for more complex projects. This study thus complements and extends existing research on gender and competitive labor markets to the context of IT labor markets. Second, I explore the extent to which technical complexity and boundary spanning may differentially influence the decision to bid for projects across gender, building on prior research showing women systematically shying away from more complex work – interestingly, I find that women are more likely to participate in projects with higher boundary spanning requirements.

While the low prevalence of women in IT may be partially explained by a decision to opt out of competitive environments, my findings show that women's decision to participate may not necessarily be driven by intrinsic or extrinsic barriers. Indeed, the lack of women in IT labor markets does not appear to be a pipeline problem, because the women in my sample, representative of women in tech, are not deterred by competition or boundary spanning complexity. Unlike prior studies that found women

to be more risk-averse, women in my sample seem no more risk averse than men and in fact come across as risk takers, highlighting the effect of self-selection of competitive, smart, and risk-seeking women into IT labor markets. In essence, my work shows that the IT industry cannot simply shrug and pass off the lack of women in IT as a pipeline problem (Saujani and Bdeir 2019). The industry needs to reflect on how the goals of policy aimed at increasing the presence of women within IT labor markets, and by extension to STEM professions, need to be suitably repositioned. My work here addresses the important issue of women's participation for IT work, and thus has significant theoretical and practical implications for Information Systems (IS) scholars focusing on gender related research questions.

2.2. Background Theory and Hypotheses

Given my interest in understanding why individuals may choose to compete for projects in the presence of technological and contextual challenges, I draw on information processing theory (Tushman and Nadler 1978). Information processing theory postulates that every organizational and economic activity entails the need for information processing since all tasks are interdependent and require coordination. In certain settings, the information processing requirements are more pressing, thereby making such settings inherently more uncertain and riskier (Langer et al. 2014). In such contexts, additional information processing methods are needed to achieve success. In my context, I argue that IT projects tend to represent varying levels of information processing needs by virtue of their technical and coordination requirements. Even when project details are enunciated ex ante, individuals competing for such projects rarely

ever have all the pertinent information needed for decision making. Therefore, participation behavior is influenced by the potential demands for information processing that may be anticipated by the focal individual, based on project and client details provided.

Within typical software development or analytics projects, information on the specific aspects of the project is rarely ever present in its full form. Indeed, incomplete information about the technical and organizational requirements for the project is assumed to be the default, which is also why the requirements development stage is considered to be vital (Chari and Agrawal 2018; Nidumolu 1995). In such settings, both clients and vendors put forward a general set of requirements and assume that more complete information will be made available over the course of execution. When a freelancer software professional considers the parameters of a project on offer, there are two significant factors that are likely to influence the professional's risk perceptions on the project (Nidumolu 1995). First, the technical requirements laid out in the project, even at a preliminary level, can provide information about the extent to which the project is risky and complex. The project description may include its technology and domain specific requirements, yet the precise level of skill and expertise needed can only be partially inferred. Second, in a typical "outsourcing" context, there is a need for coordination and communication between contracting parties (Gopal and Gosain 2010) that involves coordinating across various technical and cultural boundaries. In software projects, these costs are non-trivial (Levina and Vaast 2005). Beyond these project-related factors, the presence of intense competition from other entities for the project can also add uncertainty for the focal software professional.

The interacting influence of these factors, perceived even during the early stages of an IT project, can affect the decision to participate in the marketplace. While these factors increase the uncertainty and risk embedded within IT projects, my goal here is to examine if there are differences between men and women in terms of competing for such projects, contingent on factors that vary their information processing requirements. Specifically, I study whether the presence of technological complexity, boundary spanning processes, and competition - all of which enhance the riskiness and information processing needs in the project, will differentially influence the decision of women to bid on such projects (Galbraith 1974; Kraut and Streeter 1995; Morgan 2006; Simon 2013; Tushman and Nadler 1978). In the following sections, I outline the main theoretical arguments for each of these factors in terms of how they may affect decision making across genders.

2.2.1. Gender and Task Complexity

Within the context of software development, a significant source of information processing need emerges from task complexity, defined as the series of interdependent and interconnected subtasks that need to be completed in a specified order for the task to be completed (Banker et al. 1998; Espinosa et al. 2007). In general, task complexity is associated with greater uncertainty, since each subtask may not always be well understood or easily completed, while their interdependencies are even less predictable. Uncertainty in this setting is therefore the difference between the information available to the agent and the full complement of information needed to complete the task. Thus, the greater the task complexity, the greater is the information processing need, and hence greater is the uncertainty in the activity, all else being equal (Tushman and

Nadler 1978). Technologically complex IT or software projects that involve a combination of technical requirements combined with complex data processing needs are inherently more uncertain since they require high levels of information processing. Inasmuch as the technical knowhow is present in the vendor's skillset, the incremental uncertainty created by the project description itself can add to the technical complexity faced by the prospective software professional. From an information processing perspective therefore, technically complex projects represent significant uncertainty.

How may task complexity affect the decision by women to bid for such projects, relative to men? Prior research argues that dynamic task environments that intrinsically represent greater uncertainty (Duncan 1972) will tend to generate gender disparities in terms of bidding behavior for such projects. Women may be more uncertain of their ability to deliver on more complex projects when they do bid. Since higher task complexity engenders more risk, an individual's propensity to bear risk can lead to systematic differences in response. Using this reasoning, Niederle and Vesterlund (2007) argue that women tend to display more risk-averse behavior and therefore opt for less complex undertakings, relative to men. Other scholars have also suggested that when faced with complex and potentially risky activities, women and men tend to respond differently (Borghans et al. 2009; Croson and Gneezy 2009). Men are generally significantly more confident about their capabilities with respect to managing uncertainty inherent in more complex tasks than women, and expect to be compensated for it (Niederle and Vesterlund 2007). Women may also believe that IT labor markets may consider their expertise in complex problem solving as lower compared to men (Babcock and Laschever 2003). This diffidence regarding their ability to successfully

execute a more complex project –compared with men's confidence in accomplishing more complex tasks – could result in them placing a lower value on their requisite compensation and may lead them to think that they may not deserve a higher hourly rate (Babcock and Laschever 2003). Indeed, it has also been argued that asking for more money may have negative social consequences for women (Bowles and Babcock 2013). Given the link between technical complexity and risk and the observed prevalence of greater risk-averse behavior by women relative to men, I posit:

H1a: Ceteris paribus, relative to men, women are less likely to bid for projects with high technological complexity.

H1b: Ceteris paribus, relative to men, women are more likely to issue lower bids, if they bid, for projects with high technological complexity.

2.2.2. Gender and Boundary Spanning

Successful development and execution of software and IT projects necessitates integration of knowledge and information across many boundaries, be they functional, technological, procedural, geographical, or organizational boundaries (Gopal and Gosain 2010, Levina and Vaast 2005). For an IT project to be executed competently and efficiently, it is important that both the client and the software professional realize that the boundaries between their respective knowledge domains have to be spanned successfully, i.e. information and knowledge has to flow as needed between the two parties. In addition to organizational boundaries, IT vendors may have expertise in the technology relevant to the project, but lack the domain knowledge essential for project execution (Gopal and Gosain 2010), necessitating cross boundary interaction with the specific client's domain or even joint problem solving (Langer et al. 2014; Rai et al. 2009). Additionally, the development of global platform for vendors and clients to

connect change the nature and provenance of traditional IT sourcing paradigms, introducing geographical, temporal, and cultural boundaries in the project such that the vendor and client may have to work across time zones and language barriers (Espinosa et al. 2003; Langer et al. 2014). These boundaries are not traversable via contractual mechanisms or controls alone, they require coordination and governance structures to facilitate boundary spanning, wherein both the boundary spanning individuals and objects are identified and coded into the process (Gopal and Gosain 2010, Levina and Vaast 2005).

As the boundaries embedded in a project requirement increase, their information processing requirements also increase, increasing project risk. Although, women are arguably more risk averse compared to men, and hence projects with high boundary spanning may seem potentially less attractive to women (Tushman and Scanlan 1981), boundaries are managed using boundary spanning and relational objects such as communication and coordination tools and seeking work collaboration. The collaborative communication and joint problem solving necessary for boundary spanning is more amenable to what is perceived to be women's style of project execution, and hence they are less likely to shy away from projects with more boundary spanning constraints (Araújo-Pinzón et al. 2017; Chan and Wang 2018).

Women have been shown to value relationships more in general (Carli 1989) if they are driven to invest in a new relationship with a potential client. They may have more confidence in managing the various boundaries that such a project may entail by better managing the relational aspect of the project (Bowles and Babcock 2013; Gysler

et al. 2002; Stuhlmacher et al. 2007). By asking for more compensation, women would thus like to indicate their boundary spanning capabilities to a prospective client. Thus,

H2a: Ceteris paribus, women are more likely to bid for projects with high boundary spanning constraints.

H2b: Ceteris paribus, women are more likely to issue higher bids for projects with higher boundary spanning constraints.

2.2.3. Gender and Competition

Beyond the presence of technological complexity and boundary spanning needs, the presence of competition for the same project (or positions, in the context of firm-level hiring) can also influence the decision to participate in the marketplace. Although research has addressed how the presence of competition may manifest differently across men and women in terms of their performance, these have been conducted largely in non-IT settings and with non-professionals. Gneezy et al. (2003a) show that in highly competitive environments, men tend to outperform women on average. In more recent work, Niederle and Vesterlund (2007) confirm these broad findings in the lab by showing that women tend to respond less favorably to competition while men are more eager to compete and tend to respond more positively to the presence of competition. The literature also shows that men view the presence of competition as a challenge and less as a threat; in contrast, women view competition as risk (Croson and Gneezy 2009; Eckel and Grossman 2008). A selection of this research is described in brief in Table A.2.1 in the Appendix. While compelling, it is not clear how these results may generalize to contexts where both men and women are professionally qualified and face varying levels of competition, which is the context I address here.

How may the presence of competition affect the differential response of software professionals on their participation decisions? With respect to the decision to participate, Niederle and Vesterlund (2007) examine how women and men respond to a choice between a competitive versus a non-competitive compensation scheme and find that men are more likely to believe that they can outperform others. Consequently, they are more inclined to enter the tournament and compete. In contrast, women do not make the same choices and prefer the non-competitive scheme. Thus, women appear less willing to enter competitive tournament settings on average.

Extrapolating this to the context of trained software professionals, I expect to see a similar effect of competition. However, given the presence of equivalent training, the effect of gender may be lesser in magnitude than seen in non-IT settings. These differences in behavior cross over to bidding behavior as well, when facing competition. Liang et al. (2018) argue that women tend to bid for jobs with lower hourly wages, relative to men, and are less willing to bid for online jobs where they are likely to be monitored. Arguably, software projects that require less monitoring are less uncertain in general and are likely to provide lower wages. Finally, because they may perceive themselves to be weaker than they truly are, relative to men, and may therefore feel that a more competitive project is out of reach, they can resort to aggressive bidding and bid lower than others in order to secure the contract (Chen et al. 2015; Ham and Kagel 2006; Maskin and Riley 2000). Building on this reasoning, I expect that the women professionals I study will appear to systematically respond to competition by choosing to not participate in the bidding process, and when they do bid, they are likely to bid lower than men, all else equal. However, again, the presence of training and

competence, as well as the absence of any organizational factors may contribute to a smaller effect of competition on wage bids in my setting. I formalize these arguments in the following hypotheses:

H3a: Ceteris paribus, relative to men, women are less likely to bid for projects with greater competition.

H3b: Ceteris paribus, relative to men, women are more likely to bid for less wages for projects with greater competition.

2.3. Methodology and Experimental Design

I empirically test these hypotheses with using an experiment conducted using participants from a leading East Coast university in the United States. The university's business school offers MS programs in business analytics and information systems, and the graduate students enrolled in these programs were recruited as experimental subjects for this study. The students were given the choice of participating in the study, with no associated rewards or financial payouts for participation. The study was approved by the Institutional Review Board of the university as well as program administrators within the business school. I note that there is no deception involved in the experiments and that post-experiment, all participants were debriefed on the purpose of the study. The graduate students spanned two successive cohorts and reflected a cross-section of enhanced technical capabilities and work experience, thereby differentiating them from other studies that use undergraduate students. I was able to garner participation of over 90% across the two cohorts into the experiment, since the topic of the study was viewed as being of much interest.

The experiments were conducted in specifically designated classrooms where the students were first invited to provide their consent forms for the experiment. Subsequently, they were directed to an URL where the study was implemented using Qualtrics. The entire experiment took roughly 15 minutes, and the experiment was conducted in multiple batches so as to reduce congestion and potential spillover effects. In each setting, experimental subjects were told to consider themselves as freelance software professionals on sites such as *UpWork* and *FreeLancer*, i.e. as a "vendor" bidding for a project. They were then presented with a set of requirements for a project that was available and asked if they were interested in bidding for the project.

These project profile pages include information provided by the potential client on the technical requirements of the project, the programming environment or technical skillset requirement that is involved, a tentative duration for the project, a short description of the expected deliverable, and other information that may be relevant to the project. Furthermore, the project profile provided some background information on the client, such as location, prior experience on the platform, total project spending on the platform, and reviews left for the client by prior vendors, if applicable. This information is provided to ensure that bidding vendors are fully informed about not only the technical environment but also the clients and mimic typical job listing in an online freelancing platform. If they indicated that they were interested in bidding for the project, they were then asked to enter in a wage expectation for the project. Each subject completed this process for two projects which varied along specific dimensions described below. The expectation was that the project would be completed in an online

setting, to retain consistency with the experimental material used that resembled a typical online freelancing platform.

I employ a combination of between and within subjects design (Charness et al. 2012), wherein each subject is randomly assigned to one of the 8 factorial cells. The three treatments that I manipulated are (a) task complexity, (b) boundary spanning complexity, and (c) presence of competition (see Table 2.1) I randomize within subjects for project complexity with two dimensions (low vs. high), between subject design for boundary spanning with two dimensions (low vs. high) and competition with two dimensions (low vs. high). Given my focus on gender, the experiment allows me to identify the effect of the three proposed treatments across two genders with little systematic bias (e.g., Bertrand and Mullainathan 2004).

The three treatments were based on manipulating the following information in the project. First, to vary **technical task complexity**, I manipulate the technical requirements of the project itself, based on parameters associated with the depth of data manipulation required, the sophistication of the programming languages and interfaces required, the function points involved in the project, the complexity of the data itself, and the output requirements. The less complex project was significantly simpler in terms of the technical environment, the output requirements, and the extent to which data manipulations are needed to complete the project. My next treatment manipulates **boundary spanning complexity**, that is, the extent to which the subject and the potential client were separated by fault-lines or boundaries that require active managing through boundary spanning processes. Therefore, the high boundary spanning condition required managing across time-zones, language barriers, and more stringent

requirements for coordination and communication between the client and vendor. Alternatively, the low boundary spanning condition was significantly easier with fewer clear fault-lines and boundaries at play in the project profile. Finally, the presence of **competition** was captured by providing information on how many other professionals were currently in the running for the same project. I provide this information on the project profile page, as a way for vendors to gauge the competitive intensity for a project and their odds of being hired for the project. The low competition setting showed only four professionals with average ratings, while the high competition setting showed twenty other entities with some variation in their overall ratings. An example of a project is shown below in Figure 2.1. The appendix provides the details of the specific treatments for technical task complexity, boundary spanning complexity and competition (Table A.2.2). These profiles were similar and comparable, except for the specific treatment that varied. I then created a composite project that incorporates the main information provided across the two platforms, except for the experimental stimuli (Table 2.2). Before conducting the experiments, the stimuli were examined by three experienced raters with experience in software development in general (Espinosa et al. 2007, Langer et al. 2014). Subsequently, I ran two pilot sessions with a small sample of MS students and crowd workers on Amazon Mechanical Turk to ensure that they were reasonable for the purposes of the study. These students were not included in the final experimental pool.

Prior to the experiment, I trained the subjects on two sample projects so as to clarify all questions related to the main experimental procedure. Subsequently, each

subject was presented with a randomly chosen project profile (A-H) and then asked two specific questions that inform my dependent variables:

1. Would you like to **bid** for this project (Yes/No)?
2. If you chose to bid for this project, **what hourly wage rate (in $)** would you choose to enter?

I then asked a series of questions as manipulation checks to ensure that the purported treatments have indeed registered with the subject. I finally concluded the experiment with a set of demographics questions to gather information about the subject's age, gender, education, work experience, and years of experience in STEM. I obtained a usable sample size of roughly 281 participants across the two cohorts of the graduate programs, yielding a total of 562 observations respectively.

2.3.1. Randomization and Manipulation Checks

An important aspect of a randomized experiment is that the treatment should indeed be random across treatment and control groups (Bertrand and Mullainathan 2004; LaLonde 1986). I compared the means and standard deviations of gender, age, race, and educational background for the three treatments and found no statistically differences between the two groups, allowing me to conclude that the treatment was indeed random. I present the randomization checks in Tables 2.3. Second, in the context of software projects, I need to establish that experimental subjects are able to perceive relevant differences across high and low treatment settings (Acquisti and Fong 2020; Eesley and Wu 2019).Therefore, before participants exited the experiment, I asked a series of questions as manipulation checks to ensure that the applied treatments had

registered with subjects on the given project. I ask three questions using a 10-point scale: 1) How competitive did you feel the bidding process was for this project? 2) How complex did you feel the project requirements were? 3) How easy do you think coordinating with the client would be, had you won the project? If the manipulations were effective, subjects shown high treatment levels (competition, task, and coordination complexity) will rate these higher than those shown low levels of the treatment. Table 2.4 shows that subjects did perceive low levels of the treatment to be statistically different from high levels.

Table 2.5 show the final summary statistics of the variables of my sample, while correlation tables are provided in the Appendix (Table A.2.3). Women constitute 38.8% of the sample. Age group 18-24 dominates the sample (72.6%). It was also mostly exclusively Asian (94%). 75.8% of the participates choose to bid, and the average bid amount was $32.4.

2.4. Results and Discussion

2.4.1. Model-free Evidence

I first demonstrate model free evidence by showing the average propensity to bid and bid amount across gender, shown in Figure 2.2. On average, I observe that women are more willing to bid for projects than men ($\mathbf{Mean_F}$= 0.802; $\mathbf{Mean_M}$=0.729) The difference in bid amount, on the other hand, across the two genders is less salient. Figures 2.3-2.4 show how women and men's average propensity to bid and bid amount vary across the three treatment factors, respectively. I note that compared to men, women are more willing to bid when offered the high-complexity project ($\mathbf{Mean_F}$=

0.844; $\mathbf{Mean_M}$=0.773), more willing to bid for projects with high boundary spanning requirements ($\mathbf{Mean_F}$= 0.825; $\mathbf{Mean_M}$=0.717), and more willing to bid for projects with higher competition ($\mathbf{Mean_F}$= 0.824; $\mathbf{Mean_M}$=0.702). I also note that the bid amount doubles for high complexity projects compared to low complexity projects ($\mathbf{Mean_{HComplex}}$= 45.202$, $\mathbf{Mean_{LComplex}}$= 19.604$). Men issue higher bid amounts on average ($\mathbf{Mean_M}$=46.79$), compared to women ($\mathbf{Mean_F}$=42.697$).

2.4.2 Regression Results and Discussion

Next, I switch to regression analyses to examine the effects of the treatments and the interactions with gender, so as to test my research hypotheses. I use a linear probability model to analyze the experimental data for the bidding decision, and a Tobit model to ascertain the effect of treatment and demographic variables on the bidding amount once the subject decides to bid (Greene 2003).[2] My primary focus is to ascertain differences between participation of men and women when faced with task complexity, boundary spanning complexity, and competition. The regression analysis allows me to use interaction effects to ascertain these differences. Further, since subjects making repeated decisions for projects across the high and low complexity conditions, I cannot assume independence within the individual subject. Therefore, I account for this by clustering standard errors on the individual subject (Abadie et al. 2017; Cameron and Miller 2015).

[2] I examined model-free evidence of the effect of treatment as well as a probit model for the decision to bid, and my results are qualitatively similar to the LPM. Further, I also conducted manipulation checks to ensure that the treatments indeed were effective. These results are available from the authors upon request.

I report the regression results for the propensity to bid for the sample in Table 2.6. I first ran the baseline model with the treatment and other demographic variables. I then added interaction effects for Female*Treatment[3]. My results are largely stable across the specifications; therefore, in the interest of space, I discuss results from the full model (Column II).

With respect to the direct effects of the three treatment variables, I first find that project complexity increases the likelihood of bidding (**β**=0.122, $p<0.01$), perhaps because vendors may perceive such projects to be more lucrative if they bid. The presence of competition decreases the propensity to bid (**β**= -0.1, $p<0.05$). Not surprisingly, vendors are also less likely to bid when there is higher competition, which in turn decreases the likelihood that they will be hired. I see no direct effect of the boundary spanning complexity on the decision to bid for a project. I found that relative to younger age group (18-24) years, 25-34 age group is more likely to bid projects (**β**=0.086, $p<0.05$). I now consider the interaction effects with gender, which form the basis for my hypotheses.

Gender Effects in Bid Decision: As a baseline, I find that women are more likely to bid on IT projects compared to men (**β**=0.143, $p<0.001$), all else equal. Since I am considering women who are in professional programs and are treated largely on par with the men in the program, the organizational and social pressures that may manifest on them within a more corporate setting are absent here. Furthermore, since the context was positioned as an online project rather than a face-to-face opportunity,

[3] I also generate plots for these interaction effects. Interaction plots are available from the authors upon request.

I see little evidence that women are less likely to respond positively to opportunities, relative to men. I also observe that in the presence of competition, women are more likely to bid, relative to men ($\boldsymbol{\beta}$=0.173, $p<0.05$). This is counter to what is currently viewed in the broader literature on how women respond to competition. Furthermore, higher boundary spanning requirements do not appear to faze women – they respond positively to the need for greater communication and coordination efforts in the project, relative to men ($\boldsymbol{\beta}$=0.172, $p<0.05$). Finally, I find that when faced with technically complex projects, women are no less likely to bid for these projects.

In summary, within the cadre of technically trained women at the relative start of their careers, the traditional expectations from the literature on gender differences between men and women do not manifest. Rather, I actually find women to respond with greater alacrity to competitive environments and those with greater needs for coordination, relative to men. Of course, it is possible that their responses to these factors may change over time as they are exposed to organizational and social constraints, but my results suggest these differences that have been noted in prior work are likely not structural to women in the tech sector. It is worth noting that while the projects that were offered to the subjects were hypothetical, they were feasible in that they were adapted from real software projects that were posted earlier on sites like *Upwork* and *FreeLancer*. Furthermore, my randomization and manipulation checks ensured that the treatments were reliably and accurately implemented. Thus, the significant differences I observe between men and women in my setting is particularly noteworthy.

I now consider the effects of the treatments on the bid amount, if the subject chose to bid for the project. The results are shown in Table 2.7. In terms of the direct effects, as expected, more complex projects elicit higher bids, all else being equal **(β** =34.741, $p<0.001$). Similarly, projects that require additional boundary spanning effort lead to lower bids as expected **(β**=-9.179, $p<0.05$) but competition does not have any significant effect on bidding amount **(β**=-1.422, $p>0.1$). Subjects in the 25-34 age group bid more comparing to younger age group (18-24) years **(β**=9.378, $p<0.01$), arguably since they have a higher value for their own time and effort.

Gender effects in Bid Amount: I observe no difference between men and women in terms of their bids. However, when considering the interactions with gender, I see interesting nuances. Consistent with the literature, I find that women tend to bid less for complex projects, relative to me **(β**=-8.923, $p<0.1$). Even though women are willing to participate, their eventual wage expectations appear lower than men. However, women bid marginally higher for projects that require additional coordination efforts **(β** =8.972, $p<0.1$), which is consistent with my arguments for H2b. Finally, in the presence of competition, women issue higher bids, compared to their male counterparts (**β**=12.673, $p<0.05$), which again contradicts what is expected from the literature. In summary, I observe significant variation from prior work in terms of how women have been viewed to respond to opportunities within the IT industry.

2.4.3 Post-hoc Analysis by Region

Since my subject pool consisted of graduate students who are international in composition, I was able to perform some post hoc analyses to examine variations within gender. Most of the students in the programs I study were Asian, i.e. primarily from

East Asia (China and neighboring countries) and South Asia (India and neighboring countries). Although both cultures are collectivist in nature, there are differences in how gender is viewed across these Asian cultures (Siddiqui and Rehman 2017). Therefore, I use subsample analysis to uncover how bidding behavior varies across these two cultures. The subsample results for the propensity to bid and bid amount are shown in Table 2.8-2.9 respectively. Overall, both South and East Asian students respond positively to high technical complexity (β_{SOUTH}= 0.091, $p<0.05$; β_{EAST}=0.126, $p<0.05$). However, I found South Asian women were significantly more willing to bid on projects compared to South Asian men **(β**=0.188, $p<0.001$). In contrast, East Asian women were overall less willing to bid for projects **(β**=-0.244, $p<0.1$), but were more likely than East Asian men to bid for projects with higher boundary spanning requirements **(β**=0.32, $p<0.01$) and higher competition **(β**=0.27, $p<0.05$).

With respect to the actual bid amounts, I see interesting nuances as well. Overall, both South and East Asian subjects choose to bid higher for high complexity projects (β_{SOUTH}= 31.466, $p<0.001$; β_{EAST}=30.113, $p<0.001$) and lower for high boundary spanning projects (β_{SOUTH}= -10.864, $p<0.05$; β_{EAST}=-10.864, $p<0.05$). However, South Asian women bid significantly higher compared to their male counterparts (**β**=8.075, $p<0.05$) and bid higher with the presence of competition **(β**=12.107, $p<0.1$). In contrast, East Asian women bid less overall if they choose to bid compared to East Asian men (**β**=-11.734, $p<0.05$) but issue higher bids for projects with high boundary spanning requirements (**β**=15.619, $p<0.05$). Across both subsamples, I see that East and South Asian women show clear trends that counter the prevailing expectations about how women may respond to opportunities in the technology sector. While South Asian

women appear to be more embracing of competition, while East Asian women respond positively to the need for boundary spanning. While a deeper analysis of these differences is difficult in the context of my data, given the size of the IT industries in these two regions of the world, more research is needed to understand how gender may play a role here.

2.5. Conclusion

The issue of equitable participation by women within the IT and STEM professions has remained a challenge, whether these include academic communities or for-profit firms (Hammond et al. 2020). The policy-based solutions to remedying this situation have, for the most part, tackled wage disparity issues, biases in hiring, as well as concerns of work-life balance that tend to disproportionately affect women's careers.[4] Alternatively, hostile work environments have been identified as reasons for why women may choose to leave IT and STEM environments.[5] Each of these streams of research tends to presuppose that women are equally interested in participating in the workforce and are present in the marketplace. However, if women choose to not participate or forbear from entering the labor market, then the resulting wage disparities or biased hiring processes are likely to exacerbate a situation where a good deal of human capital is already lost. Thus, to gain a more complete picture of how gender influences employment and wage decisions within the IT or STEM sectors, it is important to first

[4] https://www.weforum.org/agenda/2019/09/stem-women-gender-equality-science-technology-engineering-mathematics/

[5] https://www.pewsocialtrends.org/2018/01/09/women-and-men-in-stem-often-at-odds-over-workplace-equity/

examine whether women and men are equally likely to participate when faced with opportunities, while removing any organizational or social constraints. Using a sample of trained graduate students in information systems and business analytics programs, I study exactly this question but using experimental methods. I thus examine potential reasons for why women may choose to not compete for projects in a context where office polices and biases were muted, contingent on factors that are visible and relevant.

I identified task complexity, boundary spanning needs, and competition as pertinent project attributes that affect women's participation in IT works. In a set of controlled randomized experiments, I access subjects' participation behavior by comparing the effect of high complexity, high boundary spanning, and high competition on propensity to bid for such projects and the bid amounts, for both men and women. I found that women are more likely to bid for projects in general, are less deterred by the project's boundary spanning needs or competition. In fact, they are also more likely to bid higher for such projects. These findings overwhelmingly suggest that women are willing and able to take on the uncertainty and risks of projects in the field of IT (analogously, STEM fields), reflecting more recent research in the financial literature on the self-selection of women into these highly demanding and risky careers (Adams and Ragunathan 2017). Given my most interesting finding suggests different bidding behaviors between South and East Asian women, further work could potentially further investigate the roles of culture and/or education impact on women's willingness to compete on IT opportunities.

This study has implications for employers and vendors in the IT labor market, as well as for academics as they train and educate the next generation of women in IT.

As a first step, my work suggests that trained women, at early stages of their career, do not appear to be systematically disadvantaged in terms of their willingness to take on complex and challenging work, nor are they fazed by competition. These are women who presumably have self-selected into the complex and highly competitive IT labor markets despite the numerous biases these markets pose for women. Indeed, the women in my sample, much like women in STEM and finance fields, seem to be risk loving than not and thrive on complexity and competition in terms of their willingness to participate ***and*** be compensated for it. In other words, it is not the pipeline problem that plagues IT labor markets but the systemic biases that still need to be rooted out. Any structural factors that inhibit women when facing complex or competitive tasks may need to be re-evaluated, especially in the technology sector. Interesting, women in IT appear more participative in the face of complexity and competition than men. However, data on the labor market outcomes for women later in their careers clearly shows that women are less represented and earn lower wages (Ceci et al. 2015; Trauth et al. 2010a). Therefore, my work highlights the detrimental impacts of factors that may affect women adversely later, such as organizational and social biases as well as personal concerns such as families and child-rearing (Cech and Blair-Loy 2019). From a policy perspective, therefore, a first step would be to recognize that trained women in IT do not systematically shy away from participating in complex or competitive task environments. Policy interventions aimed at maintaining these capabilities, such as by reducing societal barriers or organizational policies that may disproportionately affect women later in their careers becomes critical. These are externally induced barriers and do not represent inherent or structural barriers.

