The Cost of Coming Out*

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Abstract

Despite significant progress in advancing lesbian, gay, and bisexual (LGB) rights, discrimination based on sexual orientation remains a prevalent issue in many countries. The concealable nature of sexual orientation presents LGB individuals with a trade-off: to avoid discrimination, they may choose to hide their identity, but this decision often results in negative mental health outcomes. Consequently, understanding people's reactions to the disclosure of sexual minority status is crucial. In this paper, we use an innovative source of data from a famous online video game to credibly identify the effects of coming out. At the beginning of the 2022 LGBT Pride Month, the developers of the game announced that one of their playable characters is gay. We use detailed daily data to track players' revealed preferences for the character over time and employ synthetic control methods to isolate the effect of the disclosure. Our findings suggest a substantial and persistent negative effect of coming out.

Keywords: LGB economics, concealable stigma, taste-based discrimination, natural experiment.

JEL Codes: J15, J71

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1 Introduction

Despite significant progress in advancing lesbian, gay, and bisexual (LGB) rights, discrimination based on sexual orientation remains a prevalent issue in many countries. Limited employment opportunities (Bertrand & Duflo, 2017; Neumark, 2018), wage disparities (Badgett, 1995; Klawitter, 2015), and barriers to financial resources (Badgett et al., 2013) are just a few of the challenges that disproportionately affect LGB individuals compared to their heterosexual counterparts. To further emphasize the importance of studying the economic implications of sexual orientation, one must also consider the substantial size of the LGB community, estimated to be over 18,000,000 individuals in the United States during the period from 2014 to 2018 (Badgett et al., 2021).

Discrimination against LGB individuals differs from discrimination based on race, sex, and disability due to the concealable nature of sexual orientation. This means that individuals can anticipate discrimination and strategically choose to hide their identity (Kudashvili & Lergetporer, 2022). However, extensive research has consistently shown that concealing one's sexual orientation has detrimental effects on mental health (Meyer, 2003; Pachankis, 2007; Pachankis et al., 2020). Thus, despite the benefits of being open about our identity (Akerlof & Kranton, 2000), it is important to acknowledge that the act of coming out is often accompanied by feelings of uncertainty, anxiety, and fear of negative consequences. The question then arises of how people react to the disclosure of one's sexual orientation.

Measuring responses to sexual minority status disclosure presents significant challenges. An ideal experiment would involve randomly requesting individuals to disclose their sexual orientation and observing the reactions of their peer group over a meaningful period. However, such an approach raises significant ethical concerns. In this paper, we propose an innovative solution by utilizing data from the online video game *League of Legends*. This enables us to leverage a natural experiment that closely approximates the ideal scenario, allowing for a credible identification of the effects of coming out.

At the beginning of the 2022 LGBT Pride Month, the developers of League of Legends announced that one of their playable characters is gay. We show that the announcement

was not anticipated and use detailed daily data to track players' revealed preferences for the character over time. By employing synthetic control methods (e.g., Abadie, 2021; Abadie & Vives-i-Bastida, 2022) to isolate the effect of the disclosure, we find a substantial and persistent negative effect of coming out.

Our paper makes a significant contribution to the existing literature by being the first study to investigate the immediate reactions to coming out. The current body of research primarily focuses on measuring discrimination against LGB individuals either through correspondence designs, where sexual orientation is manipulated in job applications (e.g., Weichselbaumer, 2003; Drydakis, 2009; Tilcsik, 2011; Patacchini et al., 2012; Ahmed et al., 2013; Drydakis, 2014), or by comparing the labor market outcomes of sexual minority individuals with those of non-minority individuals with similar observable characteristics (e.g., Badgett, 1995; Plug et al., 2014; Carpenter & Eppink, 2017; Martell, 2021). These studies consistently reveal that LGB job candidates are less likely to be invited for interviews or offered job opportunities. Additionally, they consistently find a wage penalty for gay and bisexual men and a wage premium for lesbian women, although the latter can be explained by lesbian women working more than their heterosexual counterparts (see e.g., Antecol & Steinberger, 2013).[1] Despite these valuable insights, these approaches have limitations that hinder the ability to draw causal inferences from their findings. Moreover, they do not allow for the investigation of the immediate reactions individuals face upon coming out. Our study addresses these gaps and provides an understanding of the impact of coming out on individuals' experiences.

Our paper also emphasizes the relevance of video game data and the unique advantages they offer to economists. First, video games provide a controlled research environment, enabling the observation of behaviors that may be challenging to capture through traditional survey methods. Second, online gaming platforms offer the benefit of anonymity, which reduces social desirability bias and facilitates the disclosure of sensitive information. The majority of existing research on LGB individuals relies on survey data where

[1] The only study finding a wage premium for gay men is that of Carpenter and Eppink (2017). However, they are not able to control for living in an urban area, which is crucial as those areas typically have higher wages and more gay men than rural areas (Badgett, 2020).

respondents can report their sexual orientation (see e.g, Badgett et al., 2021). However, Coffman et al. (2017) show that a substantial share of LGB respondents is reluctant to answer honestly, which complicates the interpretation of existing results and makes understanding incentives to identity disclosure even more important. Our use of video game data provides an objective measure of behavior and identity, circumventing the limitations of self-reported identity in surveys and increasing the incentives for individuals to reveal their true attitudes towards the LGB community.

Finally, our paper also advances the understanding of consumer behavior in the video game industry. In the context of the contemporary digital era, video games have established themselves as virtual meeting environments where individuals converge and engage with one another. This trend is further amplified by the advent of the Metaverse, a virtual universe where users can engage in various activities and experiences. Given the growing significance of video games as social platforms, it is increasingly crucial for economists to comprehend and analyze these new and evolving markets.[2]

The rest of the paper unfolds as follows. Section 2 describes the key elements of League of Legends that are relevant to our study and outlines the natural experiment we leverage to identify the effects of coming out. Section 3 introduces the data. Section 4 explains the methodology we use to isolate the effects of coming out and presents the main results. Section 5 examines the underlying mechanisms driving the estimated effects. Section 6 discusses the policy relevance of our findings. Section 7 concludes.

2 Context

In this section, we explore the contextual framework that enables us to credibly identify the causal effects of coming out. Specifically, we turn our attention to the online video game *League of Legends* as our source of data and the natural experiment we leverage.

The next subsection describes the key elements of League of Legends that are relevant

[2] To date, very little is known about consumer behavior in the video game industry. To the best of our knowledge, Parshakov et al. (2022) is the only study focusing on this topic. They examine the impact of marking products with a gay label on consumer demand, finding a significant, albeit short-lived, decrease in consumers' demand following the introduction of the gay label.

to our study. Our analysis does not rely on in-game information but instead focuses on the pre-match phase. Therefore, we do not provide an exhaustive account of how matches unfold but rather emphasize the details that inform our research. Then, we discuss the coming-out event we exploit and its implications for identification purposes.

2.1 League of Legends

League of Legends is a prominent multiplayer online game developed and published by Riot Games. In 2022, the game attracted an impressive player base, with an average of over 32 million players joining the game daily and 180 million players overall. League of Legends has also achieved significant financial success, with its microtransaction system generating an average daily revenue of $2.64 million.

In League of Legends, players are divided into two teams of five players each to compete in matches with the aim of destroying the opposing team's base. Players in each team sort themselves into one of five roles, each requiring specific playstyles and contributing differently to the team's final objective.

