

AI Influence on Employment in the Creative Arts Sector: Evidence from USA Labor Market

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Abstract

This study investigates whether emergence of publicly available AI models influenced employment in the creative arts sector in United States. The launch of ChatGPT, the most widely used generative AI alongside its image-generating counterpart DALL-E, has been chosen as AI inception date. Synthetic Control Method estimates suggest a divergence of artist employment from synthetic trajectory three month post-ChatGPT market introduction. Divergence peaks four months after ChatGPT's debut, resulting in 28.4% decrease in artist employment. Notably, employment dynamics revert to the synthetic baseline merely seven months post-ChatGPT, subsequently achieving an unprecedented peak in December 2023.

1 Introduction

The rapid advancement of AI technologies has sparked a debate about its potential impact on various job sectors. Many are concerned about the potential loss of jobs and unemployment due to AI replacement. Historically, technical advancements have generally led to job losses among blue-collar workers, where simple mechanical tasks were replaced by machines. This case is particularly interesting - for the first time, white-collar workers are also at risk, with AI taking over jobs historically reserved for humans.

As ([Acemoglu and Johnson, 2023](#)) point out the rapid advancement of AI technologies is not an inherently positive development automatically leading to progress and prosperity. Authors contend that the current trajectory of AI adoption is primarily driven by the desire of business elites to cut costs and increase profits, rather than to augment human capabilities and increase productivity across society.

Throughout history, technological advancements have often failed to improve the living standards of the masses, as the benefits were captured by the elites who controlled the means of production. It was only after the advent of democratic reforms and social mobility in the late 19th century that the average incomes began to rise consistently, as workers gained the ability to demand a fairer share of the benefits of progress.

Acemoglu and Johnson express concern that the current digital revolution, and particularly the rise of AI, is leading to a similar dynamic, where the gains are concentrated among a small group of tech giants and business elites, while the broader population faces stagnant wages and growing inequality. They argue that AI is primarily being used to replace human workers, rather than to create new opportunities and expand the scope of human capabilities.

One area of particular concern is the creative arts sector. AI models, like DALL-E from OpenAI, are becoming increasingly capable of performing tasks traditionally undertaken by

human artists. This research aims to investigate whether the emergence of publicly available AI models has influenced the labor market within this sector. Utilizing data from the IPUMS CPS, covering the period from January 2021 to March 2024, this study will specifically examine changes in employment patterns among artists. By analyzing variables related to labor force participation, employment, age, education and demographic characteristics, this research seeks to provide a comprehensive understanding of the AI's impact on employment dynamics in the creative arts sector.

2 Data and Sample

2.1 Data

The study employs data acquired from IPUMS CPS, a comprehensive, harmonized database of microdata from the U.S. Current Population Survey, providing detailed demographic, social, and economic information for research and analysis. The dataset includes information about american workers in period of 01.2021-03.2024, including a wide range of topics related to labor force participation, employment, unemployment, earnings, and demographic characteristics of individuals.

2.2 Sample

Dataset contains variables regarding year, month, occupation, marital status, race, hours worked per week and metropolitan area of each individual. In total dataset includes 20 variables over 39 periods (months), and the total of 3,644,738 observations.

Based on the occupation variable (4-digit code) individuals occupations can be identified and grouped accordingly. Occupation variable (OCC) is a 4-digit numeric variable. Each 4-digit encode a different occupation. For the purpose of this research the focus is on **2600 (Artists and related workers)**. Full list of occupation codes can be found [here](#).

3 Empirical Specifications

Empirical strategy to identify the effects of AI on artistic sector employment involves utilizes the Synthetic Control Method to create synthetic doppelganger from a selected pool of 137 occupations. The primary objective is to compare the differential monthly employment growth between real artists and their synthetic doppelganger, following the emergence of ChatGPT. This includes estimating the following equation:

$$g_{it} = \alpha_i + \beta_i AI_i + \sum_t^{T-1} \gamma_{it} g_{it-1} + age_i \delta + race_i \kappa + qq_i \lambda + sex_i \zeta + marst_i \eta + bach_i \theta + uhrrs_i \iota + met_i \mu + \varepsilon_{it}. \quad (1)$$

- g_{it} is the employment change for occupation i in year t and
- AI is a dummy indicating AI appearance
- g_{it-1} is employment change in previous periods
- age_i is average age variable
- $race_i$ is average race variable
- qq_i is average household type variable
- sex_i is average sex variable
- $marst_i$ is is average marital status variable
- $bach_i$ is share of higher education variable
- $uhrrs_i$ is average hours worked per week variable
- met_i is variable for metropolitan area

or simpler:

$$g_{it} = \beta_i AI_t + \gamma X_{i,t} + \epsilon_{it}. \quad (2)$$

where the dependent variable g_{it} is the monthly employment growth rate, $X_{i,t}$ is a matrix of covariant and controls, ϵ_{it} is the error term, and AI_t is the dummy variable for AI. The coefficient β of the AI dummy captures the percentage points growth gap after ChatGPT emergence.