In addition, my work potentially highlights the factors that appear to motivate or dissuade men and women in IT from participation in projects. Interestingly, I see that technology work that requires higher coordination and sharing across cultural and language boundaries are more amenable to women, rather than men. Prior research has attested to the fact that women are better equipped to manage in environments where communication and coordination are critical (Chan and Wang 2018; Lanaj and Hollenbeck 2015), and I find some corroboratory evidence through the experiments. Similarly, when faced with competition, South Asian women in particular appear to be more than willing to bid for work, relative to South Asian men, suggesting that competition is not necessarily a problem for women even from collectivist cultures where forbearance from competition may be culturally more common. I see some persistence of the tendency to demand lower wages in my experiments on the part of women, but these differences are relatively small and do not dominate the results. As the IT labor market becomes more global and diverse, with more women entering the workforce through training programs, I argue that some commonly held notions about women and participation in the IT market need re-examination. Thus, my findings are critical for an academic audience as the misrepresentation of female among STEM graduates has been an important driver behind the gender gap in STEM labor market success (Salzman and Lieff Benderly 2019).

As with all research, I am limited by the scope of the experiments. While the experiments were randomized and had effective manipulation of the treatment, they do not capture the opportunity costs of bidding on a real, live project. Although my subject pools were more representative of IT professional, racial and national differences may

yet play a role in the decision processes that I was unable to fully capture in the analyses. Finally, the study was also limited by the scope and composition of the two graduate programs where I based my study – these programs were heavily skewed towards international students (non-American) and therefore, the results may not fully generalize to other populations. However, when one considers the global IT industry, where South and East Asian countries play a significant role in terms of markets, populations, and IT workers, my results do speak to these demographics.

Despite these limitations, I believe this study to be one of the first studies to examine the motivation and identify the specific factors relevant to the IT industry that deter or encourage women in IT to participate in competing for work opportunities in the field. My work is focused on a period that is largely overlooked in research that addresses firm-level outcomes for women in IT (Langer et al. 2020), preferences for women professionals over men (Chan and Wang 2018), and wage disparities within the field (Ceci et al. 2015). I focus attention on the point where women choose to participate in the labor market, and whether they systematically choose to forbear from complex and competitive task environments. I believe that more research is needed to fully examine early as well as mid-career factors that may lead to skewed participation by women in the IT industry, and to identify when and why social and institutional factors may kick in. As more IT work shifts to online platforms where organizational politics and norms are muted, the systemic imbalances between men and women within the IT and STEM fields may be mitigated. However, more work is needed to fully describe these processes. I hope that the research described helps towards furthering these goals.

Chapter 3: Dancing to the #challenge: The Effect of TikTok on Closing the Artist Gender Gap in the Music Industry[6]

3.1. Introduction

It is well-established that the entertainment industry, in particular the music and film sectors, lacks equal representation across multiple demographics. The under-representation of women within these sectors is particularly noteworthy, given the presumed central role accorded to women artists within mainstream culture. In the music context, for instance, a recent Billboard report concluded that women represented less than one-third of all performers, and only 12.5% of songwriters across the 800 most popular songs from 2012 to 2019. Women have accounted for only 11.7% of the Grammy award nominees between 2013 and 2020[7], translating to a gender ratio of 7.5 men to every 1 woman nominee. Many reasons have been postulated for why these gender disparities exist in the entertainment industry, including systematic discrimination, discounting of the abilities of women artists, unwanted stereotyping or sexualization, negative studio cultures, and lack of role models (Smith et al. 2020). However, one specific factor that may explain this observed underrepresentation remains understudied in the literature – the inability to or penalty associated with any effort to *self-promote* their own work within the industry. In this paper, I focus on this

[6] This chapter is co-authored work with Jui Ramaprasad and Anandasivam Gopal

[7] Source: https://www.grammy.com/recording-academy/press-room/diversity-inclusion

aspect, and provide evidence for how newly available social media capabilities may provide an unlikely yet effective remedy to this issue.

Across multiple contexts, research shows that women shy away from promoting their work or showcasing their abilities, compared to equally capable men (Exley and Kessler 2019; Moss-Racusin and Rudman 2010). Furthermore, women tend to understate their preferences, requirements, and wage expectations (Chan and Wang 2018; Fernandez-Mateo 2009; Gneezy et al. 2003b; Sterling and Fernandez 2018), which enhances the odds of their being left out of the competitive arena. When women do promote their own work, they are often faced with disproportional levels of discounting, criticism, or negativity, since self-promotion is often viewed as a "masculine" stereotypical trait (Brescoll 2016; Foschi 1996; Haines et al. 2016). Thus, from a gender concordance perspective, the inability to self-promote one's artistic abilities or output can help contribute to the gender skew observed in the arts, making it difficult for women artists to access the full measure of resources and opportunities needed to facilitate a successful career. These costs associated with self-promotion for women extend beyond the offline context and exist even on social network sites (SNS). User-generated content posted by women on older forms of SNS such as YouTube and Facebook receives greater levels of negative commentary and criticism relative to men (Wotanis and McMillan 2014). However, newer forms of social media platforms, involving the sharing of short-form videos, may provide a feasible solution to address these dynamics, especially for women artists. It is this specific argument that I explore in this paper. I examine the beneficial aspects of an interesting technological

phenomenon called the "hashtag dance challenge"[8], made popular by the short-form video platform, TikTok, launched in 2017.

Hashtag dance challenges (HDCs) are short video clips wherein an original piece of music by an artist is re-created in combination with a series of dance steps and posted on the platform for others to enjoy or emulate. Users interested in participating in the challenge can then film themselves performing the same dance steps and post these on the platform, linking them to the original challenge through the appropriate hashtag. The challenges can be created by both the original artist or, consistent with social media principles, by users on the platform. The hashtag helps link together all of the videos that use the same music and dance steps, thereby creating content that is easily shared and enjoyed by all users on the platform (shown in Figure A.3.1).

HDCs have become popular and have led to significant traffic on the platform since they represent a combination of original content (in terms of the chosen music) and user-generated content (the user adapts the original music to a specific set of dance moves). Moreover, they tend to possess all the features typically associated with viral content – they are creative, are easily viewed and broadcasted, evoke emotional reactions in the audience, and invite imitation and sharing. Thus, it is not surprising that HDCs are largely well-received, remain popular, and are widely shared on TikTok by a variety of users who apply their own creative styles to the original music. More to the point, their relevance and utility in enhancing the profile of artists whose music is

[8] An example can be viewed here: stayhipp.com/media/tiktok/doja-cats-say-so-tiktok-dance-trend-sayso/

featured within, remains unexamined in the literature on social media, a gap that I address in this paper.

How do HDCs help music artists more directly? I suggest that artists benefit from the wave of amateur content creators responding to HDCs for two reasons. First, HDCs represent, at their core, virtual advertisements for the underlying music that is used. By virtue of their popularity and viral nature, they can increase the likelihood that users will share content with their peers, thus increasing the salience of the music and the original artist. Second, since the music is almost always credited to the original artist (as shown in the challenge interface in Appendix Figure A.3.2), there is a direct link to enhancing the brand appeal and popularity of the artist. Third, and importantly, given the viral nature of HDCs, there is likely a significant spurt of attention provided to the artist, which could result in actual action, i.e., the average user is likely to sign on as a follower of the artist's music on musical platforms like Spotify rather than display a passive interest in the artist. I aim to capture this demonstrated increase in popularity of the original artist in my analysis, regardless of the artist's existing popularity or following. In other words, for both established and new artists, I explore whether being featured in an HDC leads to a significant increase in market traction. Thus, I ask: *does the introduction of an HDC enhance the artist's popularity in terms of followers on streaming music platforms?*

Beyond the main effect of the HDC, and relevant to my work here, I argue that *women artists* are more likely to benefit from the HDC on TikTok for multiple reasons. First, HDCs are primarily initiated by users and are a pathway to advertise music that does not require self-promotion by the artist. Therefore, an HDC initiated by a user is,

by definition, free of any self-promotion bias that tends to punish women artists disproportionately. Women artists should enjoy the positive aspects of user-generated viral content featuring their music on the platform, released from the downsides of self-promotion discounting. Second, the extant literature on dance and gender stereotyping argues that as an art form, *dance* is more deeply associated with women artists, especially in contemporary dance and choreography (i.e.,Jeschke 1991). From a gender-based role congruity perspective, there is a more significant association of women with artistic excellence in dance than men. In such contexts, I contend that women artists are more likely to see an increase in popularity when promoting their own music by initiating an HDC, relative to men artists, bringing up my second broad question: *to what extent is the effect of an HDC on an artist's popularity moderated by the gender of the original artist?*

I examine these research questions using a set of HDCs initiated on TikTok between January 1st, 2020 and April 30th, 2020. I obtain song level and artist level data from Chartmetric – a music analytics company that collects data from Spotify and the artist's social media activity. I choose Spotify because it is one of the world's largest music streaming service provider, with over 381 million monthly active users, and provides an effective proxy measure of an artist's creative impact.[9] While there are other ways to follow an artist's musical work, following the artist on Spotify represents an easy and feasible way to measure an artist's commercial appeal in the marketplace (Fruci 2020). I collaborate with a TikTok API authorized analytics company to gather data on individual HDCs posted on TikTok. My dependent variable captures the

[9] https://newsroom.spotify.com/company-info/.

percentage change in the artists' followership on Spotify, thus providing a naturally normalized measure of the artist's popularity that allows comparisons across artists. To identify the effect of the HDC on an artist's followers on Spotify, I compare songs that have an HDC initiated on TikTok during my observation window to similar songs that do not have an HDC on TikTok. I use propensity score matching in conjunction with a differences-in-differences econometric specification to conduct my empirical analysis (e.g, Liu and Lynch 2011; Smith and Todd 2005). I further consider the role of gender by conducting interaction and subsample analyses, examining the different impacts of HDCs across women and men artists, while treating gender as a binary construct for the purposes of my analysis.[10]

My results suggest that, on average, the presence of an HDC boosts the associated artist's daily Spotify followers by approximately 1% across the period of my analysis. While I differentiate between HDCs initiated by the artists themselves and those initiated by users, I see no difference in their effectiveness on artist popularity, suggesting that artists benefit from both user- and artist-generated HDCs. Furthermore, and importantly, I find that women artists benefit significantly more than men artists – women artists' Spotify followers grow by approximately 3% per time-period following the introduction of an HDC featuring their music, while there is no significant effect in the case of male artists. As a baseline, my results speak to the influence that newer short-form videos, such as HDCs, have on artists and their abilities to promote or draw attention to their own work. Their viral and appealing nature allow them to generate

[10] I acknowledge that gender is not binary, but face limitations in identifying non-binary genders in my data, as described in the methodology section.

impact, in addition to being inexpensive and relatively accessible to most artists. While research on gender role incongruity has primarily focused on how women are not treated on par with men in many fields (Jakubowska and Byczkowska-Owczarek 2018; Mo 2015), I find that in the specific case of HDCs, women artists are better positioned to benefit in terms of their popularity, relative to men.

My work contributes to the literature in two distinct ways. First, my work addresses the immediate question of how music artists may use newer forms of social media to gain visibility and traction. Prior research has established how viral content can facilitate social influence, in turn affecting user behavior (e.g., Aral and Walker 2011; Phelps et al. 2004). Research has also demonstrated how the broadcasting nature of viral content can increase user production adoption (Chen et al. 2011; Chen and Berger 2016), user engagement (Huang et al. 2020) and media attention (Berger and Milkman 2010). Building on this foundation, I show that HDCs, rooted in the context of the short-form video platform, are particularly useful in generating attention. I argue that these results speak to both the appeal of the short-form video contexts as well as the relative democratization and decentralization of social media's impact, where even users can help new and budding artists gain popularity. More to the point, my work shows how these results address an important issue women artists face in promoting their music work since self-promotion is penalized in multiple ways. Intriguingly, I find that HDCs are more useful for women artists to achieve traction since they help remove the stigma of self-promotion while building on the stereotypical congruity between dance and women artists, at least in the short term. Whether these remain in place in the future remains an open question for future work.

Finally, at a macro level, my work addresses questions pertaining to gender parity, especially within the digital music industry (e.g., Born and Devine 2015; Wang et al. 2021) and in creative labor more broadly (e.g., Bielby and Bielby 1992; Lutter 2015). Many studies show discrimination and bias toward women in the digital music context (e.g.,Ferraro et al. 2021; Lesota et al. 2021; Wolfe 2019) but research on mitigating these biases is relatively scarce. Social media and the availability of user-generated content (UGC) can potentially correct some of these imbalances by providing women a safer and more collaborative platform for achieving their music promotion goals. Although traditional social media platforms like YouTube were expected to serve as these equitable forums, research shows that this is not the case (Wotanis and McMillan 2014). My study suggests that the combination of user-generated dance and music that characterize HDCs may serve as an alternative modality by which artists, especially women artists, can have a fair shot at increasing the visibility of their work.

3.2. Background Theory and Hypotheses

3.2.1. The Role of Hashtag Dance Challenges (HDCs) on Artist Promotion

Hashtag dance challenges, which started as a phenomenon on TikTok, are affect-rich and broadcasted, features that are typically associated with viral content (Berger and Milkman 2012; Henke 2013). Evidence that affect-rich content is likely to go viral has been well established. For example, Berger and Milkman (2010) examined New York Times articles over three months and found a strong relationship between emotion and virality: affect-laden content is more likely to make the most emailed list, whether positive or negative. Palka et al. (2009) suggested that surprising content may be viral

due to its high entertainment value. Sharing surprising information may reflect positively on the sender, suggesting that he or she knows interesting and unusual things. Heath et al. (2001) explore the role of emotion in selecting which information—urban legends, in particular—get passed along and find that people report a greater willingness to share more surprising urban legends. In a similar vein, Peters et al. (2009) studied social anecdotes in everyday conversation, finding that people are more willing to share affect-rich episodes that arouse interest, surprise, and happiness. Along these same lines, HDCs incorporate affect-rich features that are designed to evoke strong, positive feelings of enjoyment and happiness within viewers, thereby inviting wider dissemination and participation by design. In addition, the TikTok platform ensures that HDC video content is easily viewed and broadcasted, thus attracting more users to not only adopt and participate in creating content that adds to the HDC (Aral and Walker 2011; Chen et al. 2009) but also generates user engagement with the original content featured in the HDC (Shi et al. 2014). Thus, the HDC and its content is particularly designed to be viral in nature and assimilate quickly through the TikTok network in an exponential manner.

Exponential growth in viewership of an HDC makes the content easily available and recalled. A rich stream of literature on availability heuristics has provided evidence that the more available information on a particular topic or event, the more likely it will be consumed compared to less available topics or events, and likely to be endowed with positive qualities (Tversky and Kahneman 1973). For example, Chernev (2003) noted that more available products tend to be the more preferred products, all else equal. Similarly, Wiles (2007) found that making information about a brand's achievement

and testimonials available enhances customer trust. Since songs with HDCs are more available to people compared to songs without HDCs, there is a much greater probability that the focal viewer remains positively influenced by the HDCs. Thus, when an HDC is generated about a specific song, it is likely that the focal user will track down the original song (typically credited within an HDC) and will also follow the credited artist. The virality of the HDCs will likely induce purposive action in the users, rather than passive engagement that may not result in any observable benefit.

Thus, as a baseline, I expect that the presence of an HDC will lead to an organic increase in the number of followers of the original musical artist. Furthermore, since the actual HDCs are often created by users rather than the artists per se, I expect this effect to be present across all types of artists, regardless of their longevity or pre-existing popularity. The increased attention to the artist is likely to manifest across multiple platforms and domains but given that Spotify is a leading platform for music consumption and provides a reasonable measure of an artist's appeal and market appeal, I use followership on this platform as my measure of the benefits of the HDC. Thus, I formally hypothesize:

H1. The presence of HDCs will result in increase in followers for artists on Spotify.

3.2.2. Differential Effects of HDCs on Women Artists

Why are women less represented in digital music and social media, and why do they tend to achieve less traction than equally talented and capable men? While there are several factors at play, I focus on one key factor here that has been documented in research over the past decade - a persistent gender gap in self-promotion. Women are

more likely to downplay their accomplishments instead of promoting them for a variety of underlying reasons. Not only have women typically presented themselves as communally orientated (Diekman et al. 2015), and likely to underrate their abilities relative to men (Heilman and Caleo 2018; Singh et al. 2002), they also are less likely to take credit for their successes (Barber and Odean 2001; Exley and Kessler 2019). Research shows that when faced with opportunities that match their talent or capabilities, women are less likely to participate or push their candidacy when compared to men (Smith and Huntoon 2014). These dynamics extend beyond the offline context even into the online world - women are less likely to promote their work on social media, but they are willing to promote other people's work and achievements (e.g., Smith and Huntoon 2014). These trends are particularly striking when marketing and promoting creative endeavors are considered key aspects of the democratization of the public discourse, especially in online communities.

Beyond a reluctance to engage in self-promotion or accepting credit for their achievements, when women do self-promote, the feedback they receive is often negative since self-promotion is viewed as a stereotypically male trait (Brescoll 2016; Foschi 1996; Haines et al. 2016). This self-promotion penalty is more keenly displayed on women than on equivalent men who may engage in self-promotion. One reason provided for this disparity is role congruity, i.e. the notion that self-promotion is a male trait and not behavior associated with women (Rudman 1998). Role incongruity theory argues that when people display behavior that is inconsistent with either their expected roles or those determined by stereotypes, the response tends to be more negative (Eagly and Karau 2002). Alternatively, when there is congruity between role and individual,

in terms of gender or other such factors, the general response tends to be positive and reinforcing. Thus, women behaving in a perceived male role magnify adverse reactions, and similarly for stereotypically male behavior in a perceived female role.

Along the same lines, stereotypical behavioral gender traits deemed incongruent with observed gender are disproportionately evaluated negatively (Heilman 2001; Heilman 2012). For example, women who self-promote are not as well-received as those who do not (Bosak et al. 2018; Rudman 1998). Women are consistently disadvantaged in leadership roles as these are predominantly associated with men (Mo 2015; Yang and Aldrich 2014). Furthermore, the behavior and tonality of that behavior associated with each gender are punished when deemed incongruent (Brescoll 2016; Moss-Racusin and Rudman 2010). Thus, when women do exercise self-promotion, they may be perceived as highly competent but risk incurring backlash for their assertive behavior. Being aware of the penalties for counter stereotypical behavior, women may choose to behave defensively to avoid such risks (Rudman and Fairchild 2004). Building on this line of work, it stands to reason that self-promotion by women on social media tends to elicit negative responses since self-promotion is more associated with men. Role incongruity would thus indicate that even when women choose to promote their work or creative endeavors online, they do not receive the same traction as men.

How do HDCs potentially change this narrative? I argue that HDCs potentially benefit women artists more by offering two specific mechanisms that allow the mitigation of any self-promotion penalties. First, HDCs provides an *indirect* promotion mechanism because they are primarily initiated and broadcasted by users rather than

artists themselves. Furthermore, the introduction of an HDC by a user is largely unconnected to the artist per se; users exercise their own agency in preparing and uploading the HDC using the original music that is featured prominently on the HDC itself. Thus, any penalty associated with self-promotion for women artists should be minimized as the actual "promotion" emerges from independent users. Using this reasoning, there should be no disproportional negative impact associated with women artists, relative to men, suggesting a level of parity in terms of benefits that may accrue from the HDC.

However, there is also a second indirect mechanism that is associated with women artists and the dance art form itself. HDCs incorporate dance as a central feature, and it is well-established that dance, especially modern and contemporary dance, is stereotypically more associated with women as an art form (Gard 2001; Jeschke 1991; Risner 2002). Cultural and creative mores typically associated dance, and dance performances, with women rather than men, especially among younger users who are more likely to be influenced by such stereotypes (Holdsworth 2013). Recall that from role congruity theory, I understand that men also get penalized for performing non-masculine activities (Moss-Racusin et al. 2010; Rochlen et al. 2009) and achieving success in stereotypically feminine domains (Cherry and Deaux 1978; Rudman and Fairchild 2004). When a feminine trait like dance is combined with music produced by a women artist, there is less role and task *incongruity* than when dance is combined with music produced by male artists. Thus, women artists are thus likely to see a higher effect on their followers than men artists.

Furthermore, note that although HDCs are primarily initiated by users, they can also be offered by the artists themselves. As argued, user-generated HDCs should have no self-promotion penalty, but I may expect to see some residual self-promotion penalty to show up if a women artist offers HDCs using her own music. In other words, it is likely that when TikTok users choose to promote an HDC that incorporates music from a female artist that is unrelated to the user, the positive spillover on the artist's popularity is likely more enhanced than if the artist herself were to present an HDC using her own music. Based on this logic, I propose:

H2. The positive impact of HDCs on Spotify followers will be higher for women artists than men artists.

H3. The positive impact of HDCs on Spotify followers will be higher for user-generated HDCs for women artists than men artists.

3.3. Data and Empirical Methodology

3.3.1. Data

To conduct my empirical analysis, I focus on HDCs created on the TikTok platform. To recap briefly, in order to create and share an HDC, the user first chooses an existing song clip on TikTok or uploads a song clip. Once the song clip is selected, the user can record a 15-60 second dance move and post the video with a formatted hashtag (#songnamechallenge). These are conducted independently by users, without any coordination with the original artist, unless the HDC is created by the artist, which I account for later in the analysis section. These dance challenges are the foundation I use to conduct my analysis. Briefly, my identification strategy involves comparing

HDCs introduced on TikTok in a specific time-period with similar songs that are present on TikTok but without an HDC associated with them, thereby isolating the effect of the HDC itself on the focal artist's followership on Spotify. In order to conduct this analysis, I compile my dataset by triangulating across song-level, artist-level, and TikTok platform level information, as described below.

Song-level data. I first obtain 2,949 newly released songs on Spotify between January 1st, 2020, and April 30th, 2020, in Canada and the United States. For each song, I obtained song-related information, including release date, artist name, and music genre. I also capture underlying musical attributes for each song, including measures of beats per minute, danceability, causticness, energy, liveness, valence, speech-ness, and duration from Spotify. These characteristics are useful in assessing the intangible aspects of the song. I only consider singles – songs released separately from an album and songs by individual artists rather than bands to ensure clean identification. I also make use of the artist popularity index provided by Spotify to remove the top ten most popular artists from my sample to avoid the potential celebrity affect. Celebrities typically have followership on Spotify in very high numbers, potentially skewing any analysis. Therefore, I removed these from my analysis, so as to not bias my results. This step results in 1,873 unique songs.

Artist-level data. For the 1,873 single songs I identify, I use a database of 19,305 North American artists from Chartmetric to identify corresponding artists' information. I only consider solo artists and omit songs from bands to reduce the extent to which band heterogeneity may affect the analysis. Chief among the artist-level data is artist gender. I coded artist gender as a binary variable and cross-checked accuracy following

studies that infer gender through names (Bertrand and Mullainathan 2004) or profile pictures (Kelan 2008). I acknowledge that cases where the artist may not conform to a specific gender are not captured in my analysis. Since the artist can adopt a stage name, I also cross-checked gender coding based on the artist's profile on Chartmetric. I was able to identify the gender of all 1,873 artists following this strategy. To obtain additional artist-level data, I extract time-invariant information such as artists' main genres and time-varying information such as daily digital music platform engagement (i.e., Spotify followers) between Dec 1st, 2019, and May 31st, 2020.

TikTok platform-level data. Among the 1,873 songs identified through the process outlined above, 570 were available on TikTok in some format, i.e., as a short clip, part of a video, or as part of a dance challenge. I note that not every song is associated with a TikTok dance challenge. I worked with a TikTok analytics company to identify if an HDC was associated with a specific song that occurred between January 1st, 2020, and April 30th, 2020. As mentioned above, my empirical strategy relies on comparing songs on TikTok associated with an HDC (*treated*) to songs on TikTok that are not associated with an HDC (*control*). My treatment therefore is whether the song had a dance challenge on TikTok between January 1st, 2020, and April 30th, 2020, while songs that appear on TikTok but do *not* have an HDC serve as my control group. Following this strategy, I identified 62 TikTok dance challenges for newly released songs in the period of interest. Furthermore, I identified whether the challenge was initiated by user or by the artist.

3.3.2. Variable Description

Table 3.1 provides a detailed description of the variables used in my analysis.

Dependent Variable: My primary dependent variable of interest is the daily percentage change of Spotify followers at the artist level. I log-transformed the daily Spotify followers to adjust for the right skewness of the variable. Then I take the first differences to obtain the percentage change in daily Spotify followers (in log). Effectively, the variable is normalized, since it captures the percentage growth in followership across artists.

Independent Variables: My key independent variable is the HDC status of a song on TikTok (denote *HDC*), taking the value of 1 if an HDC is associated with the song, 0 otherwise. *Post HDC* is defined as the time before (*Post HDC* = 0) and after (*Post HDC* =1) a dance challenge.

Control Variables: I control for both time-variant and time-invariant variables on song and artist levels. Song-level control variables include time-invariant music attributes (i.e., danceability, speechness, acousticness, instrumentalness, liveness, valence, tempo, loudness, and primary genre, see Table 3.1) and time-variant variables, including the number of days since the song has been released on Spotify, as well as the song's tenure on TikTok. I also include artist gender dummies (*women artist*) coded 1 for women and 0 otherwise.

3.3.3. Empirical Specification

To examine the causal effect of the HDC on an artist's daily Spotify follower growth, I adopt a difference in differences (DID) model, commonly used to infer the causal effect of a "treatment" on the treated (Meyer 1995). In my case, the treated group are songs

with an HDC, while the control group includes songs that are on TikTok but without an HDC. Since treatment in my context is staggered (HDCs may occur at different times), I follow prior research (e.g., Gao and Zhang 2017) and normalize the time dimension to simulate an "event study" approach to identification (Callaway and Sant'Anna 2021; Goodman-Bacon 2021). I set the day a song starts in an HDC to day 8, with days 1-7 as pre-treatment and 8-15 as post-treatment periods. I identify an observation window of 15 days to access the short period of the 'viral' dance challenge effect. Since viral content is designed to gauge immediate attention, the life span of viral content is relatively short (Vaish et al. 2012). Therefore, choosing a window of 15 days allow me to access the immediate impact of the HDC, consistent with the definition of virality in the literature.

Songs that receive the treatment in my setting are not randomly generated; I therefore have to account for the process by which songs are selected for an HDC. I use propensity score matching to address this selection bias here (Abadie 2005). Propensity score matching has been employed in various non-experimental setting when the assignment of treatment is not random (Dehejia and Wahba 2002) and used in combination with DID analysis for causal inference of the effect of non-exogenous interventions (i.e.,Kumar et al. 2018; Mayzlin et al. 2014; Tan and Netessine 2020). I first predict the propensity score of a song receiving the treatment (HDC) using a logistic regression on key observable covariates in Table 2, on the day prior to the song release on Spotify. For every treated song, I apply one-to-one nearest neighbor matching without replacement on the propensity score to identify a matched control song (Austin 2010), as shown in Figure 3.1. Given each song is associated with one

unique artist, the matching process results in 62 artists who have songs with an HDC, and a matched sample of artists with songs not associated with an HDC.

I note that in the context of creative work like music, finding exact matches to a treated observation within a set of control observations cannot fully control for the inherent quality and appeal of each individual song. While matching closely allows some mitigation of these differences in unobservable (or unmeasurable) quality across songs, I acknowledge that perfect identification in this context can only be generated through a randomized experiment, which is highly unlikely in this context since such experiments would first, not be permissible on platforms, and second, would potentially affect the professional performance of the artists involved. In such contexts, given my research question, I use matching methods to match treated units to control units as closely as possible, and also include all the matching covariates in the final regression as an additional source of control. Finally, I also perform a series of robustness tests to show that the identified effect of an HDC on artist followership remains in place under different regression and sample specifications. I start with establishing balance between the control and treated samples next.

In order to check if the distribution of song-level and artist-level attributes remain balanced after matching, Table 3.2 provides the balance check and shows that treated and control groups are similar in all observable covariates after matching. Figure 3.2 also shows the distributions of the propensity scores for the two subsamples before and after matching, confirming that the control and treatment samples are similar post-matching. I further compare the daily percentage change across treated and control before the treatment took place to ensure no significant difference in the percentage

change of the Spotify followers between groups prior to the treatment (*t-stat* = -0.352, ns). These checks provide confidence that prior to treatment, the two subsamples are largely similar in terms of trends and characteristics. As mentioned above, this process results in a sample of 62 treated songs and 62 matched songs in the control group used for the baseline DID model, as shown in equation (1):

$$\Delta\log\left(\boldsymbol{Spotify\ follower_{it}}\right) = \alpha_0 + \alpha_1 * post\ HDC_t + \alpha_2 * HDC_i + \alpha_3 * HDC_i * post\ HDC_t + \alpha_4 * woman\ artist_i + \alpha_5 * DayRelease_i + \alpha_6 * TikTok\ tenure_i + \alpha_7 * song\ controls_i + \alpha_8 * month\ dummy_t + \varepsilon_{it} \quad (1)$$

In model (1), $\Delta\log\left(Spotify\ follower_{it}\right)$ represents the percentage change in Spotify followers from day *t-1* to *t*, i.e., $\log(Spotify\ follower_{it}) - \log(Spotify\ follower_{it-1})$.[11] HDC_i is a dummy variable indicating if song *i* is in the treated group ($HDC_i = 1$) or the control group ($HDC_i = 0$). The dummy variable $post\ HDC_t$ denotes post-HDC period vs. pre-HDC period. Specifically, $post\ HDC_t =$ 1 if 8<=day<=15 and 0 if 1<=day<=7 for every treated song and its matched control song.