Players have the option to participate in either *draft* or *ranked* matches. In both game modes, the objective remains the same: destroy the opposing team's base. However, while draft matches are more casual and do not have consequences for players' rankings or ratings, in ranked matches players earn or lose points based on the outcome of the match to determine their position within the ranked system. To ensure balanced matches, the matchmaking process in ranked games groups players with similar skill levels.

Before a match begins, players must select a playable character to control during the match from a pool of 162 available characters. In our analysis, we measure players' revealed preferences for a specific character by quantifying how frequently they select that character for their matches. Our objective is to investigate whether these preferences undergo any shifts following the disclosure of the character's sexual orientation. Thus, we devote the rest of this section to exploring the design of characters in League of Legends and the process through which players select their characters for matches.

Each character has a unique set of skills and abilities and is specifically designed to

excel in one or two of the distinct roles that players can assume within the team. Additionally, characters are crafted with a rich background that adds a narrative dimension to the game but does not have any impact on the game's mechanics. This is achieved through the creation of detailed biographies and short stories that provide players with a deeper understanding of the character's history and motivations, thus offering players the opportunity to connect with their chosen characters on a more personal level.

The character selection process occurs in a virtual lobby where players can communicate with their teammates through a chat function. In a random order that alternates between teams, players take turns selecting their characters for the match. Once a player chooses a character, their selection becomes visible to all players participating in the match, including the opposing team. Once all players have selected their characters, the match begins.

When making their character selection, players consider various factors. First, they consider the role they are assigned to fulfill in the game. Each role has its own set of responsibilities and playstyle requirements, and players aim to choose a character that aligns with their designated role. Second, players take into account their personal mastery of specific characters, opting for those they are most skilled and comfortable with. Third, players may also consider their personal preferences, such as the playstyle and background story of the character, adding a subjective element to the selection process.

2.2 Identification

Every year in June, *LGBT Pride Month* takes place, a dedicated time to honor and celebrate the LGBT community. Originally born out of a series of protests for gay liberation in the United States in 1969, this month-long celebration has gained widespread recognition and evolved into a global movement. Today, LGBT Pride Month stands as an emblem of empowerment, visibility, and equality, fostering inclusivity for individuals of all sexual orientations and gender identities.

Since 2018, Riot Games has actively participated in LGBT Pride Month by integrating new content into League of Legends during the month of June. This includes the

introduction of in-game cosmetics, such as character skins, as well as emotes that allow players to express themselves in the game. It is important to note that while these additions enhance the visual and expressive elements of the game, they do not alter the game's mechanics or the characteristics and abilities of the League of Legends characters.[3]

At the beginning of the 2022 LGBT Pride Month, Riot Games released a short story featuring two of the League of Legends characters, *Graves* and *Twisted Fate*. The story officially discloses Graves' sexual orientation, revealing him to be a gay character. The following quotes provide two pivotal passages of the narrative:[4]

> *I do not have terrible taste in men. I have good taste in terrible men.* (Graves)

> *[. . .] asked Fate with a tinge of poorly concealed jealousy, despite Graves having been gay for the better part of four decades.* (Storyteller)

This coming-out event closely approximates an ideal experiment where individuals randomly disclose their sexual minority status, thus providing a unique setting to investigate the effects of coming out on the players' preferences for Graves.

To ensure the credibility of our identification, it is crucial that the disclosure was not anticipated by players. The top panel of Figure 2.1 displays the Google search interest for the query *"Graves gay."* We observe minimal interest in this search term throughout the year 2022, with a remarkable spike occurring during the week of the coming-out event. This pattern supports our assumption of no anticipation and strengthens the credibility of our identification strategy.

Furthermore, the lower panel of Figure 2.1 displays the Google search interest for the query *"lol Graves."* Similarly to the previous search term, we observe a remarkable spike in interest during the week of the treatment. What is particularly interesting is that this surge in interest surpasses the level observed during the 2022 League of Legends World Championship (held from September 29^{th} to November 5^{th}), despite Graves being among

[3] We check this in figures A.1–A.5 in Appendix A, where we present several performance measures for the characters we focus our analysis on. The figures demonstrate that the performance of these characters remained consistent during LGBT Pride Month, indicating that there was no notable change in performance associated with the event.

[4] The whole story is available at https://universe.leagueoflegends.com/en_SG/story/the-boys-and-bombolini/.

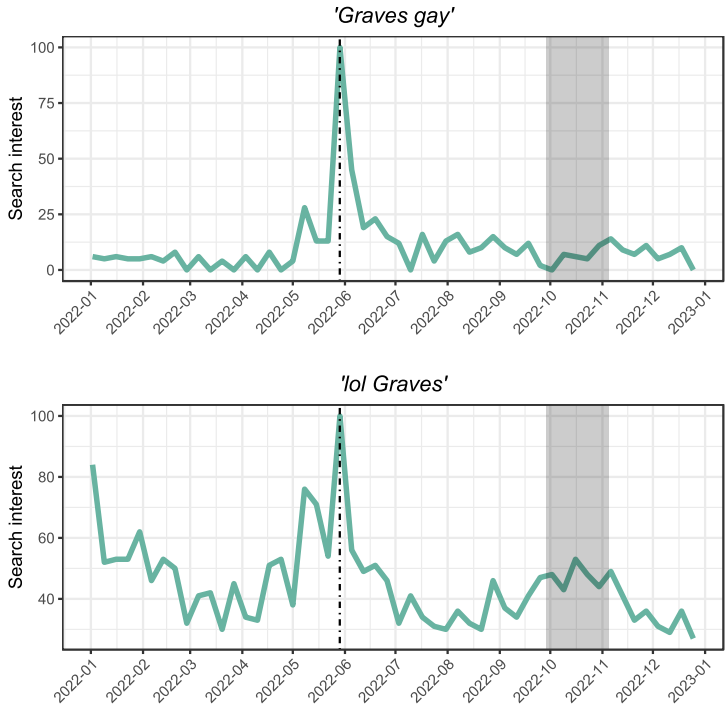

Figure 2.1: Google search interest over time for the queries *"Graves gay"* (top panel) and *"lol Graves"* (bottom panel). The dashed vertical line denotes the week of disclosure, and the shaded area highlights the League of Legends World Championship.

the top-eight most played characters during the tournament. This finding emphasizes the substantial impact and attention that the coming-out event received from players.

3 Data

We obtain our data by accessing the Riot Games API, which provides us with valuable information about League of Legends matches.

The game operates on multiple servers located worldwide, and we focus on specific servers for our analysis. These servers include Brasil, North and East Europe, West Europe, Korea, North Latin America, South Latin America, and North America.

Within these servers, we specifically target the top tier of the League of Legends ranked system, which comprises the top 200 or 300 players (approximately the top 0.01% of players) on each server. By targeting this specific group of players, we aim to minimize the noise that may arise from players who are not fully engaged in the game, thus reducing the risk of attenuation bias.

For each of these players, we collect all the matches they played during the period January-July 2022. From these data, we construct a balanced daily panel data set that tracks the behavior of each character over time. We filter the data set by removing three League of Legends characters (*K'Sante*, *Nilah*, and *Bel'Veth*), as they were released after the coming-out event. This results in a final data set composed of 129, 859 matches played over 193 days encompassing a total of 159 characters.

To gauge players' revealed preferences for characters, we construct a metric called *pick level*, which counts the number of times players choose a specific character in their games each day. Our primary objective is to investigate whether the disclosure of Graves' sexual orientation influences the pick level of this character.