By drawing from the pool of 137 occupations unaffected by AI, partially based on (Felten et al., 2023), model can estimate a synthetic doppelganger, reflecting the dynamics of occupations not influenced by AI. The doppelganger synthetic artists monthly employment growth can be then compared to the real monthly employment growth of artists, following the emergence of ChatGPT.

To estimate the doppelganger, historic employment changes and population characteristics of artists and other 137 occupations have been used. These resulted in creating a estimate for synthetic artist monthly employment growth in the researched period. Occupations selected from the available pool and weights used to create synthetic counterpart can be found in Table 1.

4 Results

4.1 Graphical Evidence

Figure 1 show the nominal employment change over time in ten occupations mostly endangered by AI, following the (Felten et al., 2023) rating. Graphical assessment of nominal employment data does not indicate any pronounced changes in employment after the emergence of ChatGPT. However, the lack of observable changes could stem from various other factors - such as an overall economic upswing that may have masked job losses caused by AI. While the nominal change graphical representation alone does not reveal a direct impact, a more comprehensive analysis incorporating additional economic indicators could do so.

Figure 2 illustrates the impact of ChatGPT on the monthly employment growth of artists and their synthetic counterparts. Before ChatGPT introduction, both groups experienced similar employment growth rate fluctuations, with a downward trend throughout most of 2021 and 2022, likely due to post-COVID economic turmoil and high interest rates. Mid-2022 saw employment begin to rise, reaching early 2021 levels by year's end. However, three after ChatGPT's launch in November 2022, a significant divergence emerged. While synthetic artist dynamic suggests employment growth, real artists suffered a employment decline, to the all time low seven months after ChatGPT launch. Artists' employment growth rates displayed heightened volatility with multiple peaks and troughs, while synthetic artists, though also volatile, exhibited a relatively smoother upward trajectory. Notably, by the end of the analysis period, the real and synthetic paths seem to converge again, possibly suggesting that the initial disruption caused by the ChatGPT shock has been assimilated by the market. Post-ChatGPT era indicates that AI's presence influenced the labour market, particularly intensifying fluctuations in the artistic sector.

4.2 The Effect of AI on Creative Arts Employment

Table 2 presents estimated dynamic changes in monthly employment growth of real and synthetic artists. In November 2022 (24), artists received the AI treatment. For the subsequent three months, employment declined for both groups. However, four months after the treatment, a sharp divergence emerged. While the synthetic control group recorded employment growth, the treatment group experienced a further sharp decline. The divergence expanded to a 28.4% difference in April 2023, five months after the treatment. In May, artists' employment began to grow; however, it still diverged at 18.7% lower than its synthetic counterpart.

Six months post-treatment (30), the gap narrowed significantly, with real artists' employment growth marginally surpassing the synthetic counterpart. Eight months after the treatment (32), a full reversal occurred. Artists' employment growth not only recovered, but exceeded the synthetic control for the rest of the researched period.

This fluctuating pattern suggests that while the initial impact of the AI treatment led to a significant employment growth disadvantage for real artists, the sector demonstrated resilience and adaptability in the medium term. The data indicates a potential "catch-up" effect, where after an initial shock, real artists' employment growth not only recovered but also surpassed the synthetic control.

The comparison of employment growth rates between real artists and their synthetic counterparts aimed to isolate and elucidate the causal impact of AI on artist employment, offering insights into how AI technologies such as ChatGPT influence employment trends within creative industries. The findings underscore the complexity of technological disruption in the labor market. Initially, AI exerted a negative influence on the creative arts' sector; however, over time, its effect appears to have shifted toward positive. This transition might result from artists adopting and leveraging AI in their work, suggesting an increase in marginal labor productivity.

4.3 Robustness Checks

For a robustness check a Time Placebo and Occupation Placebo analysis tests have been carried out, following the (Funke et al., 2023) robustness check in author’s populist leaders SCM model.

The *Time Placebo* study artificially assigns the AI treatment six months prior to the actual ChatGPT launch, resulting in a hypothetical treatment exposure for artists in May 2022 instead of November 2022. In a scenario where the treatment has a causal effect, no divergence in employment growth relative to the counterfactual would be anticipated prior to the actual ChatGPT launch. Figure 3 presents results that appear to support a causal interpretation. While the treatment and synthetic paths begin to differ after the dummy treatment, their trends remain similar. A visible divergence between the paths occurs only three months after the real treatment, reinforcing the notion of a causal relationship between the AI intervention and changes in artist employment growth.