I control for several variables that might also affect an artist's Spotify follower growth, such as (1) *DayRelease* is the number of days since the release of the song; (2) *TikTok tenure* is a categorical variable measuring the duration since the track was added to TikTok, as described in Table 1; and (3) *song attributes* (i.e., danceability,

[11] $\Delta\log\left(Spotify\ follower_{it}\right)$ represents the percentage change in spotify follower from day to day. Strictly speaking, the percentage change in Spotify follower of an artist at day t is defined as (SpotifyFollower (t)-SpotifyFollower(t-1))/SpotifyFollower(t-1), which is only approximately equal to log(Spotify Follower(t)) - log(SpotifyFollower(t-1)), but the approximation is almost exact if the percentage change is small.

acousticness). In addition to controlling for these variables, I control seasonality by including month fixed effects in the model.[12] To investigate whether the impact of an HDC varies based on the gender of the artist, I added the three-way interaction $HDC_i * post\ HDC_{\ t} * woman\ artist_i$ to the DID model. The baseline comparison group here are male artists. I specify the following model:

$$\Delta\log(\boldsymbol{Spotify\ follower_{it}}) = \beta_0 + \beta_1 * post\ HDC_{\ t} + \beta_2 * HDC_i + \beta_3 * HDC_i * post\ HDC_t + \beta_4 * woman\ artist_i + \beta_5 * HDC_i * post\ HDC_{\ t} * woman\ artist_i + \beta_6 * DayRelease_i + \beta_6 * TikTok\ tenure_i + \beta_7 * song\ controls_i + \beta_8 * month\ dummy_t + \omega_{it} \quad (2)$$

The major coefficients of interest are α_3 and β_5, which measure the causal impact of the HDC on the change in the corresponding artist's Spotify followers and the moderating role of the artist's gender, respectively.

3.4. Empirical Results

3.4.1. Model-Free Evidence

Table 3.3 shows the summary statistics of my sample. Women constitute 33.3% of the sample, close to the average gender distribution in the digital music industry, which is roughly 21.7% (Smith 2020). Among all HDCs, 63% are initiated by users, and 37% are initiated by artists.

Figure 3.3 provides model-free evidence of the daily percentage change of Spotify followers across treated and control groups within the observation window. I

[12] Since I only include one HDC per artist, I cannot include artist fixed effects in the baseline specification.

also plot the average daily Spotify follower change rate across gender in different dance challenge stages, shown in Table 3.4 and Figure 3.4. On average, women artists have a lower Spotify daily follower growth rate than their male counterparts, regardless of whether they have a song associated with an HDC. However, when their songs are associated with an HDC, women artists have a noticeable increase in their Spotify followers ($\text{Mean}_{\text{Women,Post HDC=1}} = 0.0339$) compared to their men counterparts ($\text{Mean}_{\text{Men,HDC=1}} = 0.0077$). Given this model-free evidence, I now proceed with reporting the results from the regression models specified earlier.

3.4.2. The Effect of Hashtag Dance Challenges (HDCs)

The results of the DID estimation are presented in Table 3.5. I observe the main treatment effect, i.e., the presence of an HDC significantly increases the number of the focal artist's daily Spotify followers, indicated by the positive coefficient of the interaction term (β=0.0094, $p<0.05$, Column I). The regression analyses show that, on average, the ratio of followers at time *t* to followers at time *t-1* is 1% greater for the treatment group as compared to the control group, supporting the baseline hypothesis that HDCs are influential in drawing attention to the music that is featured on the HDC and enhancing the artist's reputation and appeal on Spotify.

The results examining the moderating role of artist gender are reported in Table 3.5, column II. Here, I focus on the three-way interaction term involving artist gender, where the baseline comparison group is men artists. As shown, the coefficient of the three-way interaction term for women artists is positive and significant (β= 0.0305, $p < 0.001$, Column II). In terms of effect sizes, the daily growth of Spotify followers increases by approximately 3% more for women artists as compared to men when she

has a song associated with a HDC on TikTok, showing significant support for Hypothesis 2.

To better understand how the effect of HDCs differs *within* the two gender groups, I conduct additional subsample analysis by artist gender, and contrast the results across the two genders.[13] The results, shown in Table 3.6, show a significant effect of HDCs *within* women artists. Specifically, a woman artist whose songs are associated with an HDC grew their daily Spotify followers by roughly 4%, relative to women artists without HDCs ($\beta = 0.0367$, $p < 0.001$, Column I), providing a more proximal causal effect of the HDC for woman artists. In contrast, men artists do not seem to see a significant effect on their Spotify followers' growth rate that can be associated with an HDC ($\beta = -0.0032$, ns). Statistical tests comparing the two models, based on Clogg et al. (1995), confirm that the effect of the HDC on Spotify follower growth is statistically different across women and men subsamples (*chi2(1)* = 14.99*, p<0.001*).[14]

[13] Before I conduct the subsample analysis, I rule out the possibility that music attributes, instead of gender, may drive the HDC effect. I conducted balance checks on music attributes between songs in the men and women artist subsamples separately and found no significant differences across the two subsamples. Note that gender was not used as a match variable while song characteristics were used to perform matching. Regardless, I find no significant differences on music attributes across gender. I also compared standard mean differences of music attributes across gender groups and obtained consistent results. Results are available from the authors upon request.

[14] As a robustness check, I repeated my analysis on samples created by using PSM *within* gender groups. Specifically, I created gender-based subsamples and then matched treated songs with control songs within the subsample. Across the two subsamples created in this manner, the results are fully consistent for the effects of the HDC on followership. Results are available upon request from the authors.

3.4.3. Comparing User-generated vs. Artist-generated Challenges

Next, I test to see if the effect of the HDC on an artist's followership on Spotify is influenced by whether the HDC was user-generated or artist-generated. Recall that it is possible for artists themselves to generate HDCs based on their own music, even if it is relatively less frequent. Therefore, I add a three-way interaction term to capture how the HDC was generated: $post\_HDC_t * HDC_i * user\_gen_i$. The baseline comparison groups are HDCs that are generated by artists. I report the main results in Column 1 of Table 7. While I obtain consistent results for the main effect of the HDC, the coefficient of the three-way interaction term for user generated HDCs is insignificant, i.e., I see no difference in terms of the effectiveness of an HDC on artist popularity based on whether it was generated by the user or the artist. I also conduct additional sub-sample analyses across gender, and report these results in Table 3.7, Columns II and III. Here again, I obtain consistent results for the direct effects of the HDC but no variation across user-generated and artist-generated HDCs. Recall that this test was motivated by the notion that self-promotion by women artists may be viewed as less appealing, given stereotypical expectations. Interestingly, I see no such effect here in the context of HDCs on TikTok, i.e. artist-created HDCs do not seem to hurt the artist, potentially because even though the HDC is artist-created it is not considered self- promotion as the benefits come from other *users* adopting and perpetuating the HDC. This is in contrast to other platforms where women generally receive some penalties for their efforts to promote their own work (Wotanis and McMillan 2014).

3.4.4. Post-hoc Analysis – The Effect of User Gender

Among all songs associated with HDCs, 69% are generated by women users (mean = 0.692). This suggests that women users on the platform appear to connect more with the concept of combining music and dance in the form of short videos, relative to men, which is again consistent with prior work showing how dance is more deeply associated with women than men (Risner 2002). From a role congruence perspective, the higher proportion of women users offering HDCs is not surprising. However, this brings up an interesting question – do HDCs offered by women users provide greater traction for the focal artist? To test this, I examine the subsample of user-generated HDCs and introduce a variable capturing user gender. Specifically, user gender is coded as 1 if the HDC is initiated by a women user, 0 otherwise, and added to the regression model as an additional control variable. As shown in Table 3.8 Column I, HDCs initiated by women users directly help increase the corresponding artists gain followership on Spotify ($\beta=0.014$, $p<0.05$) compared to HDCs that men users generate, regardless of the artists' gender. In column II, I add an interaction term capturing concordance between user and artist gender, and find that that women artists benefit marginally more when their music is featured in HDCs created by women users, relative to male artists ($\beta=0.0224$, $p<0.1$). In unreported two-way contrasts, I see that the highest increase in followership comes from HDCs created by the combination of women artists and women users, albeit at the 10% significant level given the reduced sample size of this specific dataset. More to the point, the impact of role congruence is reinforced here while also showing how women artists may benefit from HDCs prepared by their women fans through the platform.

3.5. Robustness Checks

3.5.1. Testing for Parallel Trends

A fundamental assumption of DID estimation is the parallel trends assumption, i.e., the expectation that the paths of the outcome variable over time are parallel between the control and treatment groups prior to the treatment. It is important to ensure that this assumption is not violated in my dataset so that the treatment effect is cleanly identified.

I employ the approach suggested by Angrist and Pischke (2008). Specifically, I estimate the interactions of treatment and the pre-treatment period on the daily percentage change of Spotify followers. As is evident, the estimated coefficients are all statistically indistinguishable from zero, since the 95% confidence intervals contain zero. I conclude based on this test that the parallel trends assumption is not violated in my context. I report the results from the estimation in Table A.3.1, where none of the estimated coefficients for the pre-treatment dummies are positive and statistically significant. To summarize, I note that there no significant differences in the outcome variable between the treated and control groups prior to the treatment, adding strength to the inference that any observed differences post-treatment is attributable to the treatment, i.e., the presence of an HDC.

3.5.2. The Effect of TikTok – Testing for an Alternative Explanation

My primary argument here is that HDCs make artists' music salient, thereby leading to increased followership on Spotify. However, I also consider an alternative explanation – that it is the presence of a song on TikTok that leads to an increase in followership, and not the HDC per se. My baseline analysis compares songs on TikTok with an HDC

to songs on TikTok without an HDC; as a robustness test, I check if presence on TikTok itself can lead to an increase in followership. In order to address this effect, I isolate songs on TikTok *without* an HDC and match them with songs that appear on Spotify at the same time but are *not* on TikTok. Effectively, this contrast captures the effect of a song being available in some form on TikTok on an artist's Spotify followers. Following the same propensity score matching approach described above, I match songs using song-level attributes, song genre, and pre-song released artists' Spotify popularity, resulting in a sample of 214 songs – 107 songs on TikTok and a set of 107 matched songs that are on Spotify but not on TikTok. Similar to the earlier analysis, I performed covariate balance checks to ensure equivalence between the control and treatment groups. To ensure consistency, I use the same 15-day observation window and estimate the following model:

$$\Delta \log(\boldsymbol{Spotify\ follower_{it}}) = \gamma_0 + \gamma_1 * post\ on\ Tiktok_{\ t} + \gamma_2 * on\ Tiktok + \gamma_3 * post\ on\ Tiktok * on\ Tiktok_i * post\ challenge_t + \gamma_4 * woman\ artist_i + \gamma_5 * post\ on\ Tiktok * on\ Tiktok * woman\ artist + \gamma_6 * DayRelease_i + \gamma_7 * song\ controls_i + \gamma_8 * month\ dummy_t + \vartheta_{it} \quad (3)$$

My dependent variable of interest remains the daily percentage change of Spotify followers. The coefficient of interest is γ_3 and γ_5 , representing the effect of a song being made available on TikTok and the moderating effect of gender, if any. The results are presented in Table 3.9. As shown in Column I, I find that no significant effect of being on TikTok on the artist's followers on Spotify (β= -0.005, ns). In addition, I find no significant evidence that women artists benefited by simply uploading song clips to TikTok (β= 0.004, ns). I conduct additional split-sample

analyses by artist gender and find no significant differences across genders. I conclude that the observed effect I note earlier is from the appealing and viral nature of the HDC and not simply due to the song's presence on TikTok.

3.5.3. Confounding Effects Within the Observation Window – Robustness Test

My original analysis uses an observation window of 7 days pre- and post-treatment to examine the effects of the HDC. This analysis assumes that I have visibility into a song on TikTok for at least 7 days prior to the introduction of an HDC. However, in some cases, a song may be added to TikTok and subsequently used in an HDC within the 7-day pre-treatment period. In such cases, the effect of HDCs I estimate could be confounded by the effect of the song being added to TikTok itself. Although I find no significant effect from a song being added to TikTok itself (from above), I still consider the potential for confounding that arises from when a song is added to TikTok and then featured in an HDC within 7 days. This potential confounding effect is shown in Figure 3.5.

To address this potential issue, I remove all the treated songs in my sample where the song was added to TikTok less than 7 days prior to the introduction of the HDC. Unfortunately, this reduces the sample size to 30 songs, with 30 songs in the control group, but allows me to estimate the treatment effect without any potential confounds. I use the same 15-day observation window as before and estimate a similar regression model as before. The results are presented in Table 3.10 and show broadly consistent results – songs associated with the HDC effectively boost women artists' Spotify followers ($\beta = 0.019$, $p < 0.1$). The smaller sample size leads to reduced power, but I am still able to assess the treatment effect of the HDC on women artists.

3.6 Discussion and Conclusion

How do artists achieve traction in a crowded marketplace with their artistic endeavors? The difficulties in breaking through in popular culture, especially for new and unknown artists, has remained a problem for decades. This issue is exacerbated for women artists since they are constrained by unfair and often discriminatory treatment in the market as well as their own reticence and reluctance to promote themselves. As a result, the participation of women within the creative industries, in particular the music industry, has remained a challenge. While organizational and institutional factors like studio culture, workplace discrimination, and the lack of women role models may be partially addressed through policies and organizational initiatives, there still remains significant barriers to how easily women artists are able to promote their own work, compete on even ground with men, and achieve parity within the music industry.

Interestingly, the advent of social media and user-generated content, with the ability to democratize discourse and allow under-represented voices to be heard, was viewed as a positive step towards achieving gender parity, especially in the creative arts. However, even in social media, there remains under-representation of women artists. Moreover, even here, the response to women on platforms like YouTube and Instagram is viewed as systematically more biased than equivalent responses to men. Explanations for these systematic gender-based biases on these platforms emerges, in many cases, from gender stereotypes and role congruity theory, wherein actions that appear at odds with stereotypical women behavior is responded to in a harsh manner. Thus, even on social media, where the possibility to promote one's, own work is possible, women artists are hamstrung by the penalties associated with self-promotion

as well as being viewed as acting against stereotype. Into this mix emerged the Hashtag Dance Challenge (HDC), offered by TikTok's short video sharing platform, that I believe may paradoxically offer under-represented and women musicians a pathway towards gaining salience and attention. In my work reported here, I empirically try to address this question – does the HDC actually allow women artists to generate more traction in the marketplace, even if temporarily, relative to men artists?

Using a novel dataset of songs and artists collated from diverse sources like Chartmetric musician database, Spotify, and TikTok, I empirically show that women artists indeed appear to gain more followers when their music is associated with the HDC on TikTok. Interestingly, given the deep associations of dance with women, the combination of music and dance that is incorporated in the HDC is more appealing in the case of women artists. Theoretically, it is worth noting that HDCs possess many of the properties associated with viral content – they are appealing, incorporate positive affect, evoke strong emotional responses from viewers, and are easily broadcast and forwarded (Chen et al. 2009). Furthermore, unlike other social media platforms like YouTube and Facebook, HDC content is short, focused, and does not incorporate much text or material that needs evaluation (Herrman 2019). Thus, HDCs are ideal vehicles for generating attention and salience to music offered by artists, since they act as short, appealing advertisements that have the capacity to go viral. As my analysis shows, the presence of the HDC for an artist is associated with a short-term increase in followership on Spotify[15], the leading music streaming service, of approximately 3%

[15] I have replicated the analysis in the context of Instagram, a non-music platform, and Soundcloud, a smaller music-sharing platform. In the case of Instagram, I do not observe any effect of the HDC, which is not surprising since Instagram is not a music sharing platform. With respect to Soundcloud, the resulting sample is much smaller since many of the artists in my sample are not present on

per day for women artists compared to their male counterparts, regardless of whether the user or the artist generates the HDC. I further show that when women users initiate the user-generated HDCs, the promotion outcome is, on average, more salient for artists, but particularly for women artists. These effects are particularly noteworthy since the HDCs help to mitigate any fears of self-promotion penalties for women artists that may be present on other platforms appear insignificant in this case, speaking to the value of the HDC.

My work here is the first to study the HDC phenomenon, and in that capacity, I can provide some implications for both managers of the platform as well as musical artists looking to achieve traction through their activities on social media. With respect to artists, it is often assumed that social media campaigns require significant resources to produce content in a professional manner, including a social media ad plan and production staff. Even with these resources, women artists may find it hard to attract attention, which leaves artists with limited budgets with few options. My work shows that short video viral content like the HDC can actually achieve similar outcomes, albeit with much lesser cost and a lot more user participation. While an HDC can generate a large number of views on TikTok itself, even from other professional musicians (Burke 2020), I show that the benefits can manifest on the number of users who follow the artist on Spotify, arguably a more important economic outcome for the artist. For women artists who may otherwise face hostility on other platforms (Wotanis and McMillan 2014), the short-video HDCs format appear particularly beneficial in terms

Soundcloud. While I see consistent coefficients, the low sample size does not provide adequate power to generate significant results. Results are available upon request.

of drawing eyeballs, attention, and salience, potentially without the penalties associated with self-promotion.[16]

For social media platforms, the fact that the HDC is becoming increasingly popular, especially among younger and urban users, raises many opportunities for engagement and retention on the platform. Although it is too early to argue that the HDC, and the associated short-video format, is likely to be effective in the long-term, in the short-term the benefits of such formats and modalities are no doubt apparent. Indeed, the impact of the HDC phenomenon and associated mechanisms are generalizable to other social media platforms as they have also jumped on the short-video bandwagon: Instagram and Facebook, for instance, have also introduced 'Reel' functionality that includes short videos, YouTube recently introduced 'YouTube Shorts' functionality for short video content, many of which also feature dance and music. To the extent that platforms can keep the short-video format free of gender-based bias and hostility, there is likely to be enhanced activity on the platform. Bias and negative reviews on social media platforms have remained a recurring problem, also typically faced more by women than men. My work here suggests that should work towards (a) retaining the appeal and engagement associated with viral HDC contents, and (b) maintain an environment that is supportive while reducing any prevalence of bias and hostility. Finally, highlighting the beneficial spillover effects of HDCs and other forms

[16] One factor that I do not consider is whether TikTok's platform algorithm intentionally promote women artists, relative to men artists, thereby indirectly creating the enhanced salience for women artists that I identify. However, this seems unlikely (Perez 2020), since content on a user's page is driven by user input. Specifically, the algorithm considers previous videos a user has liked or shared, the accounts a user follows, the comments a user posts, and the content created by the user, in order to generate what is shown on a user's page. TikTok's algorithms are designed to keep the "For You" page fresh and diverse, and aims to remove repetitive content, spam and duplicate content. I see no evidence for gender-based differential promotions here.

of short-video activity on other platforms (such as Spotify) may help enhance the value of these platforms. My work provides a first-order estimate of where these spillover benefits may come from.

My work here is subject to some limitations. First, although I can provide some initial evidence of the positive effect of HDCs on artists' popularity through the number of followers on Spotify, I cannot provide a definitive estimate of what each additional follower represents in terms of either music streams or revenues. This data is not available at the level of granularity needed and remains a limitation. Second, I am limited by the scope of the study since the artists in my sample are either from the United States or Canada, and therefore, the results may not fully generalize to other countries. Third, I only consider individuals and not songs from bands – future work will need to extend my work to develop a fuller theoretical structure that accommodates bands and other collectives. Fourth, given my relatively short observation window (6 months) and given HDCs had just become a phenomenon on TikTok during the time-period of this study, I have a relatively small sample of songs to work with. On the one hand, this allows me to rule out other sources of time-based heterogeneity that may affect demand. On the other hand, I am constrained by the sample size in terms of the power of my analysis. I believe my analysis is robust and provides a reliable first look at the HDC phenomenon's value to women artists but recognize that more work is needed to fully flesh out the nature of the HDC phenomenon. Finally, I cannot separate the intrinsic music attributes of the song and the artist's gender, since these are by definition co-determined. This remains an issue with research within the creative industries, where intrinsic attributes of the artifact are hard to separate from the

attributes of the artist. I attempt to find "similar" artifacts using matching but acknowledge this limitation. Indeed, as in any archival data analysis, there remain potential sources of endogeneity that I may not have captured in my specifications. I acknowledge these and provide a series of robustness tests to bolster my analysis. That said, achieving perfect identification here remains challenging and I acknowledge that as a limitation.

Despite these limitations, I believe my work is an early attempt to examine the motivation and identify the role of technology-driven platforms that empower women in music production to succeed in their careers. Future steps include finding mechanisms to motivate these platforms to be more inclusive and attractive to women in digital music production. I believe that my findings are critical for an academic audience to uncover and understand how a technology-driven phenomenon may encourage and empower women music artists. The gender disparity in the music industry is well recognized, and an actionable technological-driven remedy is needed to mitigate this gap. My research takes the first step in exploring such remedies. I show that in settings where low women representation persists because of systemic industry biases, a technology-driven, democratized music promotion process may engender positive and meaningful changes. My work also speaks to the power that social media platforms may still have in being able to achieve gender parity in the creative industries. I hope that my work here sparks off more interest in both the short-video HDC format, as well as in broader research studying gender equity issues in the creative industries as well as on social media.

Chapter 4: Does Black Music also matter? The Effect of The George Floyd Incident on Hip-hop Music Streaming in the United States[17]

4.1. Introduction

On May 25, 2020, George Floyd, a 46-year-old African American man, was killed by a police officer in Minneapolis, Minnesota. The shocking incident, in which a police officer was captured on a video kneeling on Floyd's neck for nearly nine minutes, circulated widely on social and broadcast media, prompting demonstrations across the United States (Buchanan et al. 2020). The video capturing the death of Floyd garnered widespread attention on social media and became a focal point for protests and discussions surrounding racial injustice and police brutality in the U.S. Protests coalesced under the banner of Black Lives Matter (BLM), a movement founded in 2013 to fight racial injustice and police brutality in the U.S. As crowds surged through American cities to protest Floyd's death, a striking difference from prior movements entailed the diversity of the protesters. According to a report from the Pew Research Center, large shares of Hispanic (77%), Asian (75%), and White (60%) adults expressed support for the movement. Furthermore, the incident sparked off more conversations about race and racial equity within American communities than observed before (Parker et al. 2020).

The large numbers of people from various generations, ethnicities, and races were brought together by the viral video because it horrified and confused Americans

[17] This chapter is co-authored work with Gorkem Turgut Ozer and Anandasivam Gopal

who had long assumed that attitudes on race were already changing over the years since BLM had come into existence (Ray 2022). Moreover, the ongoing COVID-19 pandemic caused many people to be stuck at home leading to an increased consumption of news and social media content, which helped amplify the coverage of the protests and the issues being raised. The combination of these factors may have increased frustration and anger among some individuals, making them more likely to join protests and demand change. In effect, these events contributed to a period of significant societal uncertainty across American society. In such conditions, it is common for individuals to look for alternative explanations and factors that may help make sense of the circumstances around them; Weick (1988) referred to these as a process of "social construction that occurs when discrepant cues interrupt individuals' ongoing activity." An important component of the sensemaking process is to seek new information via external cues that can be made immediately available (Alexander 2014; Mirbabaie and Marx 2020). In this paper, I focus on one such source of information that is available to individuals in times of social turmoil - music (Eyerman 2002).

Music has long been used as a source of information and communication, due to its use as a medium for artistic expression and social commentary within social movements (Danaher 2010). Social movements like the civil rights movement in the U.S. (Dennis 2016; Reagon 2016) and the Arab Spring movement (Gabsi 2020) benefited from using music as a vehicle for expression as well as communication. In a similar manner, in the wake of the Floyd's death, music emerged as a platform for artists to express their reactions and share their perspectives with a wider audience. The cultural significance of music, particularly within the African American community in

the U.S, has allowed it to become a powerful tool for capturing the collective emotions and reactions to the social and political climate surrounding the Floyd's death. I propose that music plays an important role in this process because it is one vehicle for expressing social and political views (Street et al. 2008), generating identity (LaMarre et al. 2012), and supporting social movements (Eyerman 2002). Specifically, music serves to convey information and sentiments through the African American community involved in the social movement as well as their supporters and the general population (Dennis 2016). Within the world of African American music, I focus in particular on the genre of *hip-hop*.

Hip-hop music is particularly relevant in capturing the responses and reactions to the Floyd incident given its deep roots in the African American community and its history of addressing social and political issues (Harlow and Benbrook 2019). Since its emergence in New York in the 1970s, hip-hop has served as a form of artistic expression and resistance for marginalized African Americans (Ogbar 2007), providing a voice for the disenfranchised and under-represented in a society that has historically been dominated by white culture and has little room or the perspectives and experiences of minorities to be heard . In comparison to other music genres, hip-hop's emphasis on storytelling, lyrical content, and the use of beats and instrumentation enables artists to convey their message in a way that resonates with the audience. Hip-hop's roots in African American culture also make it particularly well-suited to address issues and deliver messages related to the BLM movement. The history of hip-hop's engagement with social and political issues highlights its unique ability to capture reactions within the population to issues related to the Floyd incident and associated BLM movements.

In this paper, I argue that as individuals in the U.S. look for meaning and information after Floyd's death as part of their sense-making process, they are likely to turn to music as a source of information and a means of participating in these discussions; in particular, hip-hop is likely to be the genre that people turn to. Hip-hop has been used as a medium for expressing social and political views, including protests against inequality, discriminative and unfair treatment against select groups. The genre has helped create a democratic space by authorizing certain "voices" to participate in open conversations and creative minds to share stories and points of view about daily experiences of the social and political world, providing a "...modern response to the social and economic ailments of the collective African American community..." (Crossley 2005). Hip-hop as a music genre can thus serve as a powerful medium for inviting and maintaining broad-based participation in these conversations and dialogue among the general population, in particular dealing with the persistence of racial disparities (Benedict et al. 2015). Thus, I hypothesize that in the time period immediately following the viral video of Floyd's death, the consumption of hip-hop music within the U.S will show increased demand, not only within the Black community but also within non-Black listeners seeking to understand the issues facing the community. Hip-hop music can thus act as a sensemaking cue since it conveys, more directly, how people perceive issues such as inequality and police brutality.

Within the hip-hop genre itself, I hypothesize that Black artists are likely to also receive a significant increase in listenership, following George Floyd's death. Music produced by Black artists has a higher level of perceived legitimacy and authenticity, particularly in representing Black culture and experiences (Johnson et al. 2006).

Additionally, Black artists have historically used music as a form of protest and storytelling, and many of their work addresses themes of racism, inequality, and social justice (Roy and Dowd 2010). Their first-hand experiences and insights are likely to be the most influential and relevant in times of social turmoil. [18] In this sense, Black artists can act as agents of sensemaking - listening to music by Black artists can serve as a way for individuals to educate themselves and engage with critical issues like equality, policy brutality and systematic racism. Hence, I expect that Black artists will see a more significant increase in listenership compared to their non-Black counterparts.

In analyzing the impact of the Floyd death on music listenership, I focus specifically on streaming music from digital music platforms for several reasons. First, the digital music streaming context allows me to study the immediate and short-term changes in people's music-listening behavior following the Floyd incident. The ease with which listeners can shift in their music choices, given the low transaction costs and price constraints in digital music, allow me to identify even small and quick shifts in demand that may be triggered by environmental stimuli. Second, digital music streaming more easily allows me to create a set of "control" genres or artists, since I have access to music that is culturally distant from black genres, especially hip-hop. Finally, as digital music streaming becomes increasingly mainstream, I am able to gather a majority of the music-related discourse within the country, rather than a specific segment of music consumption in the country.

[18] Indeed, many leading Black artists released new songs that speak directly to the BLM movement and the experiences of the Black community (e.g., "Black Parade" by Beyonce, "The Bigger Picture" by Lil Baby).

I conduct the analysis using a dataset of music streaming patterns provided via API by Spotify, the leading music streaming platform in the U.S. I obtained the unique number of listeners per week for artists across cities in the U.S and aggregated them to the genre level. The primary outcome of interest is the weekly listenership of a focal genre, hip-hop as measured by the unique weekly listeners. In my models, hip-hop forms the treated group and stereotypical white genres such as country and rock form the control group. I thus use a difference-in-differences (DID) style specification using artist and week fixed effects, where the exogenous treatment is set at the date of the Floyd's death, May 25th, 2020. In further analysis, I consider the moderating effect of artist race, captured through Spotify, to identify differences across race in listenership. I control for seasonality and other confounding effects in my analysis that spans a period of 17 weeks in the summer of 2020.

My results show that the Floyd incident is associated with a significant increase in hip-hop listenership in the U.S, relative to control genres. I further find that the growth in the number of hip-hop listeners is larger in cities where the Black population is lower than 30%, speaking to the value of hip-hop as a cue to help public in gain awareness of the cause of Floyd's death and associated racial injustice and police brutality, especially when exposure to the life of Black citizens is relatively limited. At the artist level, I find that artists who operate primary in hip-hop observed a 5.4% increase in the number of unique listeners, compared to artists whose primary genre is in the "non-black" genre group. The number of unique listeners for Black artists increase by 2.8% compared to their non-Black counterparts across all genres. Interestingly, no statistically significant differences are observed within hip-hop across

artist races. These results may suggest that outside of hip-hop, Black artists still are able to contribute to the sensemaking process of the public. I further examine the effect of gender within the set of Black artists and find that, on average, Black women artists observe 3.5% fewer weekly unique listeners compared to their male counterparts. While I do not formally hypothesize about the role of gender here, it is nevertheless interesting to note that the increase in listenership is skewed towards male musicians rather than equitably distributed, speaking to the skewed presence of women artists even in Black-dominated music genres.