4 Methodology and Main Results

In this section, we explain the methodology used to isolate the effects of the coming-out event and present our main results.

The next subsection provides a formal review of the synthetic control estimator employed in the analysis. We then present our main findings and a series of robustness checks that validate the reliability of our estimates. Finally, we explore the possibility of regional variations in attitudes toward the LGB community by replicating our analysis across different servers.

4.1 Methodology

The red line in Figure 4.1 depicts Graves' pick level series, which exhibits some upward trend despite daily variations. However, we observe a sharp drop in the series on the day of disclosure which persists over time.

A simple comparison of Graves' pick levels before and after the disclosure may not accurately reflect the impact of the coming-out event, as other unobserved factors could have changed during that period. To address this issue, we construct a synthetic control unit (see e.g., Abadie & Gardeazabal, 2003; Abadie et al., 2010; Abadie, 2021; Abadie

& Vives-i-Bastida, 2022) by weighting other characters to approximate the pick levels of Graves before the disclosure. This method allows us to isolate the effect of the coming-out event on the players' revealed preferences for Graves and gain insight into what would have happened to Graves without the disclosure.

Formally, our data set comprises $n = 159$ characters ($i = 1, \ldots, n$) observed over $T = 191$ days ($t = 1, \ldots, T$), with $T^{pre} = 150$ days prior to the coming-out event. For each unit i and time t, we denote the observed pick level as $Y_{i,t}$. We represent the coming out as a binary variable $C_i \in \{0, 1\}$ equal to one if character i discloses his sexual orientation at time $T^{pre} + 1$ (i.e., June 1^{st}, 2022). We then posit the existence of two potential pick levels $Y^c_{i,t}$, where one denotes the pick level in the absence of disclosure ($Y^0_{i,t}$) and the other denotes the pick level in the presence of disclosure ($Y^1_{i,t}$).[5]

Without loss of generality, we let the first unit $i = 1$ be Graves. This implies that $C_1 = 1$ and $C_i = 0$ for all $i \neq 1$. We then define the effects of the coming-out event for Graves in each period $t > T^{pre}$ as the difference in Graves's potential pick levels at time t:

$$\tau_t := Y^1_{1,t} - Y^0_{1,t} \tag{4.1}$$

Note that we allow the effect to change over time.

Since Graves' sexual orientation has been disclosed after period T^{pre}, under a standard SUTVA assumption (e.g., Imbens & Rubin, 2015) we observe $Y_{1,t} = Y^1_{1,t}$ for all $t > T^{pre}$. Thus, as shown in equation (4.1), the challenge in estimating our causal effects of interest is to estimate $Y^0_{1,t}$ for $t > T^{pre}$, i.e., how Graves' pick levels would have evolved in the absence of the disclosure. To this end, we can construct a synthetic control unit that approximates the pick levels of Graves before the coming out. The idea is that if the synthetic control and Graves behave similarly before the disclosure, then the synthetic control can serve as a valid counterfactual.

The synthetic control unit is characterized by a set of weights, denoted as $\omega := (\omega_2, \ldots, \omega_n)$, chosen to align the pre-treatment pick levels of the synthetic unit with those

[5] These potential outcomes are based on Rubin's model for causal inference (Rubin, 1974).

of Graves. This is achieved by solving the following optimization problem (Arkhangelsky et al., 2021):

$$\begin{aligned} \hat{\omega} &= \arg\min_{\omega \in \Omega} \ell(\omega) \\ \ell(\omega) &= \sum_{t=1}^{T_{pre}} \left(\sum_{i=2}^{n} \omega_i Y_{i,t} - Y_{1,t} \right)^2 + \zeta^2 T^{pre} \|\omega\|_2^2, \quad \Omega = \left\{ \omega \in \mathbb{R}_+^{n-1} : \sum_{i=2}^{n} \omega_i = 1 \right\} \end{aligned} \tag{4.2}$$

where the weights are restricted to be non-negative and to sum up to one and a ridge penalty is employed to ensure the uniqueness of the weights. Following Arkhangelsky et al. (2021), we choose $\zeta = (T - T^{pre})^{1/4} \hat{\sigma}$, with $\hat{\sigma}$ denoting the standard deviation of first differences of $Y_{i,t}$ for control units over the pre-treatment period. Then, we estimate the counterfactual outcome of Graves as a weighted average of the outcome of the control units:

$$\widehat{Y}_{1,t}^0 = \sum_{i=2}^{n} \hat{\omega}_i Y_{i,t} \tag{4.3}$$

Finally, to estimate the causal effects of interest, we compute the differences between Graves' observed pick levels and the synthetic counterfactual for all $t > T^{pre}$:

$$\hat{\tau}_t = Y_{1,t}^1 - \widehat{Y}_{1,t}^0 \tag{4.4}$$

One can summarize the estimated effects by reporting the average treatment effect for Graves, with the averaging carried out over the post-treatment periods:

$$\hat{\tau} = \frac{1}{T - T^{pre}} \sum_{t=T^{pre}+1}^{T} \hat{\tau}_t \tag{4.5}$$

4.2 Main Results

We apply the synthetic control estimator of the previous subsection to estimate the effects of the coming-out event for Graves. To mitigate the potential for spillover effects, we exclude four characters (*Diana*, *Leona*, *Nami*, and *Neeko*) from the donor pool, as they were already members of the LGB community prior to the coming-out event.[6]

[6] Nevertheless, even if included in the donor pool, the estimator assigns them zero weight.

The results are presented in Figure 4.1.[7] Overall, our analysis suggests a substantial negative impact of the coming-out event, with an estimated average treatment effect of −54.2 daily pick levels. Before the disclosure, the synthetic control estimator closely approximates the trajectory of Graves' pick levels, providing support for the estimator's ability to predict the counterfactual series. However, starting from June 1^{st}, 2022, the two series diverge substantially, with Graves' pick levels consistently dropping below those of the synthetic control. This gap persists over time, extending even beyond the conclusion of LGBT Pride Month.

To assess the credibility of the synthetic control estimator, we conduct a robustness check by artificially shifting the coming-out event ten days earlier. This backdating exercise allows us to evaluate the estimator's predictive accuracy during a ten-day hold-out period (see e.g., Abadie & Vives-i-Bastida, 2022). The upper panel of Figure B.1 in Appendix B presents the results of this analysis. We observe three key findings. First, the estimated effects remain qualitatively and quantitatively consistent, confirming a negative and persistent impact of the coming-out event on players' revealed preferences

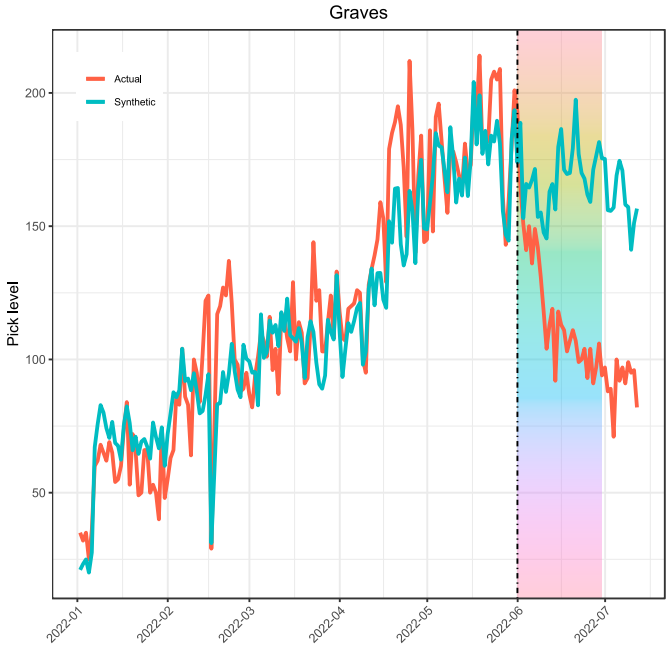

Figure 4.1: Graves' daily pick levels and synthetic control estimation results. The dashed vertical line denotes the day of disclosure, and the rainbow area highlights LGBT Pride Month.