The *Occupation Placebo* study alters the treatment group from Artists to Dancers, an occupation with a very low likelihood of being affected by AI emergence (ranked third to last among 774 occupations, with an AIOE of -1.793 (Felten et al., 2023)). If the causal inference of AI on artists’ employment holds true, an occupation relatively unaffected by AI, such as dancers, should not exhibit negative divergence from its synthetic counterpart following the ChatGPT treatment. Figure 4 presents the Synthetic Control Method estimate results for Dancers, supporting the causal interpretation. Dancers do not experience a significant employment decline post-ChatGPT compared to their synthetic counterpart. However, it is important to note that the sample size for Dancers in the IPUMS CPS microdata is relatively small, which may limit the accuracy of employment dynamic representation.

5 Conclusion

This study, utilizing IPUMS CPS employment microdata, examined the impact of generative AI models on the artistic labour market in United States. The synthetic control method revealed a complex, dynamic relationship between AI emergence and artist employment. The initial shock of ChatGPT’s introduction precipitated a significant employment contraction, peaking at a 28.4% differential five months after the ChatGPT launch. Interestingly, eight months after the treatment, a reversal occurred. Initially, AI exerted a negative influence on the artists’ labor market; however, over time, its effect appears to have shifted toward positive. This resurgence suggests a nuanced interplay between technological disruption and artists’ adaptability. This shift may indicate artists’ progressive incorporation of AI into their workflows, potentially suggesting an increase in marginal labor productivity.

Several methodological limitations warrant consideration. Firstly, the Synthetic Control Method is optimally suited for analyzing continuous and smooth trends over time, rather than fluctuating monthly rates, which may influence the precision of the estimates. Secondly, the predictor variables available in the IPUMS dataset, though carefully selected, may lack sufficient predictive power. Furthermore, the robustness of testing and the deterministic nature of graphical analysis are constrained by data availability and the inherent complexities of the creative labor market. These limitations underscore the need for further research with extended datasets to expand upon findings. Despite these caveats, this study offers a pioneering examination of AI’s impact on creative employment, laying the groundwork for future investigations into the evolving relationship between technology and the arts.

References

- Acemoglu, D. and S. Johnson (2023). *Power and Progress: Our Thousand-Year Struggle Over Technology and Prosperity*.
- Felten, E., M. Raj, and R. Seamans (2023). How will language modelers like ChatGPT affect occupations and industries? *arXiv preprint*.
- Funke, M., M. Schularick, and C. Trebesch (2023). Populist leaders and the economy. *American Economic Review* 113(3), 690–719.

Tables

Table 1: Table of Occupations and Weights for Synthetic Artists

occ	Weight	Occupation
2012	0.184	Healthcare social workers
2723	0.013	Umpires, referees, and other sports officials
2740	0.015	Dancers and choreographers
6441	0.013	Pipelayers
7100	0.247	Electrical and electronics repairers, industrial
7160	0,033	Automotive glass installers and repairers
7720	0,028	Electrical, electronics, and electromechanical assemblers
7740	0,087	Structural metal fabricators and fitters
8256	0,164	Print binding and finishing workers
8350	0,009	Tailors, dressmakers, and sewers
8450	0,029	Upholsterers
9030	0,021	Aircraft pilots and flight engineers
9210	0,156	Locomotive engineers and operators
1,000		

Notes: This table lists various occupations along with their classification codes and associated weights. The weights indicate the relative importance or prevalence of each occupation. **OCC:** The occupational classification code. **Weight:** The relative weight associated with each occupation. **Occupation:** Name of the occupation according to 2020 IPUMS classification.

Table 2: Predictor balance for employment growth

01.2021 = 100	Artists	Synthetic	Difference
Monthly Employment Growth (2)	84.35	89.09	-4.74
Monthly Employment Growth (3)	89.57	85.21	4.36
Monthly Employment Growth (4)	83.48	85.16	-1.68
Monthly Employment Growth (5)	89.57	86.56	3.01
Monthly Employment Growth (6)	80.00	81.23	-1.23
Monthly Employment Growth (7)	69.57	72.49	-2.92
Monthly Employment Growth (8)	78.26	81.85	-3.59
Monthly Employment Growth (9)	68.70	69.23	-0.53
Monthly Employment Growth (10)	67.83	73.57	-5.74
Monthly Employment Growth (11)	86.09	85.76	0.33
Monthly Employment Growth (12)	76.52	76.93	-0.41
Monthly Employment Growth (13)	67.83	71.04	-3.21
Monthly Employment Growth (14)	73.04	72.95	0.10
Monthly Employment Growth (15)	74.78	74.44	0.35
Monthly Employment Growth (16)	65.22	68.53	-3.31
Monthly Employment Growth (17)	81.74	81.20	0.54
Monthly Employment Growth (18)	75.65	81.48	-5.83
Monthly Employment Growth (19)	94.78	95.60	-0.82
Monthly Employment Growth (20)	99.13	95.27	3.86
Monthly Employment Growth (21)	90.43	89.99	0.44
Monthly Employment Growth (22)	101.74	94.40	7.34
Monthly Employment Growth (23)	89.57	85.91	3.65