My paper makes several contributions. First, my work contributes to the small but growing body of work studying the societal impacts of platforms, as well as how the demand heterogeneity in platforms is affected by societal events. I follow on recent work (Agarwal and Sen 2022; Campbell and Cornish 2021) showing how social movements, specifically BLM, affect activities on platforms. While the majority of this work is focused on how platforms affect social outcomes (Ozer et al. 2022; Sun et al. 2019), I instead show how activity on platforms themselves are heavily influenced by external triggering events (Bento et al. 2020). Second, I contribute to the empirical literature on sense-making by theorizing about how, in times of social crises, digital music may serve as a source of information and discourse, thereby helping individuals make sense of events related to racial inequality and anti-Black police violence in the U.S (Christenson et al. 2019; Maitlis and Sonenshein 2010). My finding that hip-hop receives more unique listeners especially in cities with lower Black populations is encouraging –if music is truly a vehicle for social change, then it is possible that an increased listenership of hip-hop may lead to less polarization within the country. Of

course, identifying such long-term effects are beyond the scope of my work. Finally, I contribute to the literature on digital music and its antecedents, in particular environmental triggers like Covid-19 (Sim et al. 2022). The visibility into market structure provided by digital music makes it possible to observe trends that are hard to discern in offline music. I am able to identify trends in music consumption, even at the level of the individual artist, allowing me to postulate and test theoretical questions of interest.

4.2. Background Theory and Hypotheses

4.2.1. The George Floyd Video and Its Aftermath

The video recording the killing of George Floyd in Minnesota was a significant triggering event in the BLM movement, leading to a significant increase in protests in the U.S as well as a radical increase in online activism. Between Floyd's death on May 25, 2020 and the next large protest meeting in Lafayette Square in Washington DC on June 1, 2020, the BLM hashtag was used in over 3.4 million original posts online, with 69 billion engagements, accounting for 13% of all posts and 15.5% of all engagements on Twitter for that time period.[19] The 9-minute video, filmed by bystander Darnella Frazier, went viral almost immediately, with some estimates suggesting that the video was watched 1.4 billion times in the week after the event.[20] Although protests carried out under the BLM banner had been conducted prior to the event, the Floyd incident

[19] www.brookings.edu/techstream/how-george-floyd-changed-the-online-conversation-around-black-lives-matter/

[20] https://dot.la/george-floyd-video-2646171522.html

sharply increased the perception of anti-Black police brutality and inequality among both the Black populations as well as low-prejudice, politically liberal Americans (Reny and Newman 2021). Interestingly, protests against systemic racism and inequality as a result of the Floyd video extended even beyond the U.S, with protests being held in countries in Asia, Africa and Europe as well (Pressman and Devin 2023).

An important consequence of the Floyd incident in the U.S was the unprecedented response within the country. Data showed that immediately after Floyd's death, feelings of anger increased by about half in the population: sadness increased by a third, and more than a third of the U.S population reported feelings of loss, despair, and grief. These increases were more pronounced for Black Americans, nearly half of whom reported these emotions (Eichstaedt et al. 2021). The Covid pandemic only exacerbated the situation, as many people in the U.S who viewed the Floyd incident video were already facing social isolation, unemployment, and an uncertain future (Bakioglu et al. 2021). The Floyd incident brought to light deep-rooted societal issues of inequality and racism, combined with social, health, and economic challenges. In this context of uncertainty, people were left with more questions than answers and had to seek out new information to make sense of the situation and navigate the unknown (Maitlis and Christianson 2014; Weick 1988; Weick 1995). In other words, the triggering event of Floyd's video created an environment where existing mental and cognitive models of the world were disrupted for people in the U.S, including those who did not traditionally identify with Black American society (Chater and Loewenstein 2016).

Many studies have suggested that during triggering events like natural disasters, emergencies, and pandemics, individuals engage in sensemaking to comprehend the situation better and develop strategies to overcome uncertainty (see Maitlis and Sonenshein 2010 for a comprehensive review). Previous work has demonstrated that when faced with uncertain circumstances, individuals become highly curious and are more willing to adopt new information from external sources to make sense of the situation. People often utilize external cues, including watching TV, listening to the radio, speaking with friends, and gathering to share information in both online and offline communities (Chater and Loewenstein 2016; Turner and Killian 1957). Prior work also shows that social media is one of the primary sources for sensemaking cues. For example, during the Manchester bombing in 2017, crisis responders used the Twitter hashtag as a cue to create meaning and to help shape others' perceptions and understanding of the event (Mirbabaie and Marx 2020). In the aftermath of the earthquake and tsunami in Japan in 2011, Facebook check-ins were used as cues to disseminate information about the disaster and to provide support for those affected (Alexander 2014). Oh et al. (2015) showed how online followers of Wael Ghonim gradually became more politically active using Ghonim's Facebook posts, leading them to be easily motivated to participate in protests during the Tunisian revolution. These findings suggest that people prefer immediate access to information for sensemaking during triggering social and natural events, particularly during times of enhanced uncertainty or crisis.

This search for new information can occur in many different forums, including offline settings where people reach out to new social groups and networks seeking

information. One such source where information on a diverse perspective or from alternative sources can appear is through the creative arts, in particular music. Indeed, prior research argues that music and musical genres can help individuals make sense of the commercial music industry, since it incorporates the individual decisions of several hundred artists and their artistic choices (Anand and Peterson 2000). However, I argue that music, and the genre of the music itself, can help by providing individuals with new perspectives and information that can help with the sensemaking process; I discuss these links below.

4.2.2. Hip-hop Music as a Sensemaking Cue Post-Floyd

Music broadly can be viewed as an effective vehicle for social commentary and change, particular through its ability to inform, persuade and facilitate social change through its role in the sensemaking process (Scherer and Zentner 2001). Within the specific domain I focus on, i.e., the Black Lives Matters movement and the Floyd video, I focus my attention on the specific musical genre of *hip-hop* as a suitable vehicle for commentary. In a study of 1,040 hip-hop songs released between 1960 and 2010, Christenson et al. (2019) found that the majority of hip-hop songs contained a "strong undercurrent of critical social and political commentary, offering messages of resistance and empowerment." Prior research also shows how hip-hop music has been used as a source of commentary and an assertive form of political consciousness that responds to and resists oppression (Allen and Randolph 2020; Asante 2008; Ogbar 2007). Specifically, Asante (2008) posits in her book "*Black Noise"* that hip-hop music is a weapon for artists to fight against institutions that oppress and discriminate against African Americans. As a musical genre, hip-hop can "tell alternative stories of contact

with the police" and criticize those in power through "stories in songs". In more recent work, Allen and Randolph (2020) argue that hip-hop music focusing on social and political issues can be instrumental in initiating "interracial conversations while continuing to resist forms of oppression." (p49).

Beyond just the first-hand experiences of African-Americans, the messages conveyed through hip-hop music can also influence how other races perceive issues such as inequality and police brutality, especially since a significant proportion of hip-hop listeners are white (Laybourn 2018; Richmond 2016). For example, when high school students are asked to listen to hip-hop music, they are more likely to support a Black liberal candidate in a community election (a mock government election), a behavioral change explained by a “guilt from decades of White domination” and “recognize a need for racial harmony." (Zillmann et al. 1995, p. 23)

I argue that hip-hop, through the channel of digital music streaming, acts as a source of information and communication, given its ability to offer immediate information to drive sensemaking as a response to the triggering event of the Floyd video. When triggering events or incidents occur that shake the status quo, people are driven by curiosity to acquire new information and perspectives as part of the sensemaking process (Kruger and Evans 2009). These triggering events need not always be negative; for instance, this process can even be kickstarted by the release of a new product that sparks off a drive for new information about market implications (Menon and Soman 2002). However, in the specific case I study, as people seek to understand the context of the Floyd incident, hip-hop music offers them immediate access to information for deeper, introspective thoughts through its lyrical content and

personalized narratives that are part of the typical hip-hop song structure. Therefore, as Americans grapple with the aftermath of the Floyd video, they are likely to turn to hip-hop music as a way to gather new perspectives and develop an understanding of the issues faced by African Americans, leading to a significant increase in the consumption of hip-hop streaming music, relative to other genres of music.

Given the pre-eminent role of hip-hop as a source of sense-making after the release of the Floyd video, I further argue that the effects on the consumption of hip-hop is likely to be higher in areas with lower relative populations of African Americans. The less racially diverse areas of the country are less exposed on a sustained basis to narratives about racial injustice and inequalities than those that live in highly diverse areas. This lack of exposure may lead to confusion and a sense of disorientation when confronted with events such as the Floyd video. Additionally, people residing in less diverse areas are more likely to hold biases or stereotypes about individuals from different racial and ethnic backgrounds, further contributing to the need to acquire more context when trying to make sense of the circumstances surrounding Floyd's death (Quillian et al. 2017). These individuals are more likely to seek out new information and perspectives in the period after the release of the video, potentially leading to greater cultural awareness and understanding (Schafer et al. 2013). Thus, I argue that hip-hop listenership for individuals living in areas with lower Black population will be higher as they deal with feelings of confusion and uncertainty. Therefore, I propose:

H1: The hip-hop music genre is more likely to receive an increased listenership compared to stereotypical white genres after the Floyd video.

H2: The hip-hop music genre is more likely to receive an increased listenership compared to stereotypical white genres for cities with low racial diversity, after the Floyd video.

4.2.3. The Role of the Black Artist as an Agent of Sense-Making

While I discussed the effects of the Floyd video on hip-hop, the effects of the video on Black artists in particular are likely to be more pronounced. This is because the legitimacy of Black artists, informed by their firsthand experience as members of the Black community, can play a crucial role in shaping how individuals construct meaning and make sense of the Floyd incident. Prior research suggests that when faced with adverse events, individuals are more likely to seek out and be influenced by information that is perceived as legitimate (Weick et al. 2005). For example, studies have found that people are more likely to trust information from government officials or reputable news organizations because they signal as legitimate sources of information (Chong and Druckman 2007). Similarly, people may be more likely to accept and believe the recommendations of doctors and other healthcare professionals when facing health concerns because they are viewed as legitimate sources of medical knowledge and expertise (Limaye et al. 2020). By signaling that something is authentic, legitimacy can provide a useful heuristic for individuals to evaluate and prioritize information in uncertain or ambiguous situations.

Legitimacy in my context refers to Black artists' perceived authenticity and cultural relevance and the messages they embed in their music (Clay 2003). Music made by Black artists is more legitimate for the average citizen trying to make sense of the Floyd's death because of the cultural and historical context in which it is created; Black artists, especially those from marginalized communities, often draw from

personal experiences of discrimination and inequality in their music, which makes their perspective and messages more relatable and credible to listeners. Black music artists perceived as more legitimate were more likely to inspire a sense of empowerment among their listeners, especially those in historically marginalized communities; For example, the lyrics of hip-hop songs by black artists provide insights into the experiences of police brutality and systemic racism that are not easily accessible through other sources (Perry 2004). The perceived legitimacy of Black music artists is positively associated with a perception of social relevance (Johnson et al. 2006). Hence, the music of Black artists may resonate more strongly with individuals who are seeking to make sense of the social and cultural context in which Floyd's death occurred. Therefore, I hypothesize:

H3: Black artists are more likely to receive an increased number of listeners than white artists in response to the Floyd video.

4.3. Methodology

4.3.1. Data

My data comes from the largest platform on music streaming, Spotify, which encourages the self-sufficiency of independent artists (Peitz and Waelbroeck 2006). Digital music is quickly becoming the primary source of recorded music in the U.S, and is a particularly appropriate context in which to examine my research questions for several reasons. First, digital music is based on subscriptions and is relatively free of transaction costs and price fluctuations, which allows listenership patterns to change quickly in response to current events and environmental stimuli. An example of this short-term effect is the increased consumption of movie soundtracks during the

Oscars.[21] Second, digital music allows users to shift their listening patterns seamlessly, allowing me to identify shifts in demand on a relatively granular scale. Third, digital music allows me to capture concurrent listenership in other genres outside of the focal hip-hop genre, thereby creating a suitable set of control genres for analysis. Finally, the ubiquitous adoption of digital music streaming services in the U.S gives me reasonably complete coverage of music listenership across the country, thereby reducing any selection issues.

My primary data source is Spotify, the largest music streaming platform in the world (Forde 2022). To collect a large enough representative artist sample, I made a thousand queries[22] using Spotify API to sample 14,283 artists on Spotify. Using the list of artists, I then queried for the number of monthly listeners per day by artist. Monthly listeners is updated on daily basis for the top 50 cities[23] worldwide each artist is listened in. use a rollowing window of 28 days[24]. In another word, monthly listeners per day represents the unique listeners who play the music of an artist at least once in a focal city. This means, if listeners stream an artist multiple times, they only get counted once. The way Spotify reports data allows me to account for user heterogeneity in consumption patterns, allowing for a stronger identification (Datta et al. 2018). I aggregate the unique listeners to the week level to reduce the noise and volatility of

[21] https://www.ascap.com/help/music-business-101/music-money-success-movies

[22] Spotify API has a limitation per query. I stopped at a thousand queries because any additional queries do not add new artist to the sample (i.e., additional queries yielded the same set of artist).

[23] 50 cities is the maximum Spotify API returns.

[24] Spotify use a rolloing window of 28 days because the number of days in a calendar month can vary, this means an equal number of days on the week are included (i.e., the same number of Mondays, Tuesdays, Wednesdays etc.)

daily fluctuations. Since artists usually work on multiple genres, I use *Every Noise at Once* – a service offered by Spotify to define an artist's primary genre. Each artist in my sample thus has one and only one primary genre. My primary empirical strategy focuses on contrasting weekly listenership between hip-hop (treated) and stereotypical white genres (control), in response to the exogenous shock of the Floyd incident.

I followed Holt (2009) to identify six stereotypical white genres: country, electronic dance music (edm), folk, metal, punk, and rock. This genre selection process results 2,195 artists representing the seven genres. Given how the data is reported, it is possible that an artist is listened in less than 50 U.S. cities in the given time window. Since the data is filtered by city, the total number of cities per artist will be lower. The final data sample includes 2,195 artists representing the seven genres and spans 39 cities over 17 weeks, with a total of 35,766 observations.

4.3.2. Variable Descriptions

Table 4.1 describes the variables I use in this study.

Dependent variable: Spotify data is reported at the artist level, and each artist in my sample is associated with one primary genre. At the artist level, my dependent variable of interest is the number of unique weekly listeners of an artist, denoted as artist listenership. This variable is calculated by summing the unique weekly listeners of a focal artist. To calculate the genre-level weekly listenership, I sum the unique weekly listeners of artists in a genre and denote this as genre listenership. As expected in such contexts, the listenership data tends to be right-skewed and therefore, consistent with prior work (Bhattacharjee et al. 2007; Dewan and Ramaprasad 2014), I log-transform both variables to capture the shift in listenership over time.

Independent variables: At the genre level, my key independent variable of interest is hip-hop, coded as 1 for hip-hop and 0 for genres in the control set (folk, country, metal, punk, edm, and rock). A similar coding was used for artist level analysis as well, coded 1 if the artist's primary genre is hip-hop and 0 otherwise. I coded artist race as a binary variable (Black artist = 1, non-Black artist = 0) by cross-checking artist profile pictures on Spotify. I also cross-checked artist gender following prior work that inferred gender from names (Bertrand and Mullainathan 2004) and artist pictures (Kelan 2008). I acknowledge that cases where the artist may not conform to a specific gender are not captured in my analysis. I also cross-checked gender coding for artists who adopt a stage name. I also identified single artists and bands and coded them appropriately using a dummy variable. To capture heterogeneity across the 39 cities in my sample, I used data from the U.S Census Bureau for demographic characteristics (Bureau 2021).

Summary statistics for my dataset are provide in Table 4.2. As reported, at the artist level, bands represent roughly 39.3% of the sample ($Mean_{band=1} = 0.393$). Among individual artists ($Mean_{band=0} = 0.607$), 38.55% are Black artists, while women constitute 18.9% of the sample. At the artist level, I calculated artists' weekly listenership by their race; Black artists show a noticeable increase of 1.37% in their Spotify listenership (in the log form) when their primary genre is hip-hop ($Mean_{black\ artist,pre\ Floyd} = 13.617, Mean_{black\ artist,post\ Floyd} = 13.804$), compared to 1.15% of their non-Black counterparts $\left(Mean_{black\ artist,pre\ Floyd} = 13.013, Mean_{black\ artist,post\ Floyd} = 13.170\right)$.

4.3.3. Model Free Evidence

Figure 4.1 compares the weekly music genre listenership between hip-hop and control genres before and after the Floyd incident. I plot the raw data of the average Spotify weekly unique genre listeners over the 17-week observation window. The vertical line indicates the week of the viral video, representing an exogenous shock. For hip-hop, the unique weekly listeners appear to follow a trend similar to that for white genres, but it clearly experiences an increase after the shock, compared to the white genre group. I see model-free evidence of the hypothesized increase in hip-hop listenership, relative to control genres here.

Figure 4.2 compares the weekly music genre listenership between Black and non-Black artists before and after the Floy incident. I plot the raw data of the average Spotify weekly unique artist listeners over the 17-week observation window. The vertical line indicates the week of the viral video, representing an exogenous shock. For Black artists, the unique weekly listeners appear to follow a trend similar to that for non-Black artists, but it clearly experiences an increase after the shock, compared to the non-Black group. I see model-free evidence of the hypothesized increase in Black artists' listenership, relative to control artists here.

I next switch to a difference-in-differences specification to test for these effects more formally.

4.3.4. Empirical Specifications

To examine the causal effect of the Floyd incident on genre listenership in the U.S., I use a difference-in-differences (DID) style model, commonly used to infer the causal effect of a "treatment" on the treated (Meyer 1995; Ozer et al. 2022). As discussed

above, the treated genre is hip-hop in the post-Floyd period, while the control remains the aggregate listenership of stereotypical white genres. I specify the following empirical model based on the approaches used by Luo and Zhang (2022) and Agarwal and Sen (2022) to identify the effect of the Floyd incident:

$$Y_{it} = \alpha_i + \delta(Hiphop_i X\ After_t) + \gamma_t + \varepsilon_{it}$$

This equation indexes genre and week by *i* and *t*, respectively. Genre and week fixed effects are captured by α and γ, respectively. $After$ is a treatment indicator that is set to 1 for weeks after the Floyd incident. ε captures unobserved shocks, and Y_{it} refers to the number of unique weekly listeners (in log form) of a focal genre *i* in week *t* on the Spotify platform, falling in the observation widow. The effect of interest is captured by δ, which can be interpreted as the change in hip-hop weekly listenership after the event, relative to the set of control genres.

At the artist level, I examine the effect of the Floyd incident on the listenership of specific artists contingent on their race. In this analysis, the treated group includes Black artists post-Floyd, while the control group remains the set of non-Black artists. Note that this analysis does not condition on genres per se but is focused on artist race only. I thus propose the following DID specification:

$$Y_{jt} = \eta_j + \beta\left(blackartist_j\ X\ After_t\right) + \gamma_t + \varepsilon_{jt}$$

This equation indexes artist id and week by *j* and *t*, respectively. Artist and week-fixed effects are captured by η and t, respectively. Y_{jt} refers to the number of unique weekly listeners (in the log form) of a focal artist j in week t on the Spotify platform, falling in the observation window. The effect of interest is captured by β, which can be

interpreted as the change of Black artists' weekly listenership after the exogenous shock, relative to non-Black artists.

4.4. Results

4.4.1. Testing for Parallel Trends – Genre and Artist Level Analysis

To test the parallel trend assumption, I run a leads/lags or relative-time model (Angrist and Pischke 2008). I estimated the interactions of the Floyd incident (treatment) and the weeks per-Floyd incident (pre-treatment period) on the weekly Spotify listener at genre and artist level are shown, respectively; as is evident, the estimated coefficients are all statistically indistinguishable from zero since the 95% confidence intervals contain zero, shown in Table A.4.1 and A.4.2. Based on this test, I conclude that the parallel trends assumption is not violated in my data, where none of the estimated coefficients for the pre-treatment dummies are positive and statistically significant.

4.4.2. Genre–Level Analysis: Effect of the Floyd Video on Hip-hop Listenership

To test H1, I begin by estimating equation (1) for the effect of the Floyd incident on genre-level listenership in the U.S. I use OLS and cluster the standard errors on the genre. Recall that the treated group here is the hip-hop genre, with the control group including aggregate listenership of the 6 non-Black genres. The baseline regression results are shown in Column I Table 4.3, capturing data for 17 weeks (N = 34). As shown, I see a significant effect of the Floyd video on the overall listenership of hip-hop across the 39 cities in my sample (0.641, $p<0.05$). The analysis shows an increase of 89.8% in hip-hop listenership that can be attributed to the causal shock of the Floyd

video, relative to the control group of non-Black genres. At a broad genre level, I see support for H1, showing that hip-hop demand significantly increases after the triggering event. Note that Spotify report new listeners, rather than repeat demand, and therefore these represent by definition accounts that are streaming hip-hop content for the first time during the time-period of my study. As robustness tests, I also include DID analyses where I replace the aggregate control genres with individual control genres – I show the results for the largest control genre (rock) in Column 2, and the results are largely consistent with those shown in Column 1.

Clearly, the genre-level analysis includes heterogeneous effects across the cities in my sample. In order to understand this heterogeneity, I separate the cities by the relative Black populations, and run individual city-level analyses, aggregated to the genre. I divide the cities into four subsamples and show the results from the individual analyses in Table 4.4. As is evident, half the cities in my sample have lower than 20% Black populations. Among cities that have a higher Black population, I split the sample into three groups by percentiles. The results indicate statistically significant and positive effects for cities with Black populations ranging from the 25th percentile to the 75th percentile, which represents cities with Black populations less than 30%. The significance levels and effect sizes vary across these cities. Interestingly, as the Black population proportion increases, there is no significant increase in hip-hop listenership, relative to the control genres. I thus see some support for H2 in my analysis.

In order to drive home these contrasts in the listenership of hip-hop as a result of the Floyd video, I chose to highlight the the results in two specific cities – Albuquerque and Detroit. Both are metropolitan cities, with the notable feature being

that the former has a very small African American population (3.3%) while the latter has one of the largest (78.3%). The results are summarized in Table 4.5. In Albuquerque, where the African American proportion of the population is low, I observe a positive and significant increase of hip-hop listeners post-Floyd incident ($\delta = 0.7826, p < 0.05$), an effect size of 118%. In contrast, the treatment effect for Detroit, with a majority African American population, is 0.322, not significant. In terms of demonstrating that sense-making may be at play here, the results between the two cities with their varying baseline populations is indicative of the extent to which individuals rely on available cues to make sense of complex events. Hip-hop's roots in African American community and its history of addressing social and political issues have made it an influential and easily available cue for individuals. Moreover, the finding that the sensemaking need is more salient in less diverse cities suggests that music can play an especially important role in facilitating cross-cultural understanding and empathy. In cities with lower level of diversity, hip-hop may be one of the few cultural touchstones that is shared across different racial and ethnic groups, and as such, may be particularly effective at bridging divides and fostering greater understanding and solidarity.

4.4.3. Artist–Level Analysis: The Effects of the Floyd Video on Black Musicians

I now switch to analyzing the effects of the Floyd video on Black musicians, regardless of the genre that they operate in. Recall that in this analysis, Black musicians represent the treated group while non-Black musicians represent the control group. The baseline results for the artist level analysis is shown in Column 1 of Table 4.6, where I include fixed effects for artists, genre, and week. As shown, I see a clear and positive uptick in

the listenership associated with Black musicians post-Floyd ($\beta = 0.0284, p < 0.05$). In terms of effect size, I see an increase of 2.8% in the listenership of Black artists, relative to non-Black artists, that may be causally linked to the Floyd video. While this treatment effect is small, it includes all genres where at least one Black musician operates. Thus, it is not surprising that the effect size is relatively small. However, when viewed through the lens of overall listenership on Spotify, a 2.8% increase in listenership for Black artists in a 8-week period is not trivial.

To further investigate the impact of Black artist varies based on the primary genre that an artist operates in, I added the three-way interaction of $blackartist_j * After_t * Hiphop_i$ to the DiD specification to test for potential heterogeneity. The results are shown in Column 2 of 4.6. Compared to non-Black artist working on hip-hop, Black artists receive a significant 256% increase in their weekly listenership. This finding supports my argument that Black artists are more likely to serve as an agent of sense-making bu virtue of their authenticity and legitimacy. Although hip-hop has been adopted by many artists from different backgrounds and culture, wherein they express their own experiences and perspectives on BLM-related issues, Black artists are still viewed as more authentic voices when people try to make sense of the events of the summer. This perhaps explains why there is a discernible effect of the Floyd video on listenership ex post. In effect, I find support for H3 in my analysis.

4.5. Post-Hoc Analysis

4.5.1. The Role of Artist Gender

Thus far, I have considered the effects of the Floyd video on outcomes associated with Black musicians, relative to non-Black musicians. However, within the community of Black musicians, gender plays a key role in determining legitimacy and voice. The legitimacy of men and women artists within the Black artist community are perceived very differently in the music industry, given the broader social and cultural stereotypes about race and gender. Black male artists are typically rated as more socially relevant and vital than Black women artists, even after controlling for the music genre and the lyrics' quality (Roy and Dowd 2010). Black men artists are also found to be often associated with traditionally masculine genres (such as hip-hop), which are seen as more authentic and legitimate compared to other genres; Black women artists, on the other hand, tend to be subjected to greater scrutiny and stereotypes related to their appearance, sexuality, and femininity (Aubrey et al. 2011; Peterson et al. 2007; Rosenthal and Lobel 2016). These stereotypes can make it more difficult for Black women artists to be taken seriously or recognized as legitimate within the music industry. Furthermore, Black men and women are viewed very differently in the media. For example, prior research found that Black women artists faced additional challenges due to their intersecting identities, such as being perceived as less commercially viable and being subjected to stereotypes about their sexuality (Kehrer 2017). In music videos, Black men artists were more likely to be portrayed as aggressive and dominant than their women counterparts (Emerson 2002). These gender stereotypes can impact how

Black men and women artists are perceived and valued differently in the music industry, especially in reaction to damaging events like the Floyd video.

Given these reasons, I perform post hoc analyses and examine potential gender-based heterogeneity among Black artists in my sample. I estimate equation (2) on gender heterogeneity *within* the Black musician subsample and summarize the results in Table 4.7. In line with my expectations, I find that Black women artists received approximately 3.5% fewer weekly unique listeners than their men counterparts ($\beta = -0.0352, p < 0.001$), attributable to the Floyd video. As discussed earlier, it may well be that Black men artists are considered more legitimate and representative of the issues faced by the Black community – much of the angst and anger expressed in Black-dominated music tends to come from Black men artists. Black men artists also received a greater share of media coverage associated with the events of the summer of 2020, including the Floyd video as well as the protests that were being conducted before Floyd was killed. Additionally, the themes and messages conveyed in the music of Black men artists may have resonated more strongly with listeners seeking to make sense of the event and its broader implications for race and social justice in America. It is also possible that societal biases and stereotypes about gender and race may have played a role in shaping listener preferences and perceptions of the legitimacy of women artists compared to men Black artists. While it is not possible for me to tease out what specific mechanism leads to this differential effect, I believe that remains an important topic for future research.

4.6. Robustness Checks

4.6.1. The Benefit of Being Featured on the Spotify BLM Playlists

My primary argument is that the Floyd's death makes Black artists more salient, thus increasing music listenership on Spotify. Given that Spotify has a curated playlist called "Black Lives Matters" dedicated to BLM movements, I need to check whether the causal effect of the Floyd's death on the demand for the music by Black artists is due to the inclusion in the playlist. My baseline analysis compares Black artists featured on Spotify curated playlist to non-Black artists featured on Spotify playlist.

I start by coding the 176 songs in the "Black Lives Matter" playlist, with the date added to the playlist ranging from June 2015 to Feb 2021[25]. The songs are added to and taken off the playlist over time. For the consistency of my analysis, I freeze the playlist by selecting the songs added only before the start date of the panel to avoid the effect of the Floyd's death and the effect of the song being added to the playlist. I obtained 146 songs from the playlist, with 146 corresponding artists following this sampling strategy. Among these artists, I identified a total of 55 hip-hop artists that are being featured in the playlist in my data sample and coded variable *featured*, a binary variable. Extended on Equation 2, I estimate the following model:

$$Y_{jt} = \eta_j + \beta_1\left(blackartist_j \; X \; After_t\right) + \beta_2 featured + \beta_3\left(blackartist_j \; X \; After_t \; X \; featured\right) + \gamma_t + \varepsilon_{jt}$$

[25] June 2015 is the when the BLM curated playlist was created. This time period is used to avoid the effect of Floyd's incident and the effect of song being added to the playlist.

My dependent variable of interest remains an artist's unique weekly listeners (in the log form). The coefficient of interest is β_3, representing the effect of a Black artist being featured on the Spotify playlist, if any. The results are presented in Table 4.8. As shown in Column 1, being featured in the official Spotify curated playlist significantly increases the focal artist's weekly listenership (β_2=2.983, p<0.001). Importantly, being featured on Spotify playlist gives Black artists an increase of 4.6% in their listenership compared to their non-Black counterparts ($\beta_3 = 0.045, p < 0.001$).

4.6.2. Treatment Effects in Other Black-Dominated Genres

My initial analysis examines the effects of the Floyd video on musicians within the hip-hop genre. However, it is worth noting that several other genres also see a majority of Black artists within them – notably, Holt (2009) includes blues, jazz, soul, R&B, and reggae as being genres where Black artists dominate. Although these genres are not as uniquely associated with protests and activism as hip-hop, they are nevertheless representative of Black artists in the U.S. To provide a more comprehensive understanding of how the Floyd incident impacted Black musicians' listenership, I conducted a similar analysis to examine the effects of the exogenous event on ex post listenership in these genres, specifically at the artist level. The summary statistics are shown in Table A.4.3. In Table A.4.4, I estimate the interactions of treatment and the pre-treatment period on the weekly artist listeners (in the log form). Based on this test, I conclude that the parallel trends assumption is not violated.