[7] Figure A.6 in Appendix A displays the identities and the contributions of the characters in the donor pool with non-zero estimated weights.

for Graves. Second, the synthetic control estimator demonstrates a good fit during the hold-out period, indicating its ability to accurately capture Graves' behavior prior to the disclosure. Third, the actual and the synthetic series begin to diverge on the true day of disclosure, even when the estimator has no knowledge of the actual disclosure date. The absence of estimated effects before the coming-out event also lends support to the plausibility of a no-anticipation assumption (see e.g., Abadie, 2021).

We also conduct an additional robustness test to assess the sensitivity of our findings to the choice of units in the donor pool. Specifically, we perform a leave-one-out exercise, where we repeatedly estimate the synthetic control series by excluding one character with non-zero estimated weights at a time from the donor pool (see e.g., Abadie, 2021). The lower panel of Figure B.1 in Appendix B presents the results of this analysis. Overall, our finding of a negative and persistent impact of the coming-out event is robust to the exclusion of any particular character. Most of the leave-one-out synthetic series closely align with the main estimate, thus reinforcing the robustness of the main conclusion of our study. One leave-one-out series falls beneath the other synthetic series, suggesting a somewhat reduced, although still negative, impact. However, this series significantly diverges from the actual series in the weeks prior to the treatment, which undermines the reliability of its results.

4.3 Regional Heterogeneity

Previous research has demonstrated that attitudes toward the LGB community can significantly vary between countries (e.g., Badgett, 2020; Badgett et al., 2021). To explore potential regional differences in players' attitudes towards the LGB community, we divide the matches based on the server on which they were hosted. The matches are classified into four regional categories: European matches (North and East Europe and West Europe servers), Korean matches, Latin American matches (Brasil, North Latin America, and South Latin America servers), and North American matches. We then apply the synthetic control estimator to each of these series separately.

Figure 4.2 displays the results. The synthetic control estimator closely approximates

the trajectory of Graves' pick levels for matches in Europe, Latin America, and Korea before the disclosure. However, it deviates from the actual series for North American matches, limiting our ability to draw conclusions for that region.

In Europe, Korea, and Latin America, we consistently observe a negative and persistent effect of the coming-out event on players' preferences for Graves. The magnitude of this effect varies across regions, with the largest impact observed in Europe (estimated average treatment effect around −22 daily pick levels) and the smallest impact observed in Korea (estimated average treatment effect around −12 daily pick levels).

However, this regional variation may be influenced by factors other than players' attitudes toward the LGB community. One such factor could be the differential levels of competitiveness on different servers, which may affect the character selection process

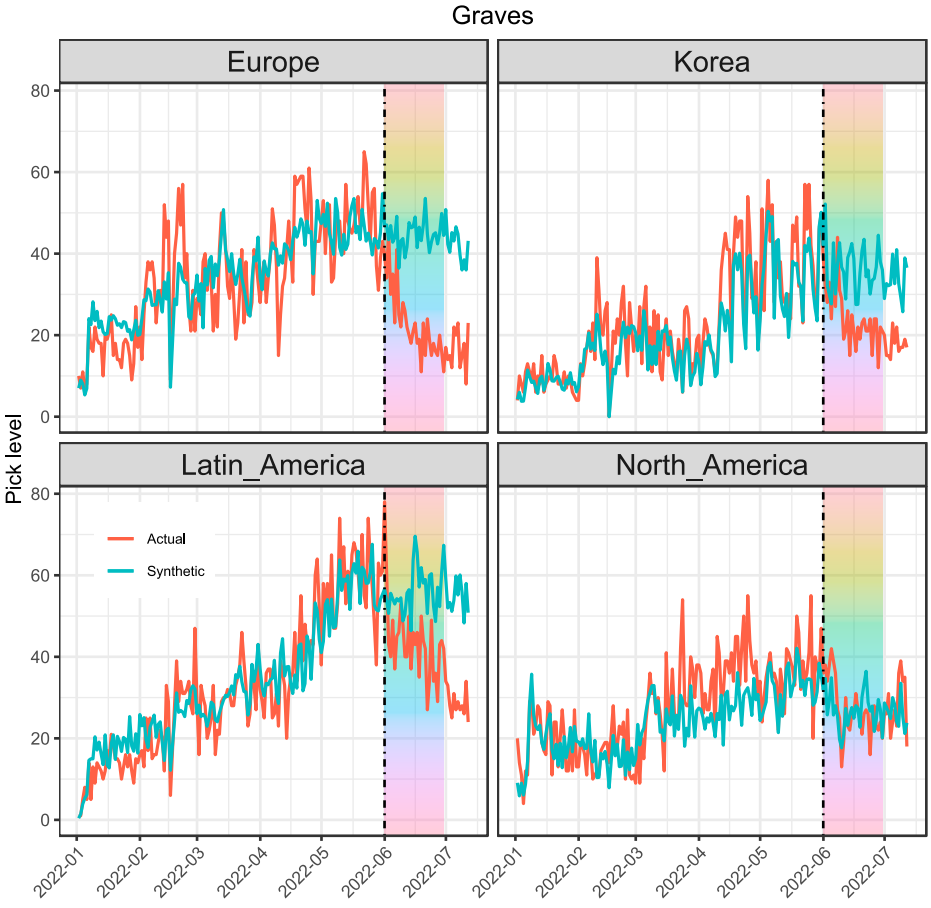

Figure 4.2: Graves' daily pick levels and synthetic control estimation results by region. The dashed vertical line denotes the day of disclosure, and the rainbow area highlights LGBT Pride Month.

by introducing different levels of subjectivity. In regions with higher levels of competitiveness, players are more likely to prioritize performance-based choices over personal preferences, potentially attenuating the impact of the coming-out event on players' preferences for Graves. This is consistent with the smallest estimated effect being observed on the Korean server, known for its high competitiveness. Therefore, the regional differences in the estimated effects may reflect a combination of both players' attitudes toward the LGB community and the competitive dynamics specific to each server.

5 Coming Out versus LGBT Pride Month

In Section 4, we established evidence of a substantial negative impact of the coming-out event on players' preferences for Graves. Building on these findings, this section aims to investigate the underlying mechanisms driving this effect.

As described in Section 2.2, the disclosure of Graves' sexual orientation coincided with the start of LGBT Pride Month. This means that our treatment, namely the occurrence of the coming-out event, encompasses both Graves' disclosure of his sexual orientation and the introduction of visual and expressive elements in League of Legends that support the LGBT community.[8] It is therefore plausible that the findings presented in Section 4 may, to some extent, be influenced by the presence of LGBT Pride Month, which might elicit negative reactions from certain players, leading them to shift their preferences away from LGB characters. While this alternative perspective does not undermine the validity of our identification strategy, it does raise questions about our interpretation of the estimated effects as the cost of coming out.

To rule out this possibility, we leverage the existence of other four characters who were already established as part of the LGB community prior to the coming-out event. These characters, named *Diana*, *Leona*, *Nami*, and *Neeko*, are subject only to a part of our treatment, specifically being part of the LGB community while LGBT Pride Month is ongoing, whereas Graves experiences both the disclosure of his sexual orientation and

[8] See e.g., Roller and Steinberg (2023) for a discussion on "simultaneous" treatments and methodologies for disentangling their effects under a Difference-in-Differences identification strategy.

LGBT Pride Month. Thus, we can evaluate the impact of LGBT Pride Month on these characters and compare the results with those obtained for Graves to assess the role of LGBT Pride Month in driving our main findings. This analysis helps us to determine whether the estimated effects on Graves' pick levels are primarily attributable to his coming out or if they can be attributed to the broader influence of LGBT Pride Month.

Formally, we recognize the potential influence of LGBT Pride Month on players' preferences by introducing the binary variable $L_i \in \{0, 1\}$ to represent the character's inclusion in the LGB community no later than $T^{pre} + 1$. Consequently, we observe three distinct groups of units: the first group includes only Graves, with $C_i = L_i = 1$; the second group includes only Diana, Leona, Nami, and Neeko, with $C_i = 0$ and $L_i = 1$; and the third group includes all other characters, with by $C_i = L_i = 0$.[9]

To explicitly account for the influence of the two treatments C_i and L_i, we define the potential pick levels as $Y_{i,t}^{c,l}$. Then, the estimands in (4.1) correspond to:

$$\tau_t = Y_{1,t}^{1,1} - Y_{1,t}^{0,0} \tag{5.1}$$

Equation (5.1) shows why we need to be cautious in interpreting the estimated effects of Section 4 as solely stemming from the disclosure of Graves' sexual orientation. Under an extended version of the SUTVA assumption (see below), we observe $Y_{1,t} = Y_{1,t}^{1,1}$ for all $t > T^{pre}$, and the counterfactual series estimator in (4.3) effectively estimates the counterfactual $Y_{1,t}^{0,0}$. Consequently, the estimated effects $\hat{\tau}_t$ displayed in Figure 4.1 correspond to the combined effects of both disclosing one's sexual orientation and being part of the LGB community during LGBT Pride Month. This can be formalized as follows:

$$\begin{aligned} \tau_t &= Y_{1,t}^{1,1} - Y_{1,t}^{0,0} \\ &= \underbrace{\left[Y_{1,t}^{1,1} - Y_{1,t}^{0,1}\right]}_{:=\tau_t^C} + \underbrace{\left[Y_{1,t}^{0,1} - Y_{1,t}^{0,0}\right]}_{:=\tau_t^L} \end{aligned} \tag{5.2}$$

with τ_t^C representing the effects of the disclosure for Graves, and τ_t^L representing the

[9] Neglecting the presence of two simultaneous treatments and treating them as a single treatment does not invalidate the results of Section 4. It primarily affects their interpretation, which, without further investigation, could only be attributed to the combined effects of simultaneously receiving both treatments C_i and L_i.

effects of being part of the LGB community during LGBT Pride Month for Graves.

The decomposition in (5.2) offers a strategy to disentangle the effects of the two treatments C_i and L_i for Graves. If we can successfully estimate the two counterfactual series $Y_{1,t}^{0,1}$ and $Y_{1,t}^{0,0}$, then we would be able to construct estimates $\hat{\tau}_t^C = Y_{1,t}^{1,1} - \widehat{Y}_{1,t}^{0,1}$ and $\hat{\tau}_t^L = \widehat{Y}_{1,t}^{0,1} - \widehat{Y}_{1,t}^{0,0}$ of τ_t^C and τ_t^L, respectively. This would allow us to quantify the extent to which LGBT Pride Month drives the main findings of Section 4.

To this end, we assume an extended version of the SUTVA that accommodates the existence of two different treatments.

Assumption 5.1. *(SUTVA):* $Y_{i,t} = Y_{i,t}^{1,1} C_i L_i + Y_{i,t}^{0,1} [1 - C_i] L_i + Y_{i,t}^{0,0} [1 - C_i] [1 - L_i]$

Under Assumption 5.1, we can estimate the counterfactual series $Y_{1,t}^{0,0}$ by constructing a synthetic control unit that approximates the pick levels of Graves before the coming-out event as in Section 4. Thus, as shown in (5.2), the challenge in disentangling our causal effects of interest is to estimate $Y_{1,t}^{0,1}$ for $t > T^{pre}$, i.e., how Graves' pick levels would have evolved if Graves were already part of the LGB community prior to the 2022 LGBT Pride Month.

Having a sufficient number of LGB characters other than Graves (that is, sufficient units such as $C_i = 0$ and $L_i = 1$) would enable us to estimate the counterfactual series $Y_{1,t}^{0,1}$ through standard synthetic control methods. However, since we only have four such characters, this approach is infeasible.

One way out is to estimate the impact of LGBT Pride Month on another LGB character and compare the results with those obtained for Graves. If the influence of LGBT Pride Month is uniform across all LGB characters, this strategy provides insight into the role of LGBT Pride Month in driving the main findings of Section 4. Without loss of generality, we denote any of the LGB characters other than Graves as unit j. We then define the effects of character j being part of the LGB community during LGBT Pride Month at each time $t > T^{pre}$ as:

$$\gamma_t^L := Y_{j,t}^{0,1} - Y_{j,t}^{0,0} \tag{5.3}$$

Under Assumption (5.1), we observe $Y_{j,t} = Y_{j,t}^{0,1}$ for all $t > T^{pre}$, and we can estimate the

counterfactual series $Y_{j,t}^{0,0}$ by constructing a synthetic control unit that approximates the pick levels of character j before the beginning of the 2022 LGBT Pride Month. We can then estimate γ_t^L by computing the differences between character j's observed pick levels and the synthetic counterfactual for all $t > T^{pre}$:

$$\hat{\gamma}_t^L = Y_{j,t}^{0,1} - \hat{Y}_{j,t}^{0,0} \tag{5.4}$$

Finally, we introduce a homogeneity assumption that leverages the estimates $\hat{\gamma}_t^L$ to provide an interpretation for the estimates $\hat{\tau}_t$ displayed in Figure 4.1.

Assumption 5.2. *(Effect Homogeneity):* $\tau_t^L = \gamma_t^L$ *for all* $t > T^{pre}$.

Under Assumption 5.2, the relationship $\tau_t = \tau_t^C + \gamma_t^L$ holds. Thus, if the estimated effects for character j $\hat{\gamma}_t^L$ are negligible, this suggests that the estimated effects for Graves $\hat{\tau}_t$ are primarily driven by his disclosure of sexual orientation.

For ease of interpretation, we create a composite LGB unit by averaging the pick levels of Diana, Leona, Nami, and Neeko. We then employ the same methodology of Section 4 to construct a synthetic control unit that approximates the pick levels of the newly constructed LGB unit before the beginning of LGBT Pride Month (compare equations 4.2–4.3). We exclude Graves from the donor pool. Finally, to estimate γ_t^L, we compute the differences between the composite LGB unit's observed pick levels and the synthetic counterfactual for all $t > T^{pre}$ as in (5.4).