Recall that in this analysis, Black musicians represent the treated group, while non-Black musicians represent the control group. The baseline results are shown in Column 1 of Table 4.9, where I include fixed effects for artists, genre, and week. As

shown, I see a positive effect in the listenership associated with a total of 787 Black musicians post-Floyd across 12 genres, i.e. six Black-dominated and six White-dominated genres (β=1.066, $p<0.05$). I further consider the impact of race within the six Black dominated genres and the six traditionally White-dominated genres in my sample to test for potential heterogeneity. The split sample results are shown in Columns 2 and 3 of Table 4.9. Within the Black-dominated genres, I see consistent results compared to non-Black counterparts; Black musicians received a significant increase in their listenership increase post-Floyd (β=1.066, $p<0.05$). I see no significant effect of being a Black musician in terms of demand within the White-dominated genres post-Floyd. Within this subsample, the number of Black musicians is minimal (2%), which perhaps explains why the Floyd video has no discernible effect on listenership ex-post. To conclude, I am able to provide evidence that the observed effect that Black artists receive an increase of listeners post-Floyd.

I conducted further analysis to investigate potential gender-based differences among Black music artists using an expanded sample of artists, and the results are presented in Table 4.10. Consistent with the main analysis, the findings indicate that Black women music artists receive significantly fewer listeners compared to their male counterparts (β=0.358, $p<0.001$). The enlarged sample included more artists from different genres, providing evidence that women artists are severely underrepresented within Black-dominated music genres (β=-0.392, $p<0.001$). These results support the argument that Black men artists maybe more commonly used as sensemaking agents compared to Black women artists. Iti s important to note that within the sample of Black artists, only 17% of the artists are women, which highlights the possibility of

marginalization and underrepresentation of Black women artists in comparison to their male counterparts.

4.7. Discussion and Conclusion

In recent years, incidents of police brutality towards Black individuals in the United States have gained increasing attention from the media and public, leading to widespread protests and demands for change. The tragic death of George Floyd in May 2020, in particular, propelled issues related to racial justice to the forefront of public consciousness, due in large part to the unprecedented viral spread of the incident on social media platforms such as Twitter, Facebook, and Instagram. Videos of the incident captured by bystanders quickly went viral, sparking outrage and widespread protests both online and offline. This unique combination of a high-profile incident and the power of social media to rapidly disseminate information and mobilize collective action contributed to the unparalleled attention and impact of the Floyd case on public discourse. As a result, there is an urgent need for individuals to gather new information and make sense of the events and issues surrounding police brutality and systemic racism under the special circumstance. While traditional news sources (i.e., TV programs) and social media (i.e., Twitter) can provide some information, the role of music in this the context of social movement is particularly noteworthy because it offers a different perspective complete with an emotional connection (Danaher 2010). Importantly, music streaming platforms such as Spotify have made music more accessible than ever before, enabling immediate and ongoing access to a wide variety of perspectives. Thus, music in the form of digital streaming can serve as a powerful

tool for sensemaking, providing individuals with a unique and immediate perspective on current events that other sources of information may not offer.

Hip-hop music genre has been identified as a cultural tool for sensemaking and a source of catharsis and empowerment for Black individuals and communities in times of social and political upheaval (Burgess 2020). Rooted in the Black community, hip-hop has historically been used as a means of resistance and empowerment against systemic oppression. Hip-hop music artists, especially Black artists, bring their perspective and experience to their music, providing a voice for those who have been marginalized and underrepresented. Through music streaming, hip-hop music can be accessed and consumed in real-time, providing immediate information and a means of connecting with individuals who share similar experiences and emotions, enhancing cross-cultural communication and helping build bridges between different communities.

In this paper, I examine whether the incident of Floyd's death led to changes in people's music listening patterns. I find that hip-hop, relative to stereotypically white-dominated genres (i.e., folk, country), gained its weekly listenership by 89% after the incident than before, especially in the cities where the Black population is underrepresented. Addition results suggest that compared to their non-Black counterparts, Black artists increased their weekly listenership by 2.9% after the incident, specially if they operate in hip-hop. Overall, these findings highlight the important role that hip-hop music can play in the sensemaking process; individuals turn to hip-hop as a sensemaking cue in response to the event and especially seek out music from Black voices and perspectives, demonstrating the role of Black artists as agents of

sensemaking. The evidence from my study also suggests that while there has been an increase in listenership of Black artists after the incident, there is a disparity in the attention given to Black men artists versus Black women artists, even within the Black-dominated hip-hop music genre. This can be seen as an indication of the systemic biases and barriers Black women face in the music industry, where they may be overlooked or marginalized.

My work in this paper is subject to a few limitations that I discuss now. First, this study is limited to data from a single music streaming platform might not provide a comprehensive and representative understanding of all music consumption behavior across different platforms and listening habits. However, by focusing on the world's largest music streaming platform as many other studies do (i.e., Datta et al. 2018; Forde 2022), I am able to offer a promising starting point for further research in this area. Future studies can expand upon these findings by incorporating data from multiple sources, including different platforms and listening habits, to provide a more complete pictures of the role of music in shaping individual responses to social and political events. Second, while I account for on-platform promotion efforts, such as playlist featuring, it may not capture all promotional activities that could impact hip-hop and Black artists' listenership. While I was not able to measure these efforts due to the limitations of the data, it is encouraging to think that there could be even more positive impacts on hip-hop and Black artists' exposure and listenership beyond what I was able to capture in my analysis. From an econometric viewpoint, given the clear exogeneity of the Floyd video, many of these confounding factors may be safely assumed to be uncorrelated with the specific treatment I study. Nevertheless, this is a limitation. Third,

my paper raises questions about the demographics of hip-hop listeners. While I was unable to determine which age, race, or gender groups engage with hip-hop as a sensemaking tool, my findings demonstrate a positive trend towards increased hip-hop consumption following the incident of Floyd's death. This presents a promising starting point for future research to delve deeper into the role of hip-hop as a cultural tool for sensemaking during times of social and political upheaval.

Despite its limitations, my study marks an important starting point in understanding the role of music in sensemaking and coping with traumatic events. My findings underscore the unique ability of music in general, and hip-hop in particular when it comes to race relations in the U.S, as a cultural tool for sensemaking, particularly in providing a voice for marginalized communities. Moreover, the significant increase in listenership of Black artists, particularly Black men, has crucial implications for promoting diverse perspectives and voices in the music industry. This highlights the power of Black artists to resonate with audiences and inspire change, particularly during times of social and political upheaval. However, my study also highlights the systemic biases and barriers faced by Black women in the music industry. Addressing these issues is crucial to promoting greater equity and inclusion in the industry.

In terms of external validity, my study provides a framework for thinking about whether the incident of Floyd's death will lead to similar changes in other settings. As Rolling Stone reported, in the wake of the George Floyd protests, the music industry pledged to observe "Black Out Tuesday," a day on which the industry would pause to reflect on racism and inequality. "Black Out Tuesday" led to many record labels and

streaming services committing to donate money to social justice causes and reviewing their practices regarding diversity and inclusion, which could potentially lead to more opportunities for Black artists in the industry. Given that the entertainment ”sector tends to attract significant media attention and shares ideological alignment with the #BLM movement's objective of empowering the Black community[26,27], my findings suggest that this sector's response could serve as a promising indication of the potential for similar changes to occur elsewhere.

My study provides valuable insights into the potential changes that can result from societal triggering events and social movements. While the specific changes may differ depending on the context, the magnitude of change is dependent on the incentives to change. A significant finding from my research is the connection between Floyd's death and the surge in hip-hop music streaming. Beyond drawing attention to police brutality, the incident highlighted the deep-rooted social and economic issues surrounding racial inequality. Concurrently, the increased streaming of hip-hop music demonstrates a desire to learn more and support marginalized communities. When a triggering event exposes social and economic issues that resonate with a wide range of people, it can broaden the scope of change beyond narrow fixes focused solely on the perpetrators and issues directly related to the incident itself. It can motivate people beyond those responsible for the problem, leading to more comprehensive and lasting change.

---

[26] https://variety.com/2020/tv/news/netflix-hulu-amazon-hbo-black-lives-matter-george-floyd-protests-1234621292/

[27] https://www.weforum.org/agenda/2021/03/inequities-run-deep-for-black-professionals-in-film-and-tv-addressing-them-could-create-10-billion-in-new-revenues/

Chapter 5: Conclusion

Working towards equality and inclusion around gender and race is critically important. Despite the increasing number of conversations around these issues, more work is needed to evaluate the root cause of the unequal participation of women and men in organizations, markets, and economics. In particular, the lack of equity in terms of representation and participation within the important information technology (IT) sector has been a persistent problem. Despite efforts to promote diversity and inclusion in the workplace, the underrepresentation of women in the IT sector and, more broadly, IT-enabled work remains a significant challenge. My dissertation focuses on this sector and aims to explore potential remedies to enhance the participation and representation of women in specific segments of IT-enabled work. By focusing on different IT-enabled empirical contexts, my essays provide a comprehensive understanding of the problem and identify effective solutions, if any. I have identified and answered questions pertaining to how gender shapes participation, representation, and success in technology-mediated contexts.

In the first two essays, I focus on different IT mechanisms that make women more represented. In my first essay, I investigate the participation of women in IT labor markets and whether they are less willing to compete for complex and risky IT projects at the same rate as men. I find that women in the IT industry are more willing to participate and expect higher compensation than men. This essay is one of the first studies to examine the motivation and identify the specific factors relevant to the IT industry that deter or encourage women in IT to participate in competing for work opportunities in the field. The second essay studies the issue of unequal representation

by women within the digital music industry, where inequitable representation has been clearly noted. Women music artists are consistently faced with less attention, respect, and market share as a result. However, newer forms of social media interactions may provide some redress to this problem. I show that the presence of a TikTok dance challenge, characterized by combining user-generated dance moves with music in a short-form video, may serve as a promotion mechanism where all music artists, especially women artists, have a fair shot at enhancing their visibility and highlighting their artistic work. This essay is one of the first studies to examine the motivation and identify the role of technology-driven platforms that empower women in music production to succeed in their careers. In my third essay, I expand the scope by exploring the interaction of gender and race, set within the context of the intersection of the social incident and digital music consumption. I investigate how a triggering societal incident, namely the death of Floyd, motivates the general population to look for meaning and information through music streaming as part of their sensemaking process. I find a significant increase in hip-hop listeners following Floyd's death, and notably, for the less racially diverse area. The consumption skewed towards Black men artists compared to Black women artists, speaking to the skewed presence of women artists even in Black-dominated music genres. Through this finding, I highlight the systemic biases and barriers Black music artists face in music. To sum up, this essay is one of the first to show how music streaming activities on the platform are heavily influenced by external triggering events.

Taken collectively, the findings of this dissertation provide valuable theoretical and empirical contributions to the extant literature while also helping managers and

policymakers with pointed perceptions for ways to enhance the participation of women within these sectors. First, by examining my questions through a randomized controlled experiment, I am able to examine real-time IT participation decisions and wage expectations in the IT labor market context. Second, by collaborating with digital platforms and analytics companies, I am able to access real-time music streaming consumption and music artists' platform popularity that are driven by platforms and triggering societal incidents. My findings in this dissertation provide implications in the IT-enabled sectors in three distinct ways. First, my work has implications for employers in the IT labor market and academics as they train and educate the next generation of women in IT. From a policy perspective, a first step for employers would be to recognize that trained women in IT do not systemically shy away from participating in complex or competitive task environments. I further suggest that some commonly held notions about women and participation in the IT market need re-examination. This is critical for the academic audience as the misrepresentation of females among STEM graduates has been a significant driver behind the gender gap in STEM labor market success.

Second, my work has implications for the artist, especially women music artists. Short-form social media and user-generated content can correct some biases by providing women with a safer and more collaborative platform for self-promotion. This is an insightful takeaway for management at the short-form video platforms as the platforms are looking to increase platform diversity and inclusion. Third, my work provides valuable insights into the potential changes that can result from triggering societal events and social movements. For management in the music industry, it is

helpful to recognize the great gender disparity among Black artists and the importance of promoting greater equity and inclusion in the creative domains. In this manner, I hope my work in this dissertation will spur more work on the interesting and important nexus of gender, technology, and societal outcomes, within the information systems literature. There are several vital research questions within this domain that need addressing and this dissertation is hopefully a good start.

Tables

Table 2.1 Experiment Treatment Design

Treatment	Definition	Variation
Task complexity	Measures the task uncertainty of the project and aims to mimic level of technological complexity of an IT project.	High (H) or low (L)
Boundary spanning complexity	Measures the boundary spanning needs of a project.	High (H) or low (L)
Competition	Denotes the competition amongst other bidders for a particular project. This variable helps simulate a competitive bidding environment.	High (H) or low (L)

Table 2.2 Experimental Stimuli Framework

			Boundary Spanning	
			Low	High
Technical Complexity	Low Competition	High	B	D
		Low	A	C
	High Competition	High	F	H
		Low	E	G

Table 2.3 Randomization Checks

	Complexity		Boundary Spanning		Competition	
	High	**Low**	**High**	**Low**	**High**	**Low**
Female	0.388	0.388	0.364	0.412	0.404	0.371
	(0.488)	(0.488)	(0.482)	(0.493)	(0.492)	(0.484)
Age 18-24	0.726	0.726	0.739	0.713	0.702	0.75
	(0.447)	(0.447)	(0.44)	(0.453)	(0.458)	(0.434)
Age 24-34	0.274	0.274	0.261	0.287	0.298	0.25
	(0.447)	(0.447)	(0.44)	(0.453)	(0.458)	(0.434)
Degree-Bachelor	0.53	0.53	0.512	0.548	0.525	0.536
	(0.5)	(0.5)	(0.501)	(0.499)	(0.5)	(0.5)
Degree-Masters	0.47	0.47	0.488	0.452	0.475	0.464
	(0.5)	(0.5)	(0.501)	(0.499)	(0.5)	(0.5)
Race=Asian	0.94	0.94	0.936	0.943	0.957	0.921
	(0.239)	(0.239)	(0.244)	(0.233)	(0.202)	(0.27)
Race=Other	0.06	0.06	0.057	0.065	0.05	0.071
	(0.239)	(0.239)	(0.231)	(0.246)	(0.218)	(0.258)

Notes: Standard deviations in parentheses.

Table 2.4 Manipualation Checks

	Experimental Condition			
	Low	High	t	p
Competition	6.293	6.652	-2.016	<0.05
Task Complexity	4.996	6.448	-8.419	<0.001
Coordination	5.699	6.243	-3.011	<0.01

Note: All scales ranged from 1-10. Higher number indicate higher perceived project competition, task, and coordination complexity.

Table 2.5 Summary Statistics

Variable Name	**Mean (SD)**	**Min**	**Max**
Bid Decision	0.758 (0.429)	0	1
Bid Amount ($)	32.404 (30.051)	0	200
Complexity	0.5 (0.5)	0	1
Boundary Spanning	0.504 (0.5)	0	1
Competition	0.502 (0.5)	0	1
Female	0.388 (0.488)	0	1
Age 18-24	0.726 (0.446)	0	1
Age 25-34	0.274 (0.446)	0	1
Degree=Bachelor	0.53 (0.5)	0	1
Degree=Masters	0.47 (0.5)	0	1
Race=Asian	0.94 (0.239)	0	1
Race=Other	0.06 (0.239)	0	1

Table 2.6 Regression Results: Decision to Bid

	Baseline I		Full II	
Complexity	0.112***	(0.031)	0.122**	(0.045)
Boundary Spanning	0.022	(0.036)	-0.038	(0.047)
Competition	-0.037	(0.035)	-0.100*	(0.048)
Female	0.143***	(0.034)	-0.012	(0.072)
Race=Asian	0.068	(0.093)	0.069	(0.096)
Age 25-34	0.077+	(0.039)	0.086*	(0.039)
Degree=Bachelor	0.065+	(0.038)	0.085*	(0.039)
program=IS	-0.07+	(0.037)	-0.055	(0.036)
Female* Complexity			-0.028	(0.058)
Female* Boundaryspanning			0.172*	(0.067)
Female* Competition			0.173*	(0.069)
N	529		529	
R-sq	0.071		0.092	

Notes: Standard errors in parentheses. + p<0.1, * p<0.5, ** p<0.1, *** p<0.01.
LPM regressions. Model I estimate the base line model; Models II add treatment and race interaction effects. standard errors clustered at the subject level. Cluster size is adjusted using cook's distance.

Table 2.7 Regression Results: Bid Amount

	Baseline I		Full II	
Complexity	31.351***	(2.720)	34.741***	(3.885)
Boundary Spanning	-6.075*	(2.763)	-9.179*	(3.602)
Competition	3.329	(2.748)	-1.422	(3.744)
Female	4.139	(2.665)	-2.034	(4.861)
Race=Asian	-1.550	(7.517)	-2.025	(7.649)
Age 25-34	8.663**	(3.042)	9.378**	(3.012)
Degree=Bachelor	2.882	(3.018)	4.142	(3.054)
program=IS	-6.699*	(3.018)	-5.772+	(2.962)
Female* Complexity			-8.923+	(5.129)
Female* Boundaryspanning			8.971+	(5.222)
Female* Cmpetition			12.673*	(5.468)
N	529		529	
R-sq	0.071		0.092	

Notes: Standard errors in parentheses. + p<0.1, * p<0.5, ** p<0.1, *** p<0.01.
Tobit regressions. Model I estimate the base line model; Models II add treatment and race interaction effects. standard errors clustered at the subject level. Cluster size is adjusted using cook's distance.

Table 2.8: Regression Results: Bid Decision by Regions

Bid Decision	South Asian				East Asian			
	Baseline I		Full II		Baseline III		Full IV	
Complexity	0.091*	(0.041)	0.109+	(0.063)	0.126*	(0.052)	0.107	(0.072)
Boundary_spanning	0.017	(0.049)	-0.018	(0.070)	-0.024	(0.052)	-0.148*	(0.065)
Competition	-0.067	(0.048)	-0.116+	(0.068)	0.005	(0.057)	-0.105	(0.071)
Age_25-34	0.073	(0.052)	0.078	(0.049)	0.127*	(0.060)	0.147*	(0.064)
Female	0.187***	(0.045)	0.099	(0.080)	0.058	(0.054)	-0.244+	(0.123)
Degree_bachelor	0.076	(0.053)	0.087	(0.053)	0.022	(0.056)	0.054	(0.056)
ProgramIS	-0.008	(0.054)	0.007	(0.053)	-0.106*	(0.053)	-0.079	(0.051)
FemaleXComplexity			-0.044	(0.075)			0.026	(0.099)
FemaleXBoundaryspanning			0.098	(0.093)			0.316**	(0.095)
FemaleXCompetition			0.127	(0.088)			0.268*	(0.114)
N	295		295		209		209	
R-sq	0.083		0.093		0.063		0.130	

Notes: Standard errors in parentheses. + p<0.1, * p<0.5, ** p<0.1, *** p<0.01.
LPM regressions. Model I estimates the base line model; Models II add treatment and race interaction effects. standard errors clustered at the subject level. Cluster size is adjusted using cook's distance.

Table 2.9. Regression Results: Bid Amount by Regions

Bid Amount	South Asian				East Asian			
	Baseline I		Full II		Baseline III		Full IV	
Complexity	28.347***	(3.5192)	31.466***	(5.018)	32.445***	(4.391)	30.113***	(5.493)
Boundary_spanning	-9.141**	(3.4128)	-10.864*	(4.596)	-5.997	(4.661)	-11.282*	(4.840)
Competition	5.087	(3.3481)	0.251	(4.628)	0.404	(4.588)	-2.807	(5.062)
Age_25-34	4.273	(3.6041)	4.791	(3.475)	17.594**	(5.766)	15.559**	(5.024)
Female	8.075*	(3.2667)	3.362	(5.592)	-1.625	(4.438)	-11.734*	(5.656)
Degree_bachelor	3.228	(3.6114)	4.006	(3.612)	-1.309	(5.371)	-0.546	(4.595)
ProgramIS	-6.857+	(3.6027)	-5.566	(3.467)	-9.684+	(5.529)	-6.111	(4.815)
FemaleXComplexity			-7.607	(6.794)			-4.203	(6.849)
FemaleXBoundaryspanning			5.225	(6.416)			15.619*	(6.998)
FemaleXCompetition			12.107+	(6.326)			7.464	(7.361)
N	295		295		209		209	
R-sq	0.083		0.093		0.063		0.130	

Notes: Standard errors in parentheses. + p<0.1, * p<0.5, ** p<0.1, *** p<0.01.
Tobit regressions. Model I estimates the base line model; Models II add treatment and race interaction effects. standard errors clustered at the subject level. Cluster size is adjusted using cook's distance.

Table 3.1 Variable Description

Variable	Description	Unit of Range
$\Delta\log(\text{Spotify follower}_{it})$	Daily percentage change of Spotify followers of an artist	continuous
Post HDC	The time period after the hashtag dance challenge occurs	0/1
HDC	Song associated with a hashtag dance challenge	0/1
women artist	The artist is a woman	0/1
Song attributes		
Danceability	How suitable a track is for dancing	continuous
Speechiness	Detects the presence of spoken words in the track	continuous
Acousticness	Measures the likelihood a track is acoustic	continuous
Instrumentalness	Predicts the likelihood that a track has no vocals	continuous
Liveness	Accounts for the presence of an audience in the recording	continuous
Valence	The musical positiveness is conveyed by the track.	continuous
Tempo	The estimated tempo of a track in beats per minute	continuous
Loudness	The loudness of a track is measured on a negative decibel (dB) scale averaged across the entire track.	continuous
sinceRelease	Days between a song release date and panel date	continuous
TikTokTenure	A song's tenure on TikTok. 1 = song has not been added to TikTok in the panel 2 = song added to TikTok within 6 days in the panel 3 = song added to TikTok between 7 and 11 days in the panel 4 = song added to TikTok greater than 11 days in the panel	categorical
Song genre	main genre of a song. 1 = pop ; 2 = hip pop ; 3 = EDM 4 = rap ; 5 = country ; 6 = CCM 7 = rock; 8 = indie ; 9 = R&B 10 = folk; 11 = other	categorical

Note: Spotify provides music attributes including danceability, speechiness, acousticness, instrumentalness, liveness, valence, tempo.
Source: https://developer.spotify.com/discover/

Table 3.2 Balance Check between Treated and Control Groups

	Treated Group		Control Group		T-Test	
Variable	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**t**	**p>|t|**
Danceability	0.721	0.127	0.721	0.108	0.07	0.941
Speechiness	0.124	0.100	0.119	0.101	1.02	0.308
Acousticness	0.180	0.233	0.200	0.242	-1.75	0.080
Instrumentalness	0.003	0.118	0.003	0.008	1.39	0.164
Liveness	0.153	0.114	0.151	0.123	0.29	0.770
Valence	0.553	0.233	0.546	0.226	0.64	0.524
Tempo	120.861	31.908	121.283	25.796	-0.31	0.754
Loudness	-6.244	2.115	-6.225	2.075	-0.19	0.847
Pre HDC daily percentage change	0.0027	0.0222	0.0023	0.0048	-0.3523	0.7247
# Of songs	62		62			

Note: Treated group is defined as song associated with a dance challenge on TikTok. Control group is defined as songs not associated with a dance challenge on TikTok. Propensity score matching (PSM) based on Song level music attributes, pre-song-release artist Spotify popularity.

Table 3.3 Summary Statistics

	Mean	**Std. Dev.**
$\Delta log(spotifyfollower_{it})$	0.006	0.033
Post HDC	0.533	0.5
HDC	0.5	0.5
Woman artist	0.339	0.478
Song attributes		
Danceability	0.721	0.118
Speechiness	0.121	0.100
Acousticness	0.190	0.237
Instrumentalness	0.003	0.010
Liveness	0.152	0.118
Valence	0.549	0.229
Tempo	121.07	29.006
Loudness	-6.234	2.094
sinceRelease	14.959	35.901
TikTok tenure	2.274	1.241
If HDC = 1		
User generated	0.629	0.483
Artist generated	0.371	0.483

Note: Summary statistics of variables of interest. The sample is selected using propensity score matching within the sample of songs on TikTok. I provide a detailed discussion in the Empirical Specification.

Table 3.4 Mean Comparison between Control and Treated group, by Gender and HDC Status

Gender	Status	Post HDC= 0	Post HDC = 1
Men	Control	0.0027	0.0111
Men	Treated	0.0030	0.0076
Women	Control	0.0018	0.0017
Women	Treated	0.0016	0.0338

Note: This shows Spotify follower growth before and after the HDCs, by gender groups.

Table 3.5 The Effect of Hashtag Dance Challenge (HDC)

	DV = $\Delta log(spotifyfollower_{it})$			
	Baseline		Full	
	I		II	
Post_HDC	0.0053***	(0.0015)	0.0052***	(0.0014)
HDC	0.0002	(0.0015)	-0.0009	(0.0015)
DID (Post_HDC*HDC)	0.0094*	(0.0038)	0.0017	(0.0031)
Woman artist	0.0034	(0.0022)	-0.0042**	(0.0016)
Woman artist*DID			0.0305***	(0.0085)
sinceRelease	0.21e-4	(0.3e-4)	0.27e-4	(0.3e-4)
TikTokTenure = 2	-0.0007	(0.0031)	-0.0005	(0.0030)
TikTokTenure = 3	-0.0076+	(0.0039)	-0.0081*	(0.0039)
TikTokTenure = 4	-0.0056	(0.0047)	-0.0054	(0.0046)
_cons	0.0011	(0.0084)	0.0094	(0.0088)
N	1860		1860	
R-sq	0.036		0.061	
Song attribute control	YES		YES	
Song genre control	YES		YES	
Seasonality control	YES		YES	

Standard errors in parentheses + p<0.1 * p<.05 ** p<.01 *** p<0.001
Note: the observation window is 7 days before and after treatment (dance challenge), 15 days total for 124 songs. The level of analysis is song-day level.

Table 3.6 The Effect of Hashtag Dance Challenges (HDCs) by Gender Groups

$\Delta log(spotifyfollower_{it})$	Women subsample (I)		Men subsample (II)	
Post_HDC	0.0009	(0.0010)	0.0090***	(0.0024)
HDC	-0.0053	(0.0034)	-0.0004	(0.0016)
DID(Post_HDC* HDC)	0.0367***	(0.0100)	-0.0032	(0.0037)
sinceRelease	0.0001+	(0.0001)	0.959e-7	(0.38e-4)
TikTokTenure = 2	0.0027	(0.0058)	-0.0007	(0.0017)
TikTokTenure = 3	-0.0081	(0.0072)	-0.0042	(0.0027)
TikTokTenure = 4	-0.0120*	(0.0055)	0.0001	(0.0040)
_cons	0.0076	(0.0178)	0.0261*	(0.0110)
N	630		1230	
R-sq	0.127		0.035	
Song attribute control	YES		YES	
Song genre control	YES		YES	
Seasonality control	YES		YES	

Standard errors in parentheses + p<0.1 * p<.05 ** p<.01 *** p<0.001
Note: the observation window is 7 days before and after treatment (HDCs), 15 days total, for 124 songs. The level of analysis is song-day level.

Table 3.7 Comparing Between User and Artist-generated Hashtag Dance Challenges (HDCs)

$\Delta log(spotifyfollower_{it})$	Full sample (I)		Women subsample (II)		Men subsample (III)	
Post_HDC	0.0053***	(0.0015)	0.0012	(0.0013)	0.0090**	(0.0029)
HDC	-0.0006	(0.0030)	-0.0010	(0.0063)	-0.0009	(0.0028)
DID (Post_HDC*HDC)	0.0096+	(0.0054)	0.0325**	(0.0102)	-0.0004	(0.0055)
Woman artist	0.0037	(0.0024)				
user_gen	0.0014	(0.0028)	0.0003	(0.0057)	0.0008	(0.0032)
Post_HDC*HDC*user_gen	-0.0004	(0.0060)	0.0141	(0.0131)	-0.0042	(0.0054)
sinceRelease	0.16e-4	(0.3e-4)	0.0001	(0.0001)	-2.51e-06	(0.36e-4)
TikTokTenure = 2	0.0008	(0.0030)	0.0036	(0.0103)	-0.0001	(0.0024)
TikTokTenure = 3	-0.0068**	(0.0026)	-0.0148+	(0.0086)	-0.0037+	(0.0022)
TikTokTenure = 4	-0.0048	(0.0033)	-0.0203*	(0.0079)	-0.0000	(0.0035)
_cons	0.0001	(0.0084)	-0.0095	(0.0205)	0.0248*	(0.0105)
N	1860		630		630	
R-sq	0.036					
Song attribute control	YES		YES		YES	
Song genre control	YES		YES		YES	
Seasonality control	YES		YES		YES	

Standard errors in parentheses + p<0.1 * p<.05 ** p<.01 *** p<0.001
Note: the observation window is 7 days before and after treatment (dance challenge), 15 days total, for 124 songs. The level of analysis is song-day level.

Table 3.8 The Effect of Women user-generated Hashtag Dance Challenges (HDCs)

$\Delta log(spotifyfollower_{it})$	Baseline I		Full II	
Post_HDC	0.0142*	(0.0062)	0.0137*	(0.0061)
User gender = woman	0.0143*	(0.0060)	0.0104+	(0.0056)
Artist gender = woman	0.0199*	(0.0077)	0.0080	(0.0077)
woman user * woman artist			0.0224+	(0.0132)
sinceRelease	0.43e-4	(0.1e-3)	0.59e-4	(0.1e-3)
TikTokTenure = 2	0.0051	(0.0048)	0.0053	(0.0049)
TikTokTenure = 3	-0.0096	(0.0077)	-0.0090	(0.0076)
TikTokTenure = 4	-0.0036	(0.0123)	-0.0033	(0.0122)
_cons	-0.1028*	(0.0471)	-0.1141*	(0.0472)
N	585		585	
R-sq	0.092		0.098	
Song attribute control	YES		YES	
Song genre control	YES		YES	
Seasonality control	YES		YES	

Standard errors in parentheses + p<0.1 * p<.05 ** p<.01 *** p<0.001
Note: the observation window is 7 days before and after treatment (HDCs), 15 days total, for 124 songs. The level of analysis is song-day level.