Results are shown in Figure 5.1. Overall, our analysis suggests that LGBT Pride Month has a modest impact on players' preferences for LGB characters, with an estimated average treatment effect of −7.77 daily pick levels. Before the beginning of LGBT Pride Month, the synthetic control estimator closely mirrors the dynamics of the composite LGB unit's pick levels series, validating the estimator's ability to forecast the counterfactual series. Starting from June 1^{st}, 2022, we observe minimal disparities between the actual pick level series and the synthetic series, implying that LGBT Pride Month has little effect on players' preferences for LGB characters. Under Assumption (5.2), this suggests that the estimated effects for Graves displayed in Figure 4.1 primarily stem from his

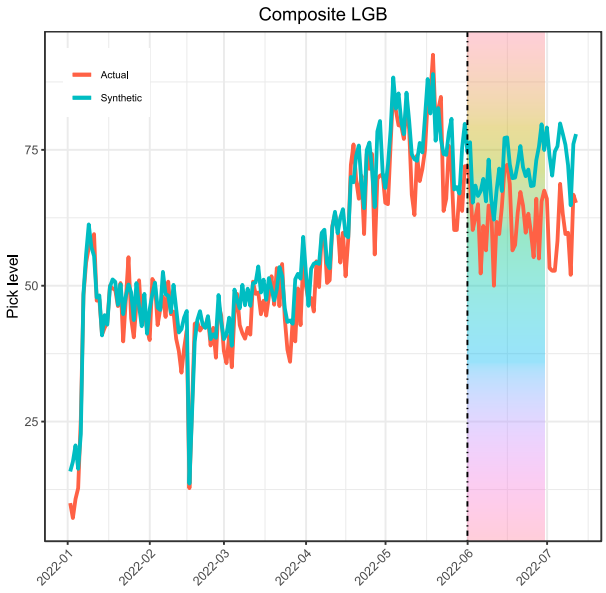

Figure 5.1: Composite LGB unit's daily pick levels and synthetic control estimation results. The dashed vertical line denotes the day of disclosure, and the rainbow area highlights LGBT Pride Month.

disclosure of sexual orientation rather than the influence of LGBT Pride Month, thereby aiding our interpretation of the results as the cost of coming out.

6 Discussion

Discrimination based on sexual orientation is first and foremost a human rights issue. However, when LGB individuals are unfairly targeted in education, health, social, and political settings, there is a loss of human capital that can have detrimental effects on the economy as a whole (Badgett, 2020). For example, bullying and discrimination act as barriers to LGB students' acquisition of skills and knowledge. Furthermore, even short experiences of bullying can have severe long-term health consequences (see e.g., Boden et al., 2016).

Our findings underscore the potential negative consequences of disclosing one's sexual minority status. This insight holds significant implications for policymakers aiming to develop interventions that effectively tackle discrimination and improve the overall well-being of LGB individuals.

However, when devising such policies, it is essential to distinguish between statistical

discrimination and taste-based discrimination.[10] If statistical discrimination is identified, the focus should be on improving the information available about individuals. On the other hand, if taste-based discrimination is at play, policies should aim to discourage engagement in discriminatory behavior (Neumark, 2018).

In our study, we have excluded any notable change in Graves' performance that could be associated with his disclosure (see Figure A.1 in Appendix A). Importantly, players have access to real-time information about this character's strengths, weaknesses, and performance, as numerous websites continuously provide updated data on character performance, allowing players to make informed choices.[11] Thus, players were aware that no game-relevant skills or attributes changed at the time of the treatment, and they could see that the character's performance remained unaffected. These factors strongly suggest that the estimated cost of coming out is unlikely to be driven by statistical discrimination.

Consequently, policies should be formulated to discourage discriminatory behavior, either by increasing its costs or by creating inclusive social environments that promote the acceptance of sexual minority individuals and reduce the stigma. Raising awareness about the reaction to sexual minority disclosure could be an important step to develop such a society.

At the same time, policymakers can also consider providing resources and support to individuals who have recently come out, such as access to counseling and mental health services. By doing so, they can mitigate some of the negative outcomes that may arise from coming out.

7 Conclusion

In this paper, we leverage an innovative data source from the online video game League of Legends to credibly identify the effects of coming out. By employing synthetic control methods (e.g., Abadie, 2021; Abadie & Vives-i-Bastida, 2022) to isolate the effect of the

[10] Onuchic (2022) provides a detailed review of traditional statistical and taste-based discrimination models, along with a discussion of recent theories that expand on these models.

[11] Examples of such websites include https://lolalytics.com/lol/graves/build/ and https://www.leagueofgraphs.com/champions/stats/graves.

disclosure, we find a substantial and persistent negative effect of coming out.

Our future research agenda includes expanding our analysis in several directions. First, we aim to collect fresh data for the year 2023 to gain additional insights into the extent to which our estimated effects are influenced by the presence of LGBT Pride Month. In 2023, Graves himself is already part of the LGB community. Therefore, we plan to utilize the new data to estimate the effects of 2023 LGBT Pride Month for Graves. If we find modest or negligible effects, this would further strengthen our interpretation of the results presented in Section 4 as the cost of coming out.

Furthermore, we plan to delve deeper into the underlying mechanisms influencing players' decisions to refrain from selecting Graves for their matches. A growing body of economic literature investigates how identity, or the concept of "who we are," influences individual behavior (for a review of this literature, see Oh, 2023). This research suggests that individuals may be averse to adopting characteristics and practices associated with other identity categories because of self-identification or social-image concerns (Akerlof & Kranton, 2000).

In the context of our study, players may refrain from selecting Graves to avoid any association with the LGB community, which regrettably faces stigma and prejudice (Meyer, 2003; Pachankis, 2007; Pachankis et al., 2020). We plan to investigate whether our results are driven by players' identity considerations or concerns about one's social image. To gain deeper insights into this phenomenon, we plan to collect data from streaming platforms like *Twitch*, where numerous players broadcast their gaming sessions live. By analyzing the shift in preferences of players who stream their games compared to those who do not, we can explore whether it is identity or social image concerns that drive our results.

References

Abadie, A. (2021). Using synthetic controls: Feasibility, data requirements, and methodological aspects. *Journal of Economic Literature*, *59*(2), 391–425.

Abadie, A., Diamond, A., & Hainmueller, J. (2010). Synthetic control methods for comparative case studies: Estimating the effect of california's tobacco control program. *Journal of the American Statistical Association*, *105*(490), 493–505.

Abadie, A., & Gardeazabal, J. (2003). The economic costs of conflict: A case study of the basque country. *American Economic Review*, *93*(1), 113–132.

Abadie, A., & Vives-i-Bastida, J. (2022). Synthetic controls in action. *arXiv preprint arXiv:2203.06279*.

Ahmed, A. M., Andersson, L., & Hammarstedt, M. (2013). Are gay men and lesbians discriminated against in the hiring process? *Southern Economic Journal*, *79*(3), 565–585.

Aigner, D. J., & Cain, G. G. (1977). Statistical theories of discrimination in labor markets. *Ilr Review*, *30*(2), 175–187.

Akerlof, G. A., & Kranton, R. E. (2000). Economics and identity. *The Quarterly Journal of Economics*, *115*(3), 715–753.

Antecol, H., & Steinberger, M. D. (2013). Labor supply differences between married heterosexual women and partnered lesbians: A semi-parametric decomposition approach. *Economic Inquiry*, *51*(1), 783–805.

Arkhangelsky, D., Athey, S., Hirshberg, D. A., Imbens, G. W., & Wager, S. (2021). Synthetic difference-in-differences. *American Economic Review*, *111*(12), 4088–4118.

Badgett, M., Carpenter, C. S., & Sansone, D. (2021). Lgbtq economics. *Journal of Economic Perspectives*, *35*(2), 141–170.

Badgett, M., Durso, L. E., & Schneebaum, A. (2013). New patterns of poverty in the lesbian, gay, and bisexual community.

Badgett, M. L. (2020). *The economic case for lgbt equality: Why fair and equal treatment benefits us all*. Beacon Press.

Badgett, M. L. (1995). The wage effects of sexual orientation discrimination. *ILR Review*, *48*(4), 726–739.

Becker, G. S. (1957). *The economics of discrimination*. University of Chicago press.

Bertrand, M., & Duflo, E. (2017). Field experiments on discrimination. *Handbook of economic field experiments*, *1*, 309–393.

Boden, J. M., van Stockum, S., Horwood, L. J., & Fergusson, D. M. (2016). Bullying victimization in adolescence and psychotic symptomatology in adulthood: Evidence from a 35-year study. *Psychological Medicine*, *46*(6), 1311–1320.

Burn, I. (2018). Not all laws are created equal: Legal differences in state non-discrimination laws and the impact of lgbt employment protections. *Journal of Labor Research*, *39*(4), 462–497.

Burn, I. (2020). The relationship between prejudice and wage penalties for gay men in the united states. *ILR Review*, *73*(3), 650–675.

Carpenter, C. S., & Eppink, S. T. (2017). Does it get better? recent estimates of sexual orientation and earnings in the united states. *Southern Economic Journal*, *84*(2), 426–441.

Carpenter, C. S., Lee, M. J., & Nettuno, L. (2022). Economic outcomes for transgender people and other gender minorities in the united states: First estimates from a nationally representative sample. *Southern Economic Journal*, *89*(2), 280–304.

Coffman, K. B., Coffman, L. C., & Ericson, K. M. M. (2017). The size of the lgbt population and the magnitude of antigay sentiment are substantially underestimated. *Management Science*, *63*(10), 3168–3186.

Drydakis, N. (2014). Sexual orientation discrimination in the cypriot labour market. distastes or uncertainty? *International Journal of Manpower*.

Drydakis, N. (2009). Sexual orientation discrimination in the labour market. *Labour Economics*, *16*(4), 364–372.

Gromadzki, J., & Siemaszko, P. (2022). *#Iamlgbt: social networks and coming out* (IBS Working Papers No. 06/2022). Instytut Badan Strukturalnych.

Imbens, G. W., & Rubin, D. B. (2015). *Causal inference for statistics, social, and biomedical sciences: An introduction*. Cambridge University Press.

Klawitter, M. (2015). Meta-analysis of the effects of sexual orientation on earnings. *Industrial Relations: A Journal of Economy and Society*, *54*(1), 4–32.

Kudashvili, N., & Lergetporer, P. (2022). Minorities' strategic response to discrimination: Experimental evidence. *Journal of Public Economics*, *208*, 104630.

Martell, M. E. (2021). Labor market differentials estimated with researcher-inferred and self-identified sexual orientation. *Economics Letters*, *205*.

Meyer, I. H. (2003). Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: Conceptual issues and research evidence. *Psychological Bulletin*, *129*(5), 674–697.

Neumark, D. (2018). Experimental research on labor market discrimination. *Journal of Economic Literature*, *56*(3), 799–866.

Oh, S. (2023). Does identity affect labor supply? *American Economic Review*, *113*(8), 2055–2083.

Onuchic, P. (2022). Recent contributions to theories of discrimination. *arXiv preprint arXiv:2205.05994*.

Pachankis, J. E. (2007). The psychological implications of concealing a stigma: A cognitive-affective-behavioral model. *Psychological Bulletin*, *133*(2), 328.

Pachankis, J. E., Mahon, C. P., Jackson, S. D., Fetzner, B. K., & Bränström, R. (2020). Sexual orientation concealment and mental health: A conceptual and meta-analytic review. *Psychological Bulletin*, *146*(10), 831–871.

Parshakov, P., Naidenova, I., Gomez-Gonzalez, C., & Nesseler, C. (2022). Do lgbtq-supportive corporate policies affect consumer behavior? evidence from the video game industry. *Journal of Business Ethics*, 1–12.

Patacchini, E., Ragusa, G., & Zenou, Y. (2012). Unexplored dimensions of discrimination in europe: Religion, homosexuality and physical appearance. *Unpublished manuscript: https://www.frdb.org/wp-content/uploads/2012/06/FRDB_Rapporto_-PATACCHINI.pdf*.

Plug, E., Webbink, D., & Martin, N. (2014). Sexual orientation, prejudice, and segregation. *Journal of Labor Economics*, *32*(1), 123–159.

Roller, M., & Steinberg, D. (2023). Differences-in-differences with multiple treatments under control.

Rubin, D. B. (1974). Estimating causal effects of treatments in randomized and nonrandomized studies. *Journal of Educational Psychology*, *66*(5), 688–701.

Sansone, D., & Carpenter, C. S. (2020). Turing's children: Representation of sexual minorities in stem. *PLOS ONE*, *15*(11), 1–16.

Tilcsik, A. (2011). Pride and prejudice: Employment discrimination against openly gay men in the united states. *American Journal of Sociology*, *117*(2), 586–626.

Weichselbaumer, D. (2003). Sexual orientation discrimination in hiring. *Labour economics*, *10*(6), 629–642.

Appendix A Additional Figures

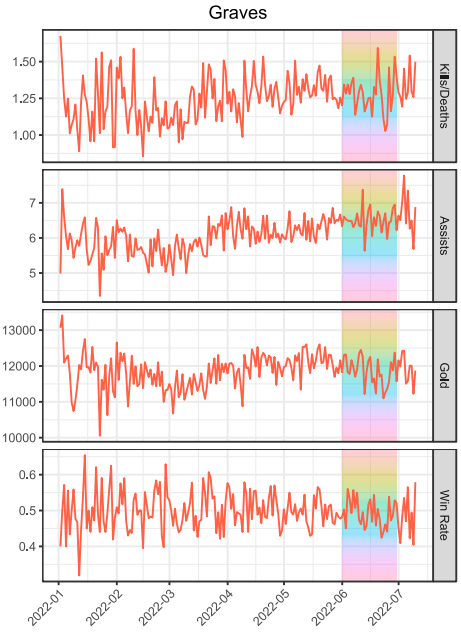

Figure A.1: Graves' performance measures over time. The four panels display Graves' kill-to-death ratio, number of assists, gold earned, and win rate. The rainbow area highlights LGBT Pride Month.