Table 3.9 The Effect of Being on TikTok

$\Delta log(spotifyfollower_{it})$	Baseline I		Full II	
Post song on TikTok	0.0030	(0.0028)	0.0030	(0.0028)
Song On TikTok	0.0024	(0.0080)	0.0025	(0.0081)
DID (Post song on TikTok * Song on TikTok)	-0.0055	(0.0073)	-0.0066	(0.0084)
Woman artist	0.0030	(0.0033)	0.0019	(0.0044)
Woman artist*DID			0.0037	(0.0056)
sinceRelease	0.23e-4	(0.0001)	0.18e-4	(0.0001)
_cons	0.0247	(0.0266)	0.0251	(0.0270)
N	3210		3210	
R-sq	0.004		0.004	
Song attribute control	YES		YES	
Song genre control	YES		YES	
Seasonality control	YES		YES	

Standard errors in parentheses + p<0.1 * p<.05 ** p<.01 *** p<0.001
Note: the observation window is seven days before and after a song is added to TikTok, in a total of 15 days for 214 identified songs. The level of analysis is song-day level.

Table 3.10 Subsample consider only songs added to TikTok at least seven days before the presence of an HDC

$\Delta log(spotifyfollower_{it})$	Baseline I		Full II	
Post_HDC	0.0048*	(0.0020)	0.0048*	(0.0020)
HDC	0.0019	(0.0041)	0.0008	(0.0040)
DID (Post_HDC*HDC)	0.0088+	(0.0054)	0.0044	(0.0053)
Woman artist	0.0001	(0.0033)	-0.0047	(0.0031)
Woman artist*DID			0.0189+	(0.0104)
sinceRelease	0.81e-5	(0.5e-4)	0.18e-4	(0.6e-4)
TikTokTenure = 2	-0.0064+		-0.0055	(0.0037)
TikTokTenure = 3	-0.0049	(0.0001)	-0.0054	(0.0039)
TikTokTenure = 4	-0.0072*	(0.0037)	-0.0068*	(0.0035)
_cons	0.0090	(0.0139)	0.0134	(0.0136)
N	900		900	
R-sq	0.039		0.048	
Song attribute control	YES		YES	
Song genre control	YES		YES	
Seasonality control	YES		YES	

Standard errors in parentheses + p<0.1 * p<.05 ** p<.01 *** p<0.001
Note: the observation window is seven days before and after treatment (dance challenge), in a total of 7 days for **60** identified songs. I obtained this subsample to avoid the confounding effect induced by song added to TikTok 7 days before the observed dance challenge. The level of analysis is song-day level.

Table 4.1 Variable Description

Variable	Description	Unit of Range
log ($genre\ listenership_{it}$)	Summed weekly number of unique listeners of a focal genre (in the log form)	Continuous
log ($artist\ listenership_{jt}$)	Summed weekly number of unique listeners of a focal artist (in the log form)	Continuous
Hip-hop	Whether the genre is hip-hop	0/1
Band	Whether the artist is a band	0/1
Black artist	If not a band, whether the artist is a Black artist	0/1
Women artist	If not band, whether the artist is woman or man	0/1

Table 4.2 Summary Statistics

Variable	Mean	Std Dev.	Min	Max
Genre level				
log ($genre\ listenership_{it}$)	22.322	0.354	21.653	22.768
Hip-hop genre	0.1429	0.351	0	1
White genre	0.8971	0.351	0	1
Artist level				
log ($artist\ listenership_{jt}$)	13.852	2.310	0	19.840
Band	0.393	0.488	0	1
Black artist	0.385	0.487	0	1
Women artist	0.189	0.392	0	1

Table 4.3 Effect of Floyd Incident on Hip-hop Listenership

log (weekly genre listeners)	I		II	
Hip-hop*After	0.641***	(0.003)	1.4781***	(0.0035)
_cons	22.077***	(0.041)	21.5578***	(0.8356)
N	34		34	
R-sq	0.782		0.757	
Week FE	YES		YES	
Genre FE	NO		NO	
City FE	NO		NO	

Standard errors in parentheses + p<0.1 * p<.05 ** p<.01 *** p<0.001
Note: In Column I, the baseline effect is shown. The treated group in this case is the hip-hop genre, while the control group consists of the aggregate listenership of the six White-dominated genres. In Column II, a robustness check is performed by replacing the aggregate control genres with Rock, which is the most listened to genre dominated by white artists, as individual control genres.

Table 4.4 Impact of the Floyd Incident on Hip-hop Listenership, by African American Population Percentile in U.S. Cities

log (weekly genre listeners)	By African American Population Percentile							
	25th-50th percentile		50th-75th percentile		75th-90th percentile		>90th percentile	
	I		II		III		IV	
Hip-hop*After	0.135+	(0.076)	0.249*	(0.101)	0.195	(0.124)	0.470	(0.773)
_cons	14.965***	(0.009)	14.847***	(0.013)	14.265***	(0.047)	13.3886***	(0.137)
N	935		687		439		294	
R-sq	0.849		0.771		0.910		0.878	
Week FE	YES		YES		YES		YES	
Genre FE	YES		YES		YES		YES	
City FE	YES		YES		YES		YES	

Standard errors in parentheses + p<0.1 * p<.05 ** p<.01 *** p<0.001
Note: This table shows the effect of the Floyd incident in different subgroups of U.S. cities, categorized by the percentile of Black population. Column focus on a sample of 10 U.S. cities where the Black population falls between the 25th and 50th percentiles. Column II focus on a sample of 7 U.S. cities where the Black population falls between the 50th and 75th percentiles.. Column III focus on sample of 7 U.S. cities where the Black population falls between the 75th and 90th percentiles.. Column IV focus on a sample of 5 U.S. cities where the Black population is greater than the 90th percentile. Note that not all 7 genres were listened to across the 17-week period in all cities, resulting in an unbalanced panel. Standard errors are clustered by city and genre to account for potential correlation within cities.

Table 4.5 City Comparisons: Effect of Floyd Incident on Hop-hop Listenership

log(weekly genre listeners)	Albuquerque		Detroit	
	I		II	
Hiphop*After	0.7826*	(0.3446)	0.3221	(0.6515)
_cons	11.9350***	(0.1731)	11.3401***	(0.2174)
N	49		60	
R-sq	0.934		0.973	
Week FE	YES		YES	
Genre FE	YES		YES	

Standard errors in parentheses + p<0.1 * p<.05 ** p<.01 *** p<0.001
Note: The sample size difference between Albuquerque and Detroit can be attributed to the fact that not all 7 genres were listened to across the 17-week period in all cities. In the Albuquerque sample, for instance, only 4 genres (country, folk, hip hop, and rock) were listened to, but not consistently in all 17 weeks, resulting in an unbalanced panel. Similarly, in the Detroit sample, although all 7 genres were listened to, they were not consistently listened to every week, also resulting in an unbalanced panel. To account for potential clustering effects, standard errors are clustered by genre.

Table 4.6 Effect of Floyd Incident on Black Music Artist Listenership

log(weekly artist listeners)	Baseline I		Full II	
Black artist*After	0.0284*	(0.0119)	0.1225	(0.2561)
Black artist*After*hip-hop			1.2714**	(0.2583)
_cons	14.6171***	(0.0206)	12.8675***	(0.0132)
N	35766		35766	
R-sq	0.250		0.134	
Artist FE	YES		YES	
Week FE	YES		YES	
Genre FE	YES		YES	

Standard errors in parentheses + p<0.1 * p<.05 ** p<.01 *** p<0.001
Note: Column I shows the baseline results of the impact of Floyd incident on Black artist listenership. The data sample include 2195 artists representing the seven genres over 17 weeks. Note that not all artists were listened to across the 17-week period, resulting in an unbalanced panel, Hence, a total of 35766 observations. To account for potential clustering effects, standard errors are clustered by genre.

Table 4.7 Gender Heterogeneity: Black Music Artist listenership Post Floyd within Black artists sample

log(weekly artist listeners)	Full sample I		Hip-hop subsample II	
Black women*After	-0.0352***	(0.0042)	-0.0376	(0.0244)
_cons	13.2766***	(0.0203)	13.2825***	(0.1437)
N	8373		8118	
R-sq	0.2704		0.2679	
artist FE	YES		YES	
genre FE	YES		NO	
week FE	YES		YES	

Standard errors in parentheses + p<0.1 * p<.05 ** p<.01 *** p<0.001
Note: Column I shows the gender heterogeneity within a subsample of 507 Black musicians, as not all artists were consistently listened to over the 17-week period, resulting in an unbalanced panel. In Column II further categorize Black musicians based on their primary genre: 492 Black musicians are categorized as hip-hop artists. To account for potential clustering effects, standard errors are clustered by genre.

Table 4.8 Robustness Check: Effect of Being Featured in The Spotify Curated BLM Playlist

log(weekly artist listeners)	Baseline I		Full II	
Black artist*After	0.0272*	(0.0119)	0.0230+	(0.0118)
featured	2.9828***	(0.3629)	2.9564***	(0.3629)
Black artist*featured			0.0452***	(0.0026)
_cons	12.4694***	(0.3520)	12.4701***	(0.3517)
N	35766		35766	
R-sq	0.2501		0.2502	
artist FE	YES		YES	
genre FE	YES		YES	
week FE	YES		YES	

Standard errors in parentheses + p<0.1 * p<.05 ** p<.01 *** p<0.001
Note: Data sample is 2195 music artists representing the 7 genres over 17 weeks. Note that not all artists were listened to across the 17-week period, resulting in an unbalanced panel, Hence, a total of 35766 observations. To account for potential clustering effects, standard errors are clustered by genre.

Table 4.9 Treatment Effects in Other Black-Dominated Genres

log(weekly artist listeners)	Full sample I		all 6 black genres II		all 6 white genres III	
Black artist*After	1.0065*	(0.3694)	1.1352*	(0.3630)	0.0449	(0.2565)
_cons	12.5793***	(0.0838)	12.0591***	(0.1354)	13.2880***	(0.0028)
N	43986		26241		17745	
R-sq	0.191		0.131		0.293	
Artist FE	YES		YES		YES	
Genre FE	YES		YES		YES	
Week FE	YES		YES		YES	

Standard errors in parentheses + p<0.1 * p<.05 ** p<.01 *** p<0.001
Note: Column I shows the average effect of Floyd incident on Black artist listenership, use a sample of 2704 music artists, representing 12 genres. Column II and III display the results of subsample analysis at the artist level, categorized by black-dominated and white-dominated genres. Column II includes a subsample of 1639 artists who primarily operate in one of the black-dominated genres (hip-hop, r&b, blues, soul, jazz, reggae), while Column III includes a subsample of 1065 artists who primarily operate in one of the white-dominated genres. It's important to note that not all artists were listened to across the 17-week period, resulting in an unbalanced panel. To account for potential clustering effects, standard errors are clustered by genre.

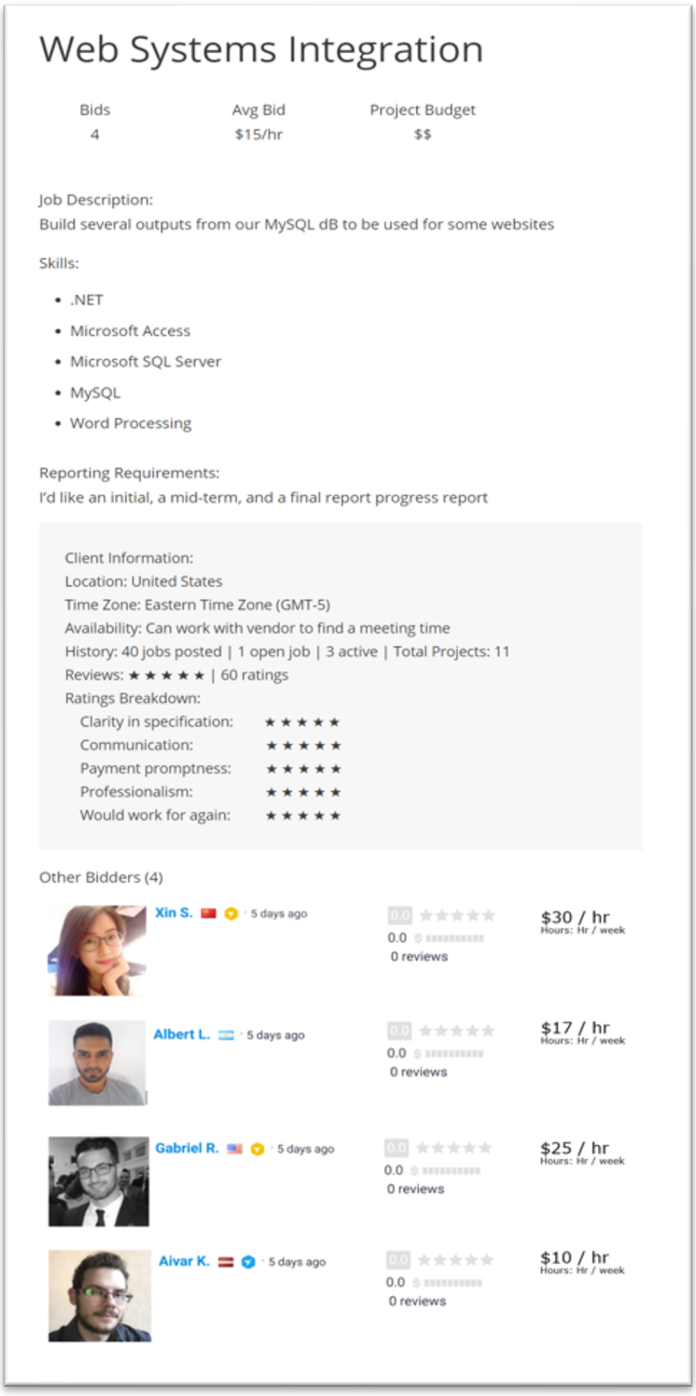
Table 4.10 Gender Heterogeneity: Black Music Artist Listenership Post Floyd Within Black Artists Sample, Consider Other Black-Dominated Genres

log(weekly artist listeners)	Full sample I		all 6 black genres II	
Black artist*After	-0.3578***	(0.0249)	-0.3921***	(0.0687)
_cons	16.5969***	(0.0217)	13.5860***	(0.0961)
N	13020		12765	
R-sq	0.200		0.197	
artist FE	YES		YES	
genre FE	YES		YES	
week FE	YES		YES	

Standard errors in parentheses + p<0.1 * p<.05 ** p<.01 *** p<0.001
Note: Column I shows the gender heterogeneity within a subsample of 787 Black musicians, as not all artists were consistently listened to over the 17-week period, resulting in an unbalanced panel. In Column II further categorize Black musicians based on their primary genre: 772 Black musicians primarily operate in one of the black-dominated genres (hip-hop, r&b, blues, soul, jazz, reggae). To account for potential clustering effects, standard errors are clustered by genre.

Figures

Figure 2.1 Exemplar Project E - Low Competition, Low Task Complexity, Low Coordination Complexity



Web Systems Integration

Bids	Avg Bid	Project Budget
4	$15/hr	$$

Job Description:
Build several outputs from our MySQL dB to be used for some websites

Skills:

- .NET
- Microsoft Access
- Microsoft SQL Server
- MySQL
- Word Processing

Reporting Requirements:
I'd like an initial, a mid-term, and a final report progress report

Client Information:
Location: United States
Time Zone: Eastern Time Zone (GMT-5)
Availability: Can work with vendor to find a meeting time
History: 40 jobs posted | 1 open job | 3 active | Total Projects: 11
Reviews: ★ ★ ★ ★ ★ | 60 ratings
Ratings Breakdown:
Clarity in specification: ★ ★ ★ ★ ★
Communication: ★ ★ ★ ★ ★
Payment promptness: ★ ★ ★ ★ ★
Professionalism: ★ ★ ★ ★ ★
Would work for again: ★ ★ ★ ★ ★

Other Bidders (4)

Xin S. · 5 days ago — 0.0 — 0.0 — 0 reviews — $30 / hr Hours: Hr / week

Albert L. · 5 days ago — 0.0 — 0.0 — 0 reviews — $17 / hr Hours: Hr / week

Gabriel R. · 5 days ago — 0.0 — 0.0 — 0 reviews — $25 / hr Hours: Hr / week

Aivar K. · 5 days ago — 0.0 — 0.0 — 0 reviews — $10 / hr Hours: Hr / week

Figure 2.2 Bid decision (left) and Bid Amount (Right) across gender

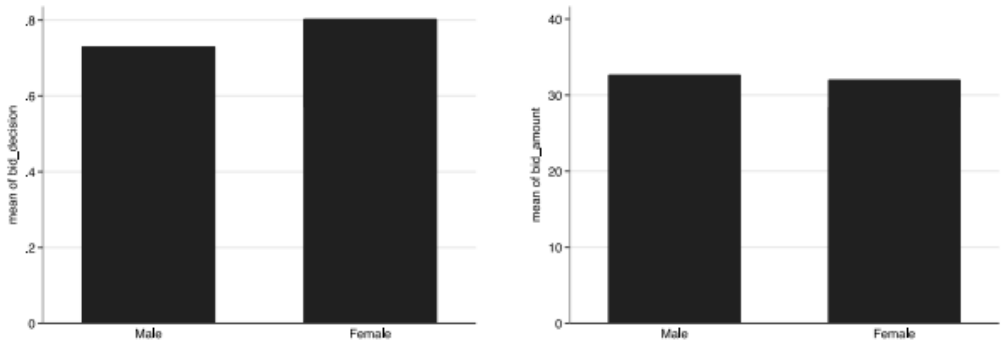


Figure 2.3: Bid decision by gender across treatments

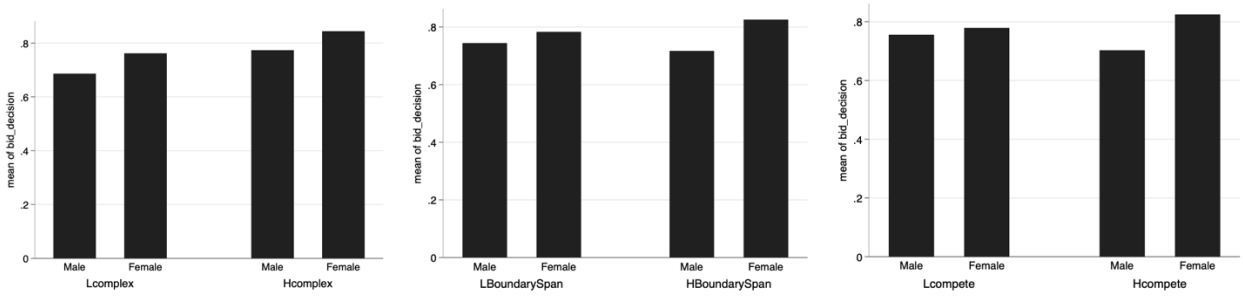


Figure 2.4: Bid Amount by gender across treatments

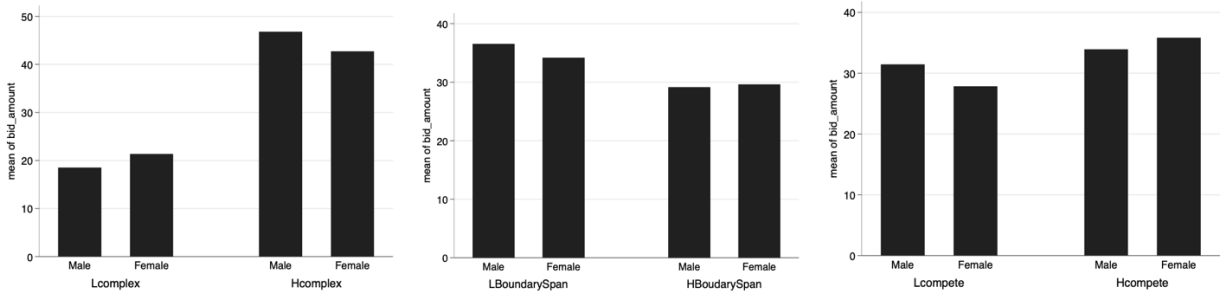


Figure 3.1 1:1 Nearest Neighbor Propensity Score Matching Strategy

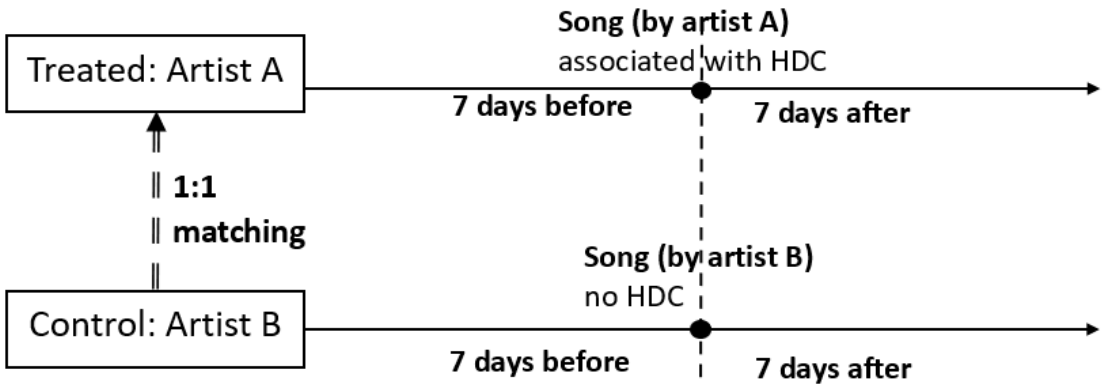


Figure 3.2 Distributions of the propensity scores before and after matching

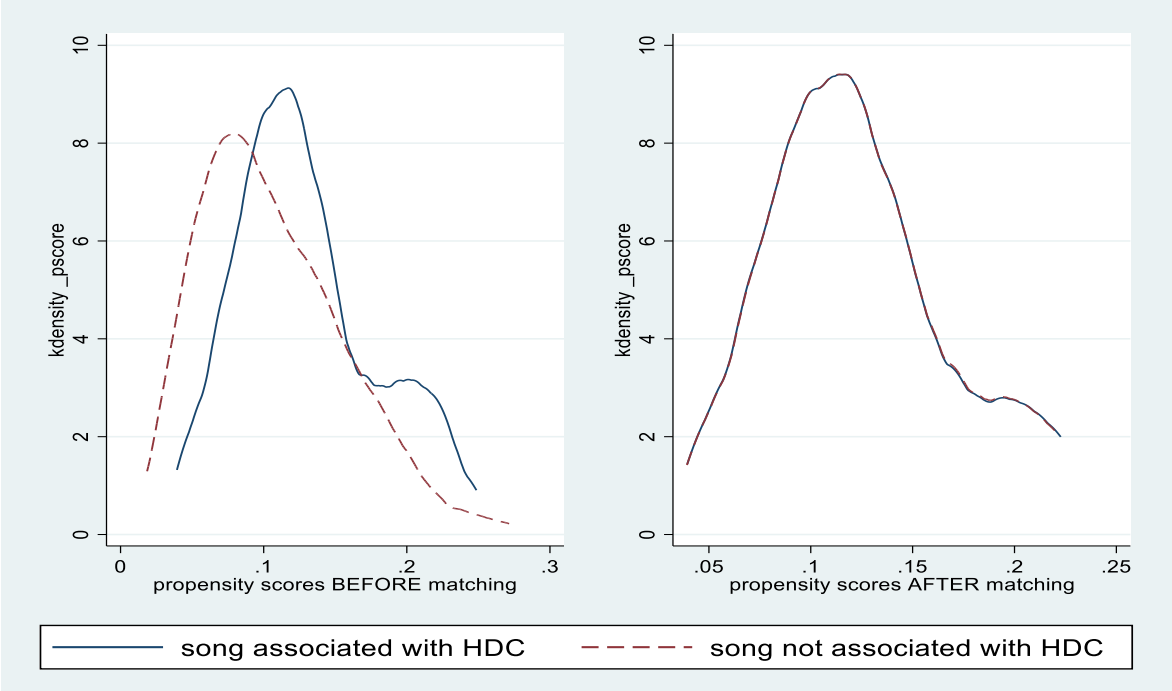


Figure 3.3 Daily Percentage Change on Spotify Followers over 15 days. Treated vs. Control

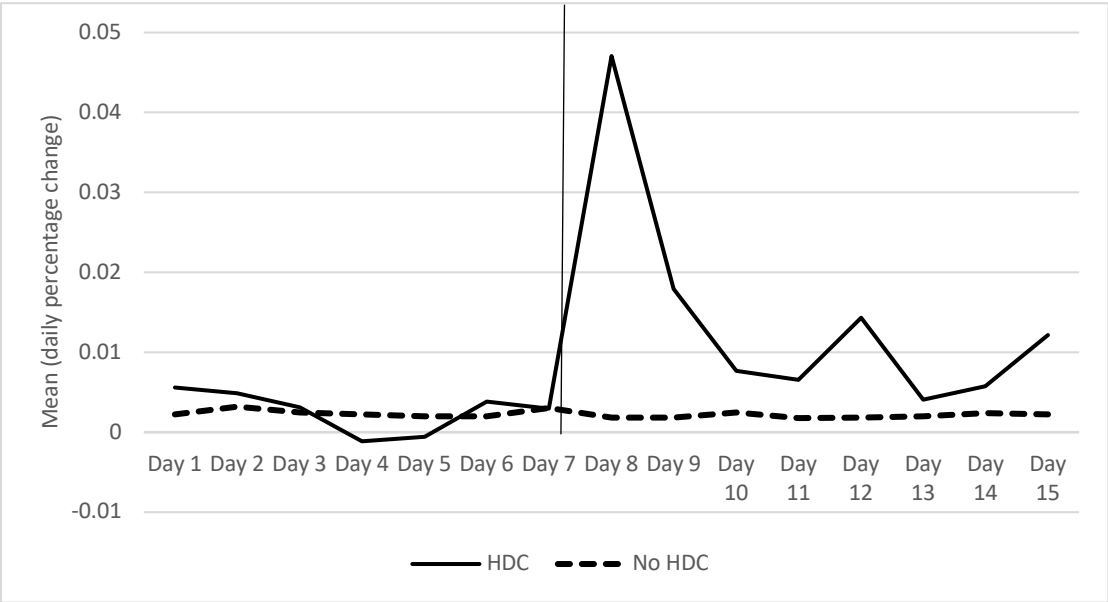


Figure 3.4 Mean Comparison Between Control (No HDC) and Treated (HDC) Group, By Artist Gender (Left: Men , Right: Women)

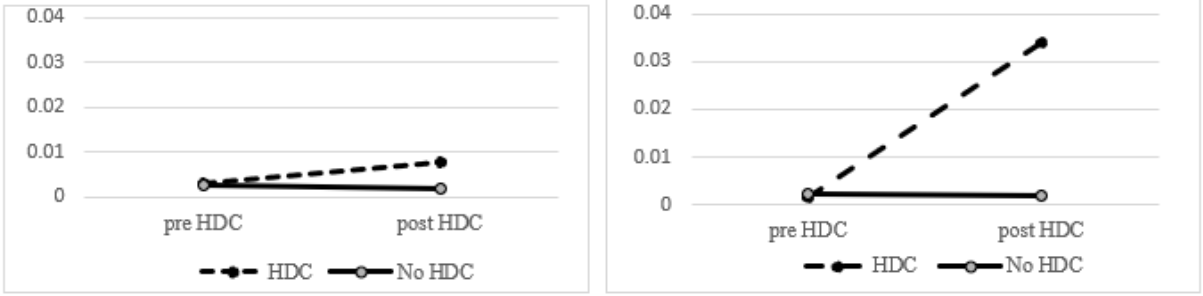


Figure 3.5 Confounding Effect When a Song is Added to Tiktok and Featured in an HDC Within 7 Days

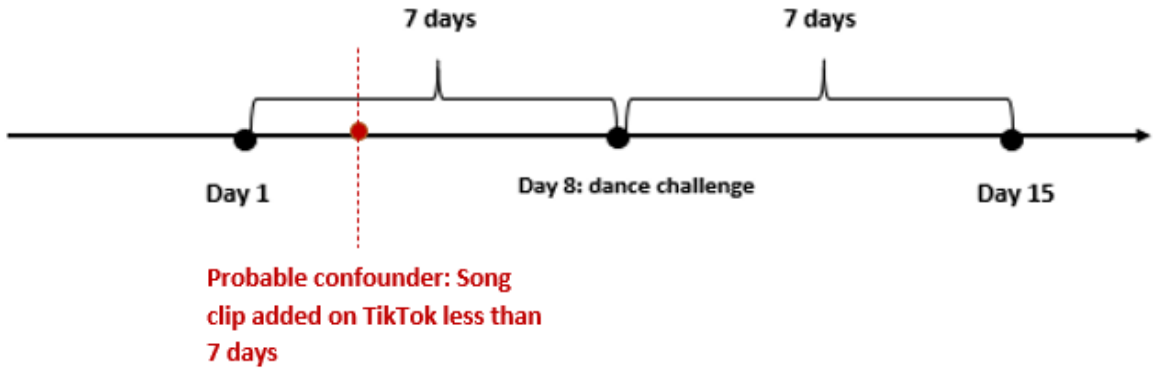


Figure 4.1 Model Free Evidence: Weekly genre listeners on Spotify over 17 weeks. Hip-hop vs. White genres