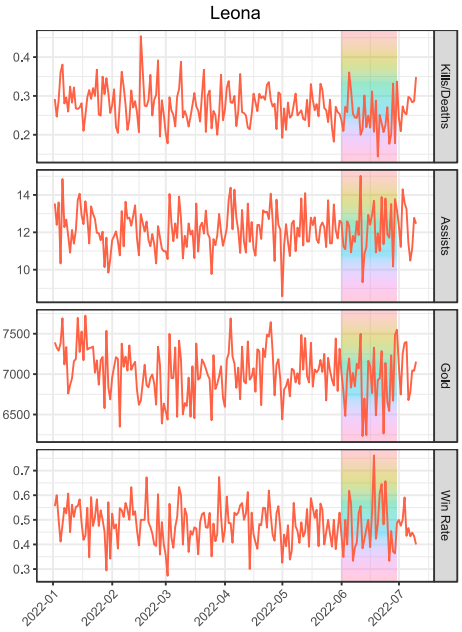

Figure A.2: Leona's performance measures over time. The four panels display Leona's kill-to-death ratio, number of assists, gold earned, and win rate. The rainbow area highlights LGBT Pride Month.

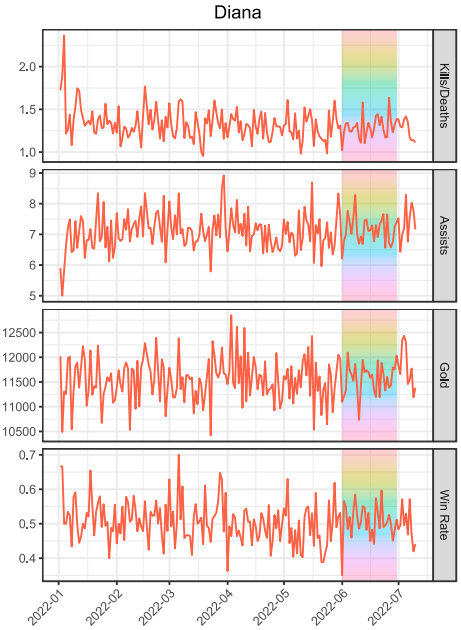

Figure A.3: Diana's performance measures over time. The four panels display Diana's kill-to-death ratio, number of assists, gold earned, and win rate. The rainbow area highlights LGBT Pride Month.

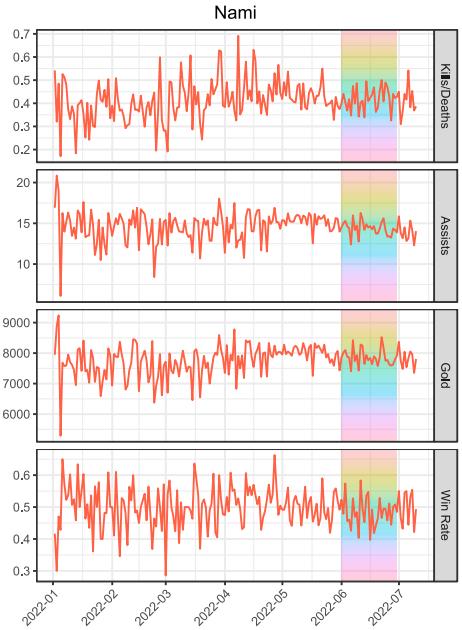

Figure A.4: Nami's performance measures over time. The four panels display Nami's kill-to-death ratio, number of assists, gold earned, and win rate. The rainbow area highlights LGBT Pride Month.

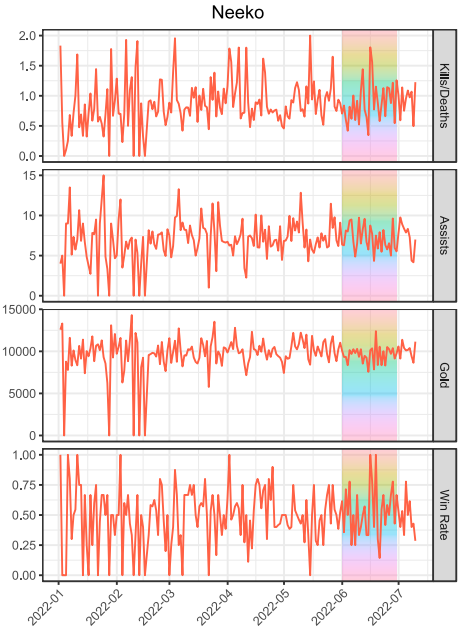

Figure A.5: Neeko's performance measures over time. The four panels display Neeko's kill-to-death ratio, number of assists, gold earned, and win rate. The rainbow area highlights LGBT Pride Month.

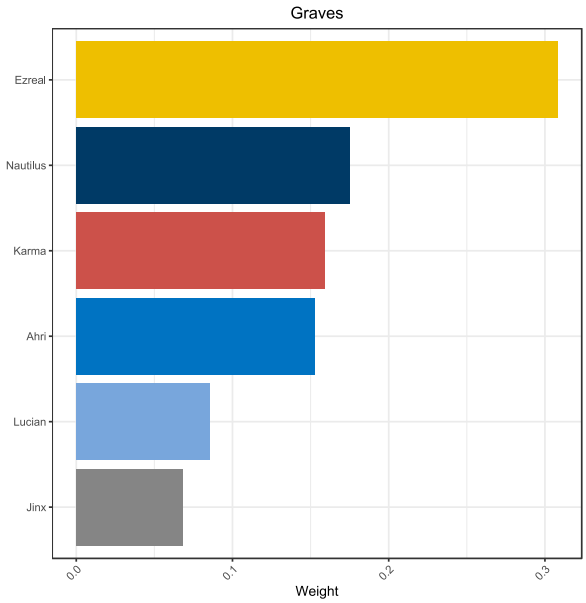

Figure A.6: Identities and contributions of characters in the donor pool for the Graves' synthetic control displayed in Figure 4.1.

Appendix B Robustness Checks

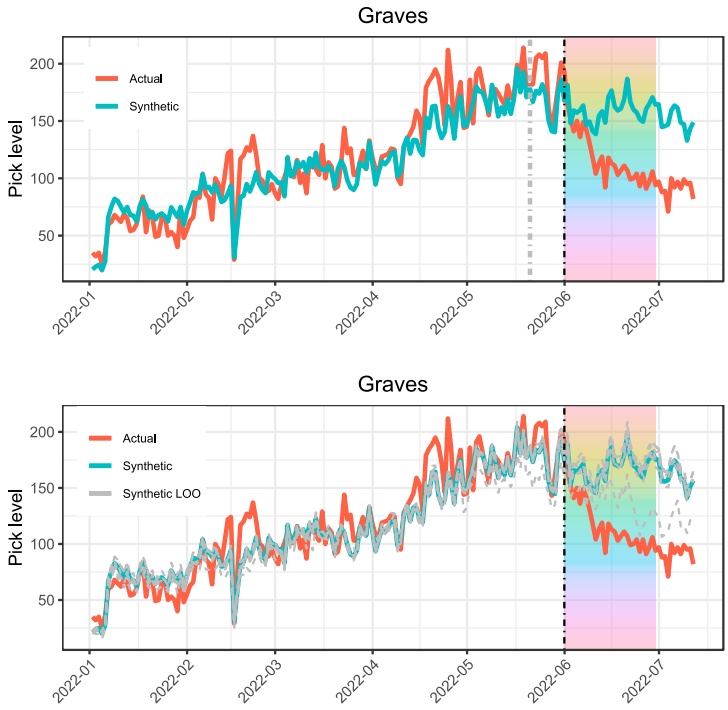

Figure B.1: Robustness checks results. The upper panel shifts the coming-out event ten days earlier, with the new treatment date denoted by the vertical gray dashed line. The lower panel reports leave-one-out estimates of the synthetic control series, obtained by excluding one of the characters of Figure A.6 at a time from the donor pool.