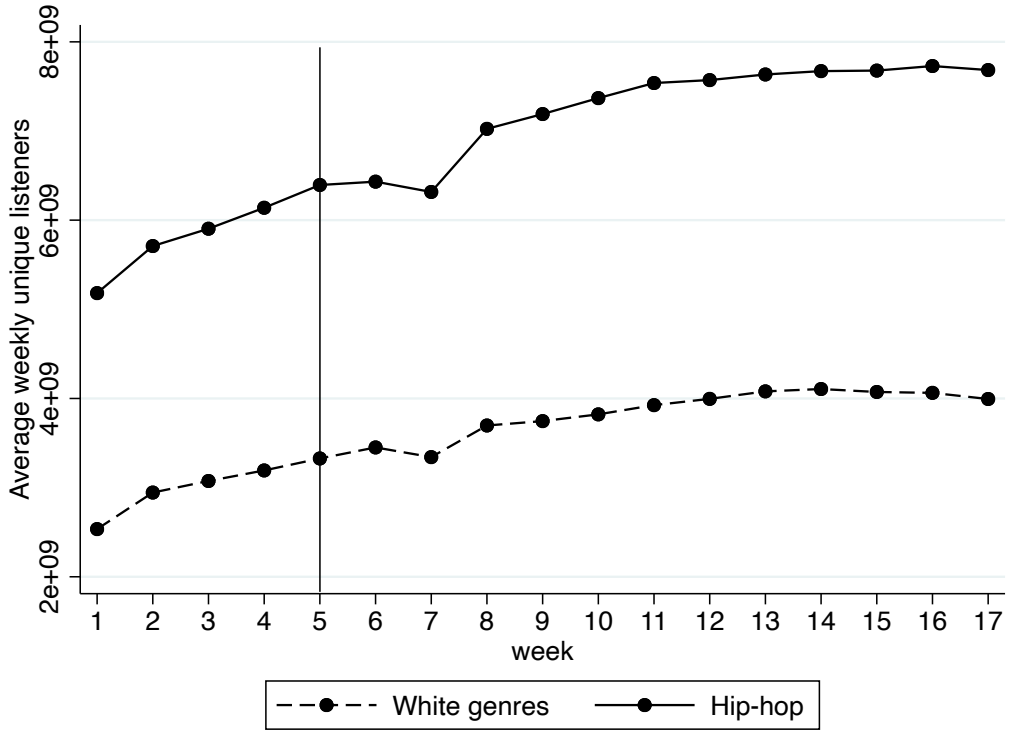
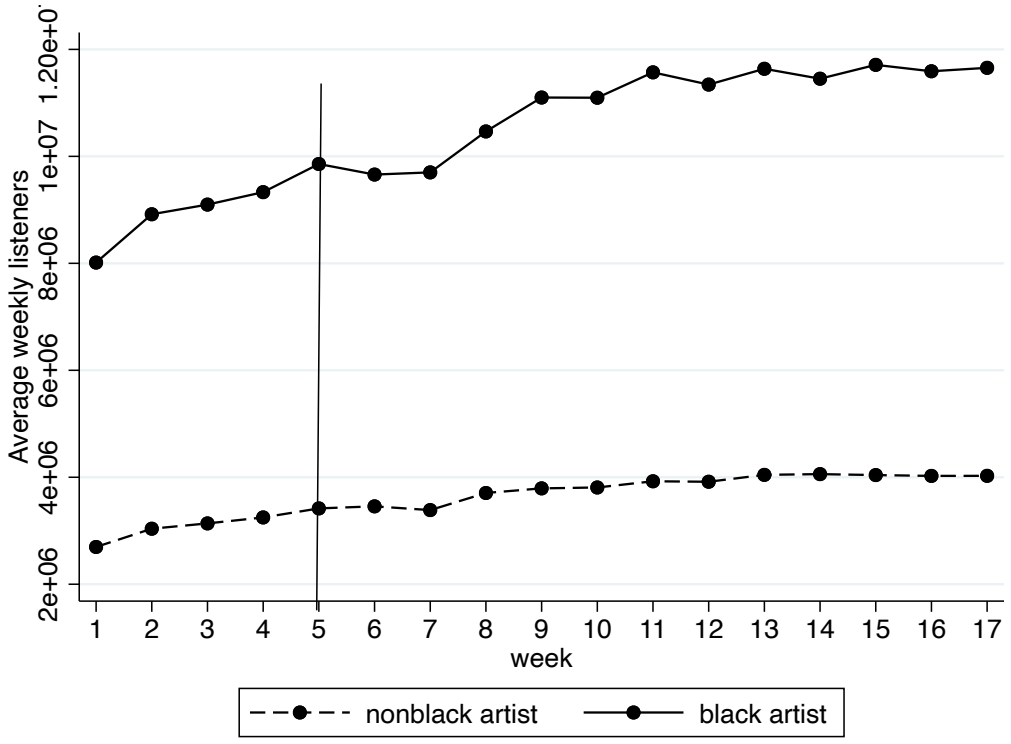


Figure 4.2 Model Free Evidence: Weekly artist listeners on Spotify over 17 weeks. Black artists vs. non-Black artists



Appendices

Table A.2.1. Relevant Literature on Women and Competition

Study	Subjects	Treatment and Set Up	Major Findings
Gneezy et al. (2003)	Lab experiments with undergraduate engineering students.	The participants solve a maze, with piece rate, tournament, and a randomized payment scheme.	Men perform better in mixed tournaments than in non-incentive competitive schemes
Niederle and Vesterlund (2007)	Undergraduate students.	Non-competitive piece rate v. competitive tournament scheme.	73 percent of men prefer tournament, compared with 35 percent women.
Nekby et al. (2008)	Runners; nonexperimental setting.	The Midnight Race, Sweden; self-selection into start groups (G1=fastest, G6=slowest).	Women chose to compete in male-dominated environments more likely to be confident/competitive.
Croson and Gneezy (2009)	This paper reviews current (as of 2009) literature on gender differences in economic experiments with respect to (a) risk preferences, (b) social preferences, and (c) attitude towards competition. 7 out of 10 papers listed used students in experiments. Suggests that women are more risk averse than men and also more averse to competition.		
Shurchkov (2012)	Students at the CLER at HBS.	Participants solve verbal and math puzzles under piece rate and tournament scheme.	Women react more negatively to math type and time constraints in selection into tournaments and performance.
Azmat and Petrongolo (2014)	Most experiments run in labs; women have lower preference for risk and competition. Women also respond differently to social cues in that gender composition of the group affects their performance.		
Buser et al. (2014)	Lab experiments with Grade 9 students in the Netherlands.	Experiment similar to Niederle and Vesterlund (2007). Students choose a study track: STEM, health, social science, humanities.	Boys are more likely to choose a STEM track; track competitiveness explains track choice.
Flory et al. (2015)	Field experiment of job entry decision	Random assignment to jobs with fixed-wage or performance based compensation.	Women significantly less likely to apply for jobs with uncertain, variable, performance based, compensation.
Paolaa et al. (2015)	Undergraduate students	Bonus exam points based on competitive versus non-competitive schemes.	No gender-based differences in decision to compete; both genders do better in competitive scenario.
Hanek et al. (2016)	8 studies, including observational data and AMT experiment.	Studies involved anagram solving, strength (hand gripper). Vary competition size.	Women, relative to men, prefer to enter smaller compared with larger competitions.
Berlin and Dargnies (2016)	Lab experiments	Niederle and Vesterlund (2007) experiments with an added feedback round.	(a) Women react more strongly to feedback they receive, (b) women don't compete when they should.
Filippin and Crosetto (2016)	Review paper that combines the data from replications of the Holt and Laury (2002) risk elicitation and finds statistically significant but economically negligible differences between genders.		

Study	Subjects	Treatment and Set Up	Major Findings
John (2017)	High school students in Malaysia	Entry decision (1) when competing against classroom peers, and, (2) from other higher- or lower-ranked peers.	Males more likely to choose competition when against known peers; females were less deterred when competing against higher performing peers.
Bandiera et al. (2021)	This study collates extant experimental research using performance pay and gender but finds that both men and women respond equally well to performance pay. Although women and men differ in propensity for risk, confidence, and even altruism, these differences are not strong enough to generate different responses to incentives.		

Table A.2.2. Sample Project Profiles Reflecting the Three Treatments

Treatment: Technical Complexity of the Project

Technical Complexity = Low

Title: Web Systems Integration
Job description: Build several outputs from our MySQL dB to be used for some websites
Skills: .NET Microsoft Access Microsoft SQL Server MySQL Word Processing

Technical Complexity = High

Improve existing machine learning binary classification model in Python
Job description: I need someone to review and optimize an existing training model for an ensemble binary classifier in Python. The data is provided in a pre-processed format, in two files: • A flat file with one row for each item in the training set and 40 variables • A short time series of a single variable. A description will be provided for all variables. Also provided is the existing python code of the training model. It is a basic ensemble model combining some rudimentary out-of-the-box python machine learning algorithms. Key performance metrics will be the AUC, Precision, and Recall. Elements that will be required: • Improving performance of model • Feature selection to ensure generalization/robustness • Determining appropriate weights for the ensemble • Cross-validation • Better hyper-parameter tuning

Treatment: Coordination Complexity

Coordination Complexity = Low

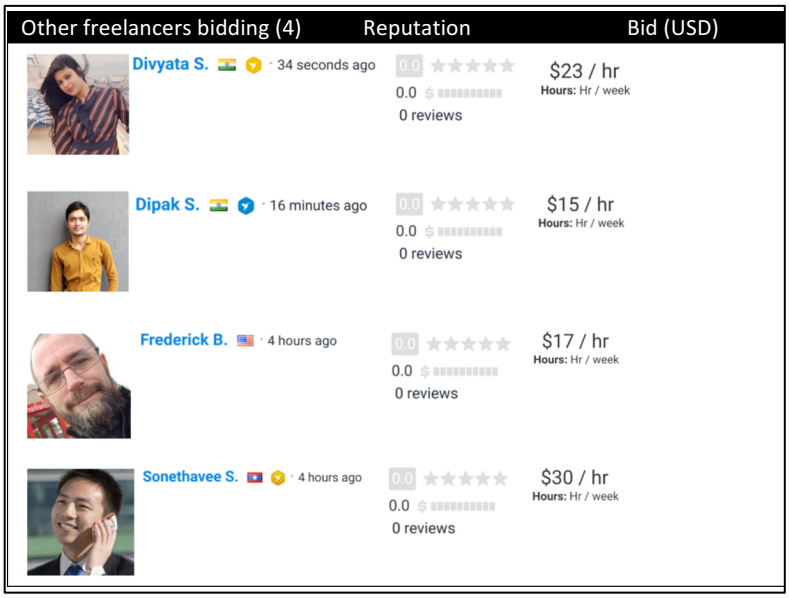
Reporting requirements: I'd like an initial, a mid-term, and a final report progress report.
Client information: Location: United States Time zone: Eastern Time Zone (GMT-5) Availability: Can work with vendor to find a meeting time History: 40 jobs posted | 1 open job | 3 active | Total projects: 111 Reviews: 5 star rating, 60 reviews Ratings Breakdown: Clarity in specification ★★★★★ Communication. ★★★★★ Payment promptness. ★★★★★ Professionalism. ★★★★★ Would work for again. ★★★★★

Coordination Complexity = High

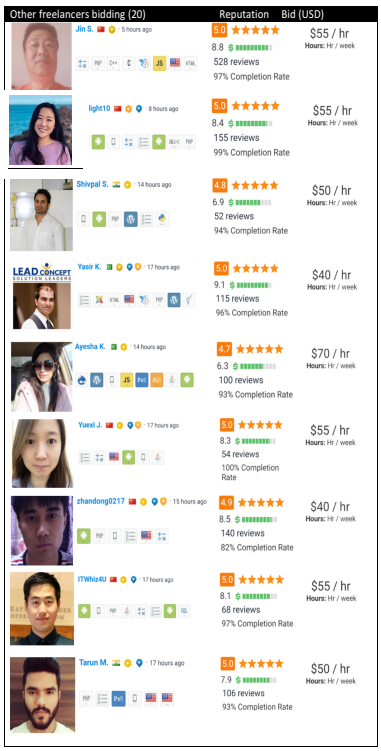
Reporting Requirements: Please let me know what your bid for this work is, and how long you think will take. The process of work, and the milestone payments, will follow this order: Review of existing model and short description of plan for work (10%) Progress report at half-way (40%) Final output (50%)
Client information**:** Location: Russia Time zone: Moscow Standard Time (GMT+3) Availability: 9 AM-5 PM Moscow Time History: 40 jobs posted | 1 open job | 3 active | Total projects: 111 Reviews: 3.5 star rating, 119 reviews Ratings Breakdown: Clarity in specification ★★ Communication. ★ Payment promptness. ★★★★★ Professionalism. ★★★★★ Would work for again. ★★★

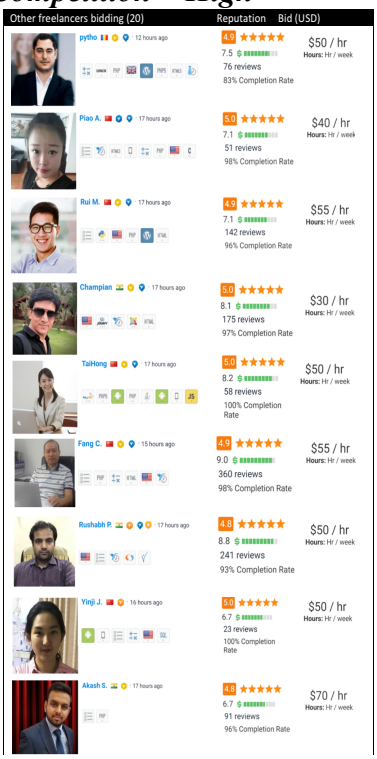
Treatment: Competition

Competition = Low



Competition = High





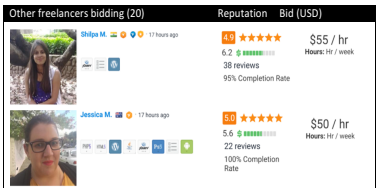


Table A.2.3 Correlation Table

		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
Bid Decision	[1]											
Bid Amount ($)	[2]	0.610										
Complexity	[3]	0.100	0.426									
Boundary Spanning	[4]	-0.004	-0.104	0.004								
Competition	[5]	-0.015	0.077	0.000	0.028							
Female	[6]	0.083	-0.010	0.000	-0.050	0.034						
Age 18-24	[7]	-0.030	-0.077	0.000	0.028	-0.054	0.031					
Age 25-34	[8]	0.030	0.077	0.000	-0.028	0.054	-0.031	-1.000				
Degree=Bachelor	[9]	0.026	0.018	0.000	-0.036	-0.011	-0.070	0.173	-0.173			
Degree=Masters	[10]	-0.026	-0.018	0.000	0.036	0.011	0.070	-0.173	0.173	-1.000		
Race=Asian	[11]	0.118	0.052	0.000	-0.013	0.076	0.171	0.011	-0.011	-0.059	0.059	
Race=Other	[12]	-0.101	-0.026	0.000	-0.017	-0.046	-0.141	-0.011	0.011	0.059	-0.059	-0.937

Table A.3.1 Parallel Trend Testing Effect of The HDC on Day-Wise Follower Growth on Spotify, Pre HDC

	Estimates	
Pre-Treatment Trends	Coefficients	Std. Err.
Day 1-Pre (7)	0.0018	0.0028
Day 2-Pre (6)	0.0003	0.0025
Day 3-Pre (5)	-0.0007	0.0020
Day 4-Pre (4)	-0.0041	0.0043
Day 5-Pre (3)	-0.0027	0.0057
Day 6-Pre (2)	0.0017	0.0017
Day7- Pre(1)	-0.0071	0.0045
Day 8 – Reference	-	-

Note: The table assesses the parallel trend assumption in the DID model for the PSM sample of the 124 artists, which 62 artists have a song associated with the HDC during the observation period. Day 8 is the first day of HDC, which is used as the reference group. The coefficients are estimated in Col (I). Standard errors in parentheses + p<0.1 * p<.05 ** p<.01 *** p<0.001

Figure A.3.1 Process Of Creating A Tiktok Dance Challenge Video

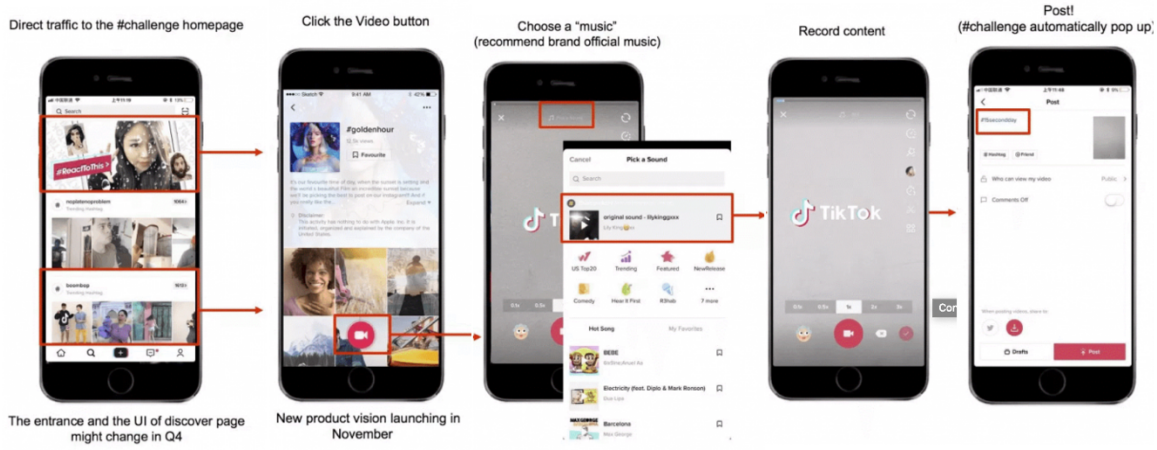


Figure A.3.2 TikTok Dance Challenge Interface

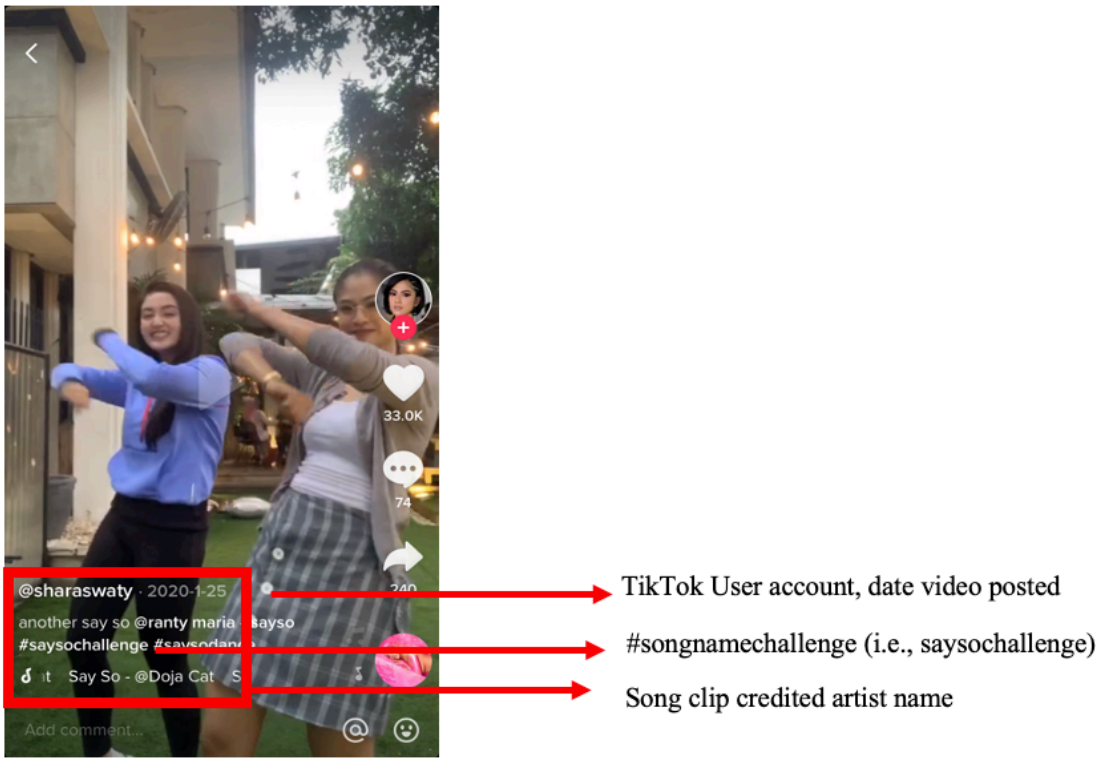


Table A.4.1 Parallel Trend Testing Effect of The Floyd Incdient on Week-Wise Genre Listenership on Spotify, Pre Floyd Incident

	Estimates	
Pre-Treatment Trends	(I) Coefficients	(II) Std. Err.
Week 1 – Pre (4)	-0.0105	0.0380
Week 2 – Pre (3)	0.0154	0.0122
Week 3 – Pre (2)	-0.0028	0.0084
Week 4 – Pre (1)	0.1287	0.0088
Week 5 – Reference	-	-

Note: The table assesses the parallel trend assumption in the DID model for the PSM sample of 7 genres, which concists of hip-hop and 6 White-dominated genres. Week 5 is the week of Floyd incident, which is used as the reference group. The coefficients are estimated in Col I, standard errors are shown in Col II. Standard errors in parentheses + p<0.1 * p<.05 ** p<.01 *** p<0.001

Table A.4.2 Parallel Trend Testing Effect of The Floyd Incdient on Week-Wise Artist Listenership on Spotify, Pre Floyd Incident

	Estimates	
Pre-Treatment Trends	(I) Coefficients	(II) Std. Err.
Week 1 – Pre (4)	0.1411	0.1647
Week 2 – Pre (3)	0.1437	0.1636
Week 3 – Pre (2)	0.1525	0.1627
Week 4 – Pre (1)	0.0830	0.1216
Week 5- Reference	-	-

Note: The table assesses the parallel trend assumption in the DID model for the PSM sample of 2195 artists. Week 5 is the week of Floyd incident, which is used as the reference group. The coefficients are estimated in Col I, standard errors are shown in Col II. Standard errors in parentheses + p<0.1 * p<.05 ** p<.01 *** p<0.001

Table A.4.3 Robustness Check: Summary Statistics

Variable	**Mean**	**Std.**	**Min**	**Max**
log ($artist\ listenership_{jt}$)	12.922	2.775	0	19.839
Band	0.168	0.374	0	1
Black artist	0.483	0.50	0	1
Women artist	0.217	0.412	0	1

Table A.4.4 Robustness Check: Parallel Trend Testing Effect of The Floyd Incdient on Week-Wise Artist Listenership on Spotify, Pre Floyd Incident (12 genres)

	Estimates	
Pre-Treatment Trends	Coefficients	Std. Err.
Week 1 – Pre (4)	-0.0156	0.1145
Week 2 – Pre (3)	0.0898	0.1142
Week 3 – Pre (2)	0.0188	0.1117
Week 4 – Pre (1)	-0.0641	0.1175
Week 5- Reference	-	-

Note: The table assesses the parallel trend assumption in the DID model for the PSM sample of 2704 artists. Week 5 is the week of Floyd incident, which is used as the reference group. The coefficients are estimated in Col I, standard errors are shown in Col II. Standard errors in parentheses + $p<0.1$ * $p<.05$ ** $p<.01$ *** $p<0.001$

Bibliography

Abadie, A. 2005. "Semiparametric Difference-in-Differences Estimators," *The Review of Economic Studies* (72:1), pp. 1-19.

Abadie, A., Athey, S., Imbens, G. W., and Wooldridge, J. 2017. "When Should You Adjust Standard Errors for Clustering?," National Bureau of Economic Research.

Acquisti, A., and Fong, C. 2020. "An Experiment in Hiring Discrimination Via Online Social Networks," *Management Science* (66:3), pp. 1005-1024.

Adya, M. P. 2008. "Women at Work: Differences in It Career Experiences and Perceptions between South Asian and American Women," *Human Resource Management: Published in Cooperation with the School of Business Administration, The University of Michigan and in alliance with the Society of Human Resources Management* (47:3), pp. 601-635.

Agarwal, S., and Sen, A. 2022. "Antiracist Curriculum and Digital Platforms: Evidence from Black Lives Matter," *Management Science* (68:4), pp. 2932-2948.

Ahuja, M. K. 2002. "Women in the Information Technology Profession: A Literature Review, Synthesis and Research Agenda," *European Journal of Information Systems* (11:1), pp. 20-34.

Alexander, D. E. 2014. "Social Media in Disaster Risk Reduction and Crisis Management," *Sci Eng Ethics* (20:3), pp. 717-733.

Allen, T. N., and Randolph, A. 2020. "Listening for the Interior in Hip-Hop and R&B Music," *Sociology of Race and Ethnicity* (6:1), pp. 46-60.

Anand, N., and Peterson, R. A. 2000. "When Market Information Constitutes Fields: Sensemaking of Markets in the Commercial Music Industry," *Organization Science* (11:3), pp. 270-284.

Angrist, J. D., and Pischke, J.-S. 2008. "Mostly Harmless Econometrics," in *Mostly Harmless Econometrics*. Princeton university press.

Aral, S., and Walker, D. 2011. "Creating Social Contagion through Viral Product Design: A Randomized Trial of Peer Influence in Networks," *Management science* (57:9), pp. 1623-1639.

Araújo-Pinzón, P., Álvarez-Dardet, C., Ramón-Jerónimo, J. M., and Flórez-López, R. 2017. "Women and Inter-Organizational Boundary Spanning: A Way into Upper Management?," *European Research on Management and Business Economics* (23:2), pp. 70-81.

Asante, M. K. 2008. *It's Bigger Than Hip Hop: The Rise of the Post-Hip-Hop Generation*. Macmillan.

Aubrey, J. S., Hopper, K. M., and Mbure, W. G. 2011. "Check That Body! The Effects of Sexually Objectifying Music Videos on College Men's Sexual Beliefs," *Journal of Broadcasting & Electronic Media* (55:3), pp. 360-379.

Austin, P. C. 2010. "Statistical Criteria for Selecting the Optimal Number of Untreated Subjects Matched to Each Treated Subject When Using Many-to-

One Matching on the Propensity Score," *American journal of epidemiology* (172:9), pp. 1092-1097.
Bakioglu, F., Korkmaz, O., and Ercan, H. 2021. "Fear of Covid-19 and Positivity: Mediating Role of Intolerance of Uncertainty, Depression, Anxiety, and Stress," *Int J Ment Health Addict* (19:6), pp. 2369-2382.
Banker, R. D., Davis, G. B., and Slaughter, S. A. 1998. "Software Development Practices, Software Complexity, and Software Maintenance Performance: A Field Study," *Management science* (44:4), pp. 433-450.
Barber, B. M., and Odean, T. 2001. "Boys Will Be Boys: Gender, Overconfidence, and Common Stock Investment," *The quarterly journal of economics* (116:1), pp. 261-292.
Benedict, C., Schmidt, P., Spruce, G., and Woodford, P. 2015. *The Oxford Handbook of Social Justice in Music Education*. Oxford University Press.
Berger, J., and Milkman, K. L. 2010. "Social Transmission and Viral Culture," *Philadelphia: The Wharton School of the University of Pennsylvania*).
Berger, J., and Milkman, K. L. 2012. "What Makes Online Content Viral?," *Journal of marketing research* (49:2), pp. 192-205.
Bertrand, M., and Mullainathan, S. 2004. "Are Emily and Greg More Employable Than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination," *American economic review* (94:4), pp. 991-1013.
Bhattacharjee, S., Gopal, R. D., Lertwachara, K., Marsden, J. R., and Telang, R. 2007. "The Effect of Digital Sharing Technologies on Music Markets: A Survival Analysis of Albums on Ranking Charts," *Management Science* (53:9), pp. 1359-1374.
Bielby, W. T., and Bielby, D. D. 1992. "Cumulative Versus Continuous Disadvantage in an Unstructured Labor Market: Gender Differences in the Careers of Television Writers," *Work and occupations* (19:4), pp. 366-386.
Borghans, L., Heckman, J. J., Golsteyn, B. H., and Meijers, H. 2009. "Gender Differences in Risk Aversion and Ambiguity Aversion," *Journal of the European Economic Association* (7:2-3), pp. 649-658.
Born, G., and Devine, K. 2015. "Music Technology, Gender, and Class: Digitization, Educational and Social Change in Britain," *Twentieth-Century Music* (12:2), pp. 135-172.
Bosak, J., Kulich, C., Rudman, L., and Kinahan, M. 2018. "Be an Advocate for Others, Unless You Are a Man: Backlash against Gender-Atypical Male Job Candidates," *Psychology of Men & Masculinity* (19:1), p. 156.
Bowles, H. R., and Babcock, L. 2013. "How Can Women Escape the Compensation Negotiation Dilemma? Relational Accounts Are One Answer," *Psychology of Women Quarterly* (37:1), pp. 80-96.
Brescoll, V. L. 2016. "Leading with Their Hearts? How Gender Stereotypes of Emotion Lead to Biased Evaluations of Female Leaders," *The Leadership Quarterly* (27:3), pp. 415-428.
Buchanan, L., Bui, Q., and Patel, J. K. 2020. "Black Lives Matter May Be the Largest Movement in Us History," *The New York Times* (3).

Buckles, K. 2019. "Fixing the Leaky Pipeline: Strategies for Making Economics Work for Women at Every Stage," *Journal of economic perspectives* (33:1), pp. 43-60.
Burgess, O. 2020. "True Colors: Race, and the Misnomer of Hip Hop as "Black Music"." from https://hiphopdx.com/editorials/id.1947/title.true-colors-race-and-the-misnomer-of-hip-hop-as-black-music
Burke, S. 2020. "Some Pros Let It Go on Tiktok: 'Is This the Future?'," in: *New York Times*.
Buser, T., Niederle, M., and Oosterbeek, H. 2014. "Gender, Competitiveness, and Career Choices," *The quarterly journal of economics* (129:3), pp. 1409-1447.
Callaway, B., and Sant'Anna, P. H. 2021. "Difference-in-Differences with Multiple Time Periods," *Journal of Econometrics* (225:2), pp. 200-230.
Cameron, A. C., and Miller, D. L. 2015. "A Practitioner's Guide to Cluster-Robust Inference," *Journal of human resources* (50:2), pp. 317-372.
Carli, L. L. 1989. "Gender Differences in Interaction Style and Influence," *Journal of personality and social psychology* (56:4), p. 565.
Cech, E. A., and Blair-Loy, M. 2019. "The Changing Career Trajectories of New Parents in Stem," *Proc Natl Acad Sci U S A* (116:10), pp. 4182-4187.
Ceci, S., Ginther, D., Kahn, S., and Williams, W. 2015. "Do Women Earn Less Than Men in Stem Fields," *Scientific American*).
Chan, J., and Wang, J. 2018. "Hiring Preferences in Online Labor Markets: Evidence of a Female Hiring Bias," *Management Science* (64:7), pp. 2973-2994.
Chari, K., and Agrawal, M. 2018. "Impact of Incorrect and New Requirements on Waterfall Software Project Outcomes," *Empirical Software Engineering* (23:1), pp. 165-185.
Chater, N., and Loewenstein, G. 2016. "The under-Appreciated Drive for Sense-Making," *Journal of Economic Behavior & Organization* (126), pp. 137-154.
Chen, H., De, P., and Hu, Y. J. 2009. "Broadcasting in Online Social Networks: An Empirical Study of Music Sales and Artists' Activities," *Available at SSRN*).
Chen, H., De, P., and Hu, Y. J. 2015. "It-Enabled Broadcasting in Social Media: An Empirical Study of Artists' Activities and Music Sales," *Information Systems Research* (26:3), pp. 513-531.
Chen, Y., Wang, Q., and Xie, J. 2011. "Online Social Interactions: A Natural Experiment on Word of Mouth Versus Observational Learning," *Journal of marketing research* (48:2), pp. 238-254.
Chen, Z., and Berger, J. 2016. "How Content Acquisition Method Affects Word of Mouth," *Journal of Consumer Research* (43:1), pp. 86-102.
Chernev, A. 2003. "When More Is Less and Less Is More: The Role of Ideal Point Availability and Assortment in Consumer Choice," *Journal of consumer Research* (30:2), pp. 170-183.
Cherry, F., and Deaux, K. 1978. "Fear of Success Versus Fear of Gender-Inappropriate Behavior," *Sex roles* (4:1), pp. 97-101.
Chong, D., and Druckman, J. N. 2007. "Framing Public Opinion in Competitive Democracies," *American political science review* (101:4), pp. 637-655.

Christenson, P. G., de Haan-Rietdijk, S., Roberts, D. F., and ter Bogt, T. F. 2019. "What Has America Been Singing About? Trends in Themes in the Us Top-40 Songs: 1960–2010," *Psychology of Music* (47:2), pp. 194-212.
Clay, A. 2003. "Keepin'it Real: Black Youth, Hip-Hop Culture, and Black Identity," *American behavioral scientist* (46:10), pp. 1346-1358.
Clogg, C. C., Petkova, E., and Haritou, A. 1995. "Statistical Methods for Comparing Regression Coefficients between Models," *American journal of sociology* (100:5), pp. 1261-1293.
CompTIA. 2020. "2020 It (Information Technology) Industry Trends Analysis | Business of Technology |Comptia." from https://www.comptia.org/content/research/it-industry-trends-analysis
Croson, R., and Gneezy, U. 2009. "Gender Differences in Preferences," *Journal of Economic literature* (47:2), pp. 448-474.
Crossley, S. 2005. "Metaphorical Conceptions in Hip-Hop Music," *African American Review* (39:4), pp. 501-512.
Danaher, W. F. 2010. "Music and Social Movements," *Sociology Compass* (4:9), pp. 811-823.
Datta, H., Knox, G., and Bronnenberg, B. J. 2018. "Changing Their Tune: How Consumers' Adoption of Online Streaming Affects Music Consumption and Discovery," *Marketing Science* (37:1), pp. 5-21.
Dehejia, R. H., and Wahba, S. 2002. "Propensity Score-Matching Methods for Nonexperimental Causal Studies," *Review of Economics and statistics* (84:1), pp. 151-161.
Dennis, A. L. 2016. "Black Contemporary Social Movements, Resource Mobilization, and Black Musical Activism," *Law & Contemp. Probs.* (79), p. 29.
Dewan, S., and Ramaprasad, J. 2014. "Social Media, Traditional Media, and Music Sales," *Mis Quarterly* (38:1), pp. 101-122.
Diekman, A. B., Weisgram, E. S., and Belanger, A. L. 2015. "New Routes to Recruiting and Retaining Women in Stem: Policy Implications of a Communal Goal Congruity Perspective," *Social Issues and Policy Review* (9:1), pp. 52-88.
Duncan, R. B. 1972. "Characteristics of Organizational Environments and Perceived Environmental Uncertainty," *Administrative science quarterly*), pp. 313-327.
Eagly, A. H., and Karau, S. J. 2002. "Role Congruity Theory of Prejudice toward Female Leaders," *Psychol Rev* (109:3), pp. 573-598.
Eckel, C. C., and Grossman, P. J. 2008. "Men, Women and Risk Aversion: Experimental Evidence," *Handbook of experimental economics results* (1), pp. 1061-1073.
Eesley, C. E., and Wu, L. 2019. "For Startups, Adaptability and Mentor Network Diversity Can Be Pivotal: Evidence from a Randomized Experiment on a Mooc Platform," *MIS Quarterly, Forthcoming*).
Eichstaedt, J. C., Sherman, G. T., Giorgi, S., Roberts, S. O., Reynolds, M. E., Ungar, L. H., and Guntuku, S. C. 2021. "The Emotional and Mental Health Impact of the Murder of George Floyd on the Us Population," *Proc Natl Acad Sci U S A* (118:39), p. e2109139118.

Elias, L. 2020. "The Music Industry Was Built on Racism. Changing It Will Take More Than Donations." from https://www.rollingstone.com/music/music-features/music-industry-racism-1010001/
Emerson, R. A. 2002. "“Where My Girls At?” Negotiating Black Womanhood in Music Videos," *Gender & society* (16:1), pp. 115-135.
Espinosa, J. A., Cummings, J. N., Wilson, J. M., and Pearce, B. M. 2003. "Team Boundary Issues across Multiple Global Firms," *Journal of Management Information Systems* (19:4), pp. 157-190.
Espinosa, J. A., Slaughter, S. A., Kraut, R. E., and Herbsleb, J. D. 2007. "Familiarity, Complexity, and Team Performance in Geographically Distributed Software Development," *Organization science* (18:4), pp. 613-630.
Exley, C. L., and Kessler, J. B. 2019. "The Gender Gap in Self-Promotion," National Bureau of Economic Research.
Exley, C. L., and Kessler, J. B. 2022. "The Gender Gap in Self-Promotion," *The Quarterly Journal of Economics* (137:3), pp. 1345-1381.
Eyerman, R. 2002. "Music in Movement: Cultural Politics and Old and New Social Movements," *Qualitative Sociology* (25:3), pp. 443-458.
Fernandez-Mateo, I. 2009. "Cumulative Gender Disadvantage in Contract Employment," *AJS* (114:4), pp. 871-923.
Fernandez-Mateo, I., and Kaplan, S. 2018. "Gender and Organization Science: Introduction to a Virtual Special Issue," *Organization Science* (29:6), pp. 1229-1236.
Ferraro, A., Serra, X., and Bauer, C. 2021. "Break the Loop: Gender Imbalance in Music Recommenders," *Proceedings of the 2021 Conference on Human Information Interaction and Retrieval*, pp. 249-254.
Flory, J. A., Leibbrandt, A., and List, J. A. 2015. "Do Competitive Workplaces Deter Female Workers? A Large-Scale Natural Field Experiment on Job Entry Decisions," *The Review of Economic Studies* (82:1), pp. 122-155.
Forde, E. 2022. "Spotify Comfortably Remains the Biggest Streaming Service Despite Its Market Share Being Eaten Into." Forbes.
Foschi, M. 1996. "Double Standards in the Evaluation of Men and Women," *Social Psychology Quarterly*), pp. 237-254.
Fruci, C. 2020. "Spotify Helps Artists Grow Their Global Fan Bases through Customer-Facing Metrics." Keen.
Gabsi, Z. 2020. "Rap and Mizoued Music: Claiming a Space for Dissent and Protest in Post-Arab Spring Tunisia," *Sociological Research Online* (25:4), pp. 626-643.
Galbraith, J. R. 1974. "Organization Design: An Information Processing View," *Interfaces* (4:3), pp. 28-36.
Gao, H., and Zhang, W. 2017. "Employment Nondiscrimination Acts and Corporate Innovation," *Management Science* (63:9), pp. 2982-2999.
Gard, M. 2001. "Dancing around The'problem'of Boys and Dance," *Discourse: Studies in the cultural politics of education* (22:2), pp. 213-225.
Gneezy, U., Leonard, K. L., and List, J. A. 2009. "Gender Differences in Competition: Evidence from a Matrilineal and a Patriarchal Society," *Econometrica* (77:5), pp. 1637-1664.

Gneezy, U., Niederle, M., and Rustichini, A. 2003a. "Performance in Competitive Environments: Gender Differences," *The quarterly journal of economics* (118:3), pp. 1049-1074.
Gneezy, U., Niederle, M., and Rustichini, A. 2003b. "Performance in Competitive Environments: Gender Differences," *Quarterly Journal of Economics* (118:3), pp. 1049-1074.
Goodman-Bacon, A. 2021. "Difference-in-Differences with Variation in Treatment Timing," *Journal of Econometrics* (225:2), pp. 254-277.
Gopal, A., and Gosain, S. 2010. "The Role of Organizational Controls and Boundary Spanning in Software
Development Outsourcing: Implications for Project Performance," *Information Systems Research*).
Greene, W. 2003. *Econometric Analysis*. Prentice Hall, New York:
Gysler, M., Brown Kruse, J., and Schubert, R. 2002. "Ambiguity and Gender Differences in Financial Decision Making: An Experimental Examination of Competence and Confidence Effects," *Working papers/WIF* (2002:23).
Haines, E. L., Deaux, K., and Lofaro, N. 2016. "The Times They Are a-Changing… or Are They Not? A Comparison of Gender Stereotypes, 1983–2014," *Psychology of Women Quarterly* (40:3), pp. 353-363.
Ham, J. C., and Kagel, J. H. 2006. "Gender Effects in Private Value Auctions," *Economics Letters* (92:3), pp. 375-382.
Harlow, S., and Benbrook, A. 2019. "How# Blacklivesmatter: Exploring the Role of Hip-Hop Celebrities in Constructing Racial Identity on Black Twitter," *Information, communication & society* (22:3), pp. 352-368.
Hawlett, S., and Sherbin, L. 2014. "Athena Factor 2.0: Accelerating Female Talent in Science, Engineering & Technology," Cent. Talent Innov.
Heath, C., Bell, C., and Sternberg, E. 2001. "Emotional Selection in Memes: The Case of Urban Legends," *Journal of personality and social psychology* (81:6), p. 1028.
Heilman, M. E. 2001. "Description and Prescription: How Gender Stereotypes Prevent Women's Ascent up the Organizational Ladder," *Journal of social issues*).
Heilman, M. E. 2012. "Gender Stereotypes and Workplace Bias," *Research in organizational Behavior* (32), pp. 113-135.
Heilman, M. E., and Caleo, S. 2018. "Gender Discrimination in the Workplace," in *The Oxford Handbook of Workplace Discrimination,* A.J. Colella and E.B. King (eds.). pp. 73–88.
Henke, L. L. 2013. "Breaking through the Clutter: The Impact of Emotions and Flow on Viral Marketing," *Academy of Marketing Studies Journal* (17:2), pp. 111-118.
Herrman, J. 2019. "How Tiktok Is Rewriting the World," *The New York Times* (10).
Holt, F. 2009. *Genre in Popular Music*. University of Chicago Press.
Huang, S., Aral, S., Hu, Y. J., and Brynjolfsson, E. 2020. "Social Advertising Effectiveness across Products: A Large-Scale Field Experiment," *Marketing Science* (39:6), pp. 1142-1165.

Ibarra, H. 1997. "Paving an Alternative Route: Gender Differences in Managerial Networks," *Social psychology quarterly*), pp. 91-102.
Jakubowska, H., and Byczkowska-Owczarek, D. 2018. "Girls in Football, Boys in Dance. Stereotypization Processes in Socialization of Young Sportsmen and Sportswomen," *Qualitative Sociology Review* (14:2), pp. 12-28.
Jeschke, C. 1991. "Ausdruckstanz—the Tradition and the Present (Mary Wigman Society)(Cologne, Germany, 24–25 November 1990)," *Dance Research Journal* (23:2), pp. 39-41.
Johnson, C., Dowd, T. J., and Ridgeway, C. L. 2006. "Legitimacy as a Social Process," *Annu. Rev. Sociol.* (32), pp. 53-78.
Kehrer, L. J. 2017. *Beyond Beyoncé: Intersections of Race, Gender, and Sexuality in Contemporary American Hip-Hop Ca. 2010-2016*. University of Rochester.
Kelan, E. K. 2008. "Emotions in a Rational Profession: The Gendering of Skills in Ict Work," *Gender, Work & Organization* (15:1), pp. 49-71.
Kraut, R. E., and Streeter, L. A. 1995. "Coordination in Software Development," *Communications of the ACM* (38:3), pp. 69-82.
Kruger, J., and Evans, M. 2009. "The Paradox of Alypius and the Pursuit of Unwanted Information," *Journal of Experimental Social Psychology* (45:6), pp. 1173-1179.
Kumar, N., Qiu, L., and Kumar, S. 2018. "Exit, Voice, and Response on Digital Platforms: An Empirical Investigation of Online Management Response Strategies," *Information Systems Research* (29:4), pp. 849-870.
LaLonde, R. J. 1986. "Evaluating the Econometric Evaluations of Training Programs with Experimental Data," *The American economic review*), pp. 604-620.
LaMarre, H. L., Knobloch-Westerwick, S., and Hoplamazian, G. J. 2012. "Does the Music Matter? Examining Differential Effects of Music Genre on Support for Ethnic Groups," *Journal of Broadcasting & Electronic Media* (56:1), pp. 150-167.
Lanaj, K., and Hollenbeck, J. R. 2015. "Leadership over-Emergence in Self-Managing Teams: The Role of Gender and Countervailing Biases," *Academy of Management Journal* (58:5), pp. 1476-1494.
Langer, N., Gopal, R. D., and Bapna, R. 2020. "Onward and Upward? An Empirical Investigation of Gender and Promotions in Information Technology Services," *Information Systems Research* (31:2), pp. 383-398.
Langer, N., Slaughter, S. A., and Mukhopadhyay, T. 2014. "Project Managers' Practical Intelligence and Project Performance in Software Offshore Outsourcing: A Field Study," *Information Systems Research* (25:2), pp. 364-384.
Laybourn, W. M. 2018. "The Cost of Being “Real”: Black Authenticity, Colourism, and Billboard Rap Chart Rankings," *Ethnic and Racial Studies* (41:11), pp. 2085-2103.
Lesota, O., Melchiorre, A., Rekabsaz, N., Brandl, S., Kowald, D., Lex, E., and Schedl, M. 2021. "Analyzing Item Popularity Bias of Music Recommender Systems: Are Different Genders Equally Affected?," *Fifteenth ACM Conference on Recommender Systems*, pp. 601-606.

Levina, N., and Vaast, E. 2005. "The Emergence of Boundary Spanning Competence in Practice: Implications for Implementation and Use of Information Systems," *MIS quarterly*), pp. 335-363.
Levina, N., and Xin, M. 2007. "Research Note—Comparing It Workers' Compensation across Country Contexts: Demographic, Human Capital, and Institutional Factors," *Information Systems Research* (18:2), pp. 193-210.
Liang, C., Hong, Y., Gu, B., and Peng, J. 2018. "Gender Wage Gap in Online Gig Economy and Gender Differences in Job Preferences," *Available at SSRN 3266249*).
Limaye, R. J., Sauer, M., Ali, J., Bernstein, J., Wahl, B., Barnhill, A., and Labrique, A. 2020. "Building Trust While Influencing Online Covid-19 Content in the Social Media World," *The Lancet Digital Health* (2:6), pp. e277-e278.
Liu, X., and Lynch, L. 2011. "Do Agricultural Land Preservation Programs Reduce Farmland Loss? Evidence from a Propensity Score Matching Estimator," *Land Economics* (87:2), pp. 183-201.
Lu, J. G., Nisbett, R. E., and Morris, M. W. 2020. "Why East Asians but Not South Asians Are Underrepresented in Leadership Positions in the United States," *Proc Natl Acad Sci U S A* (117:9), pp. 4590-4600.
Luo, H., and Zhang, L. 2022. "Scandal, Social Movement, and Change: Evidence from# Metoo in Hollywood," *Management Science* (68:2), pp. 1278-1296.
Lutter, M. 2015. "Do Women Suffer from Network Closure? The Moderating Effect of Social Capital on Gender Inequality in a Project-Based Labor Market, 1929 to 2010," *American Sociological Review* (80:2), pp. 329-358.
Maitlis, S., and Christianson, M. 2014. "Sensemaking in Organizations: Taking Stock and Moving Forward," *Academy of Management Annals* (8:1), pp. 57-125.
Maitlis, S., and Sonenshein, S. 2010. "Sensemaking in Crisis and Change: Inspiration and Insights from Weick (1988)," *Journal of management studies* (47:3), pp. 551-580.
Maskin, E., and Riley, J. 2000. "Asymmetric Auctions," *The review of economic studies* (67:3), pp. 413-438.
Mayzlin, D., Dover, Y., and Chevalier, J. 2014. "Promotional Reviews: An Empirical Investigation of Online Review Manipulation," *American Economic Review* (104:8), pp. 2421-2455.
Menon, S., and Soman, D. 2002. "Managing the Power of Curiosity for Effective Web Advertising Strategies," *Journal of Advertising* (31:3), pp. 1-14.
Meyer, B. D. 1995. "Natural and Quasi-Experiments in Economics," *Journal of business & economic statistics* (13:2), pp. 151-161.
Mirbabaie, M., and Marx, J. 2020. "'Breaking'news: Uncovering Sense-Breaking Patterns in Social Media Crisis Communication During the 2017 Manchester Bombing," *Behaviour & Information Technology* (39:3), pp. 252-266.
Mo, C. H. 2015. "The Consequences of Explicit and Implicit Gender Attitudes and Candidate Quality in the Calculations of Voters," *Political behavior* (37:2), pp. 357-395.
Morgan, G. 2006. "Images of Organisation (Updated Edition of the International Beststeller) Sage Publications," *Thousand Oaks, London, New Delhi*).

Moss-Racusin, C. A., Phelan, J. E., and Rudman, L. A. 2010. "When Men Break the Gender Rules: Status Incongruity and Backlash against Modest Men," *Psychology of Men & Masculinity* (11:2), p. 140.
Moss-Racusin, C. A., and Rudman, L. A. 2010. "Disruptions in Women's Self-Promotion: The Backlash Avoidance Model," *Psychology of women quarterly* (34:2), pp. 186-202.
Nidumolu, S. 1995. "The Effect of Coordination and Uncertainty on Software Project Performance: Residual Performance Risk as an Intervening Variable," *Information systems research* (6:3), pp. 191-219.
Niederle, M., and Vesterlund, L. 2007. "Do Women Shy Away from Competition? Do Men Compete Too Much?," *The quarterly journal of economics* (122:3), pp. 1067-1101.
O'Leary, P., and Shames, S. 2015. "Shattering the Glass Ceiling for Women in Politics," *Scholars Strategy Network,[on line] Available at: https://www. scholarsstrategynetwork. org/sites/default/files/ssn_basic_facts_oleary_and_shames_on_shattering_the _glass_ceiling_for_women_in_politics_0. pdf [29/12/2015]*).
Ogbar, J. O. G. 2007. *Hip-Hop Revolution: The Culture and Politics of Rap*. University press of Kansas.
Oh, O., Eom, C., and Rao, H. R. 2015. "Research Note—Role of Social Media in Social Change: An Analysis of Collective Sense Making During the 2011 Egypt Revolution," *Information Systems Research* (26:1), pp. 210-223.
Ozkazanc‐Pan, B., and Clark Muntean, S. 2018. "Networking Towards (in) Equality: Women Entrepreneurs in Technology," *Gender, Work & Organization* (25:4), pp. 379-400.
Palka, W., Pousttchi, K., and Wiedemann, D. G. 2009. "Mobile Word-of-Mouth-a Grounded Theory of Mobile Viral Marketing," *Journal of Information Technology* (24:2), pp. 172-185.
Parker, K., Horowitz, J. M., and Anderson, M. 2020. "Amid Protests, Majorities across Racial and Ethnic Groups Express Support for the Black Lives Matter Movement,").
Peitz, M., and Waelbroeck, P. 2006. "Why the Music Industry May Gain from Free Downloading—the Role of Sampling," *International Journal of Industrial Organization* (24:5), pp. 907-913.
Perez, S. 2020. "Tiktok Explains How the Recommendation System Behind Its 'for You' Feed Works." TechCrunch.
Perry, I. 2004. *Prophets of the Hood: Politics and Poetics in Hip Hop*. Duke University Press.
Peters, K., Kashima, Y., and Clark, A. 2009. "Talking About Others: Emotionality and the Dissemination of Social Information," *European Journal of Social Psychology* (39:2), pp. 207-222.
Peterson, S. H., Wingood, G. M., DiClemente, R. J., Harrington, K., and Davies, S. 2007. "Images of Sexual Stereotypes in Rap Videos and the Health of African American Female Adolescents," *J Womens Health (Larchmt)* (16:8), pp. 1157-1164.

Phelps, J. E., Lewis, R., Mobilio, L., Perry, D., and Raman, N. 2004. "Viral Marketing or Electronic Word-of-Mouth Advertising: Examining Consumer Responses and Motivations to Pass Along Email," *Journal of advertising research* (44:4), pp. 333-348.
Pressman, J., and Devin, E. 2023. "Profile: The Diffusion of Global Protests after George Floyd's Murder," *Social Movement Studies*), pp. 1-8.
Quillian, L., Pager, D., Hexel, O., and Midtbøen, A. H. 2017. "Meta-Analysis of Field Experiments Shows No Change in Racial Discrimination in Hiring over Time," *Proceedings of the National Academy of Sciences* (114:41), pp. 10870-10875.
Rai, A., Maruping, L. M., and Venkatesh, V. 2009. "Offshore Information Systems Project Success: The Role of Social Embeddedness and Cultural Characteristics," *MIS quarterly*), pp. 617-641.
Ray, R. 2022. "Black Lives Matter at 10 Years: 8 Ways the Movement Has Been Highly Effective," The Brookings Institution.
Reagon, B. J. 2016. "The Civil Rights Period: Music as an Agent of Social Change," in *Issues in African American Music*. Routledge, pp. 357-381.
Reny, T. T., and Newman, B. J. 2021. "The Opinion-Mobilizing Effect of Social Protest against Police Violence: Evidence from the 2020 George Floyd Protests," *American political science review* (115:4), pp. 1499-1507.
Richmond, S. 2016. *Hip Hop Ain't Dead: It's Livin'in the White House*. Hillcrest Publishing Group.
Risner, D. 2002. "Sexual Orientation and Male Participation in Dance Education: Revisiting the Open Secret," *Journal of Dance Education* (2:3), pp. 84-92.
Rochlen, A. B., Good, G. E., and Carver, T. A. 2009. "Predictors of Gender-Related Barriers, Work, and Life Satisfaction among Men in Nursing," *Psychology of Men & Masculinity* (10:1), p. 44.
Rosenthal, L., and Lobel, M. 2016. "Stereotypes of Black American Women Related to Sexuality and Motherhood," *Psychol Women Q* (40:3), pp. 414-427.
Roy, W. G., and Dowd, T. J. 2010. "What Is Sociological About Music?," *Annual Review of Sociology* (36), pp. 183-203.
Rudman, L. A. 1998. "Self-Promotion as a Risk Factor for Women: The Costs and Benefits of Counterstereotypical Impression Management," *Journal of personality and social psychology* (74:3), p. 629.
Rudman, L. A., and Fairchild, K. 2004. "Reactions to Counterstereotypic Behavior: The Role of Backlash in Cultural Stereotype Maintenance," *J Pers Soc Psychol* (87:2), pp. 157-176.
Salzman, H., and Lieff Benderly, B. 2019. "Stem Performance and Supply: Assessing the Evidence for Education Policy," *Journal of Science Education and Technology* (28:1), pp. 9-25.
Saujani, S., and Bdeir, A. 2019. "You Can't Solve the Gender Gap in Tech If You Don't Understand Why It Exists." from https://www.buzzfeednews.com/article/reshmasaujani/tech-gender-gap-pipeline-myth
Schafer, T., Sedlmeier, P., Stadtler, C., and Huron, D. 2013. "The Psychological Functions of Music Listening," *Front Psychol* (4), p. 511.

Scherer, K. R., and Zentner, M. R. 2001. "Emotional Effects of Music: Production Rules,").
Shi, Z., Rui, H., and Whinston, A. B. 2014. "Content Sharing in a Social Broadcasting Environment: Evidence from Twitter," *MIS quarterly* (38:1), pp. 123-142.
Simon, H. A. 2013. *Administrative Behavior*. Simon and Schuster.
Singh, V., Kumra, S., and Vinnicombe, S. 2002. "Gender and Impression Management: Playing the Promotion Game," *Journal of business ethics* (37:1), pp. 77-89.
Smith, J., and Huntoon, M. 2014. "Women's Bragging Rights: Overcoming Modesty Norms to Facilitate Women's Self-Promotion," *Psychology of Women Quarterly* (38:4), pp. 447-459.
Smith, J., and Todd, P. E. 2005. "Does Matching Overcome Lalonde's Critique of Nonexperimental Estimators?," *Journal of econometrics* (125:1-2), pp. 305-353.
Smith, S. L., Pieper, K., Clark, H., Case, A., and Choueiti, M. 2020. "Inclusion in the Recording Studio?," *RATIO* (25), p. 16.18.
statistics, B. o. L. 2015. "Women in the Labor Force: A Databook," *Bureau of Labor statistics, US Dept. of Labor, Report* (985).
Sterling, A. D., and Fernandez, R. M. 2018. "Once in the Door: Gender, Tryouts, and the Initial Salaries of Managers," *Management Science* (64:11), pp. 5444-5460.
Street, J., Hague, S., and Savigny, H. 2008. "Playing to the Crowd: The Role of Music and Musicians in Political Participation," *The British journal of politics and international relations* (10:2), pp. 269-285.
Stuhlmacher, A. F., Citera, M., and Willis, T. 2007. "Gender Differences in Virtual Negotiation: Theory and Research," *Sex Roles* (57:5), pp. 329-339.
Tan, T. F., and Netessine, S. 2020. "At Your Service on the Table: Impact of Tabletop Technology on Restaurant Performance," *Management Science* (66:10), pp. 4496-4515.
Trauth, E. M., Joshi, K. D., Kvasny, L., Chong, J., Kulturel, S., and Mahar, J. 2010a. "Millennials and Masculinity: A Shifting Tide of Gender Typing of Ict?,").
Trauth, E. M., Joshi, K. D., Kvasny, L., Chong, J., Kulturel, S., and Mahar, J. 2010b. "Millennials and Masculinity: A Shifting Tide of Gender Typing of Ict?," *AMCIS*.
Trauth, E. M., Quesenberry, J. L., and Huang, H. 2009. "Retaining Women in the Us It Workforce: Theorizing the Influence of Organizational Factors," *European Journal of Information Systems* (18:5), pp. 476-497.
Turner, R. H., and Killian, L. M. 1957. *Collective Behavior*. Prentice-Hall Englewood Cliffs, NJ.
Tushman, M. L., and Nadler, D. A. 1978. "Information Processing as an Integrating Concept in Organizational Design," *Academy of management review* (3:3), pp. 613-624.
Tushman, M. L., and Scanlan, T. J. 1981. "Boundary Spanning Individuals: Their Role in Information Transfer and Their Antecedents," *Academy of management journal* (24:2), pp. 289-305.

Tversky, A., and Kahneman, D. 1973. "Availability: A Heuristic for Judging Frequency and Probability," *Cognitive psychology* (5:2), pp. 207-232.
Vaish, A., Krishna, R., Saxena, A., Dharmaprakash, M., and Goel, U. 2012. "Quantifying Virality of Information in Online Social Networks," *International Journal of Virtual Communities and Social Networking (IJVCSN)* (4:1), pp. 32-45.
Wang, A., Pappu, A., and Cramer, H. 2021. "Representation of Music Creators on Wikipedia, Differences in Gender and Genre," *Proceedings of the International AAAI Conference on Web and Social Media*, pp. 764-775.
Weick, K. E. 1988. "Enacted Sensemaking in Crisis Situations [1]," *Journal of management studies* (25:4), pp. 305-317.
Weick, K. E. 1995. *Sensemaking in Organizations*. Sage.
Wiles, M. A. 2007. "The Effect of Customer Service on Retailers' Shareholder Wealth: The Role of Availability and Reputation Cues," *Journal of Retailing* (83:1), pp. 19-31.
Wolfe, P. 2019. *Women in the Studio: Creativity, Control and Gender in Popular Music Production*. Routledge.
Wotanis, L., and McMillan, L. 2014. "Performing Gender on Youtube: How Jenna Marbles Negotiates a Hostile Online Environment," *Feminist Media Studies* (14:6), pp. 912-928.
Yang, T., and Aldrich, H. E. 2014. "Who's the Boss? Explaining Gender Inequality in Entrepreneurial Teams," *American Sociological Review* (79:2), pp. 303-327.
Zillmann, D., Aust, C. F., Hoffman, K. D., Love, C. C., Ordman, V. L., Pope, J. T., Seigler, P. D., and Gibson, R. J. 1995. "Radical Rap: Does It Further Ethnic Division?," *Basic and Applied Social Psychology* (16:1-2), pp. 1-25.