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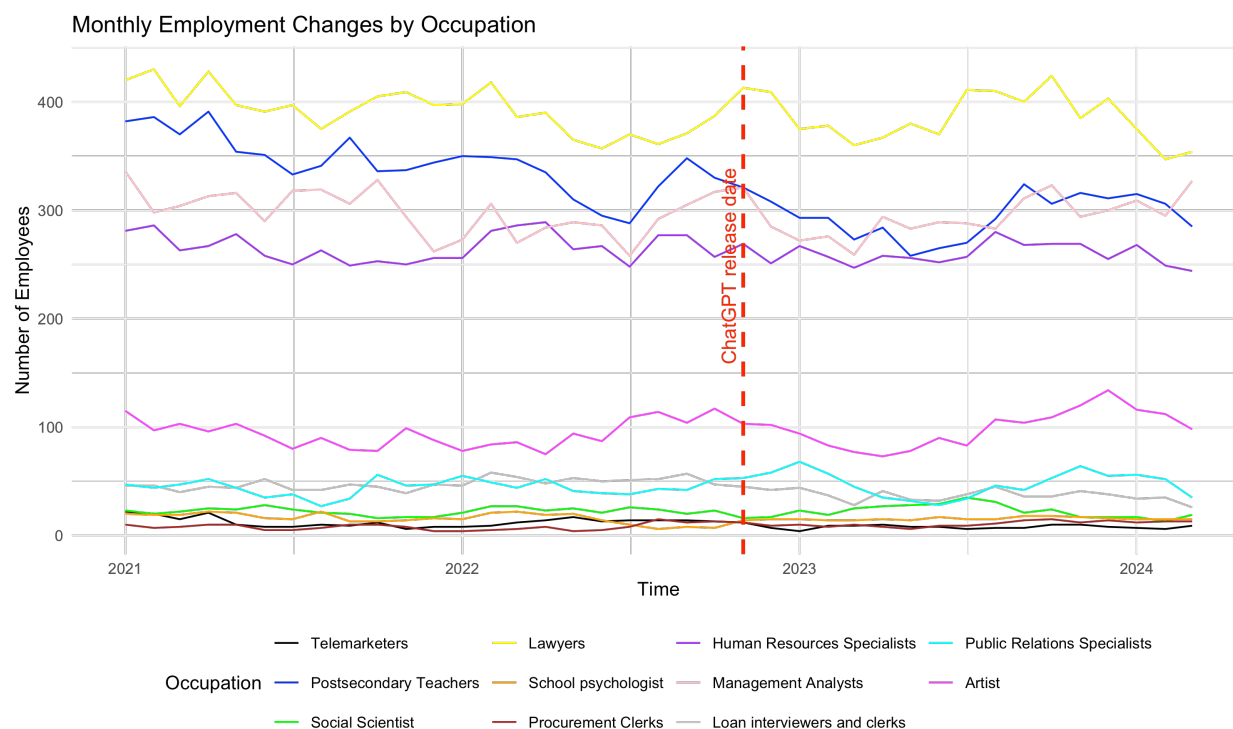
Table 2 – continued from previous page

01.2021 = 100	Artists	Synthetic	Difference
Monthly Employment Growth (24) (AI treatment month)	88.70	77.39	11.31
Monthly Employment Growth (25)	81.74	69.70	12.04
Monthly Employment Growth (26)	72.17	70.50	1.67
Monthly Employment Growth (27)	66.96	78.87	-11.91
Monthly Employment Growth (28)	63.48	91.90	-28.42
Monthly Employment Growth (29)	67.83	86.52	-18.70
Monthly Employment Growth (30)	78.26	77.15	1.11
Monthly Employment Growth (31)	72.17	82.84	-10.67
Monthly Employment Growth (32)	93.04	85.48	7.56
Monthly Employment Growth (33)	90.43	66.11	24.32
Monthly Employment Growth (34)	94.78	84.88	9.91

Notes: This table displays the predictor balance of monthly employment growth for Artists and their synthetic doppelganger. The Artists and Synthetic columns represent the respective values for each month, while the Difference column indicates the difference between real Artists and synthetic Artists. Negative differences indicate lower values in Artists compared to their doppelganger. In period 24, Artists get the AI treatment. Paths diverge sharply three months after tat in period 27 (02.2023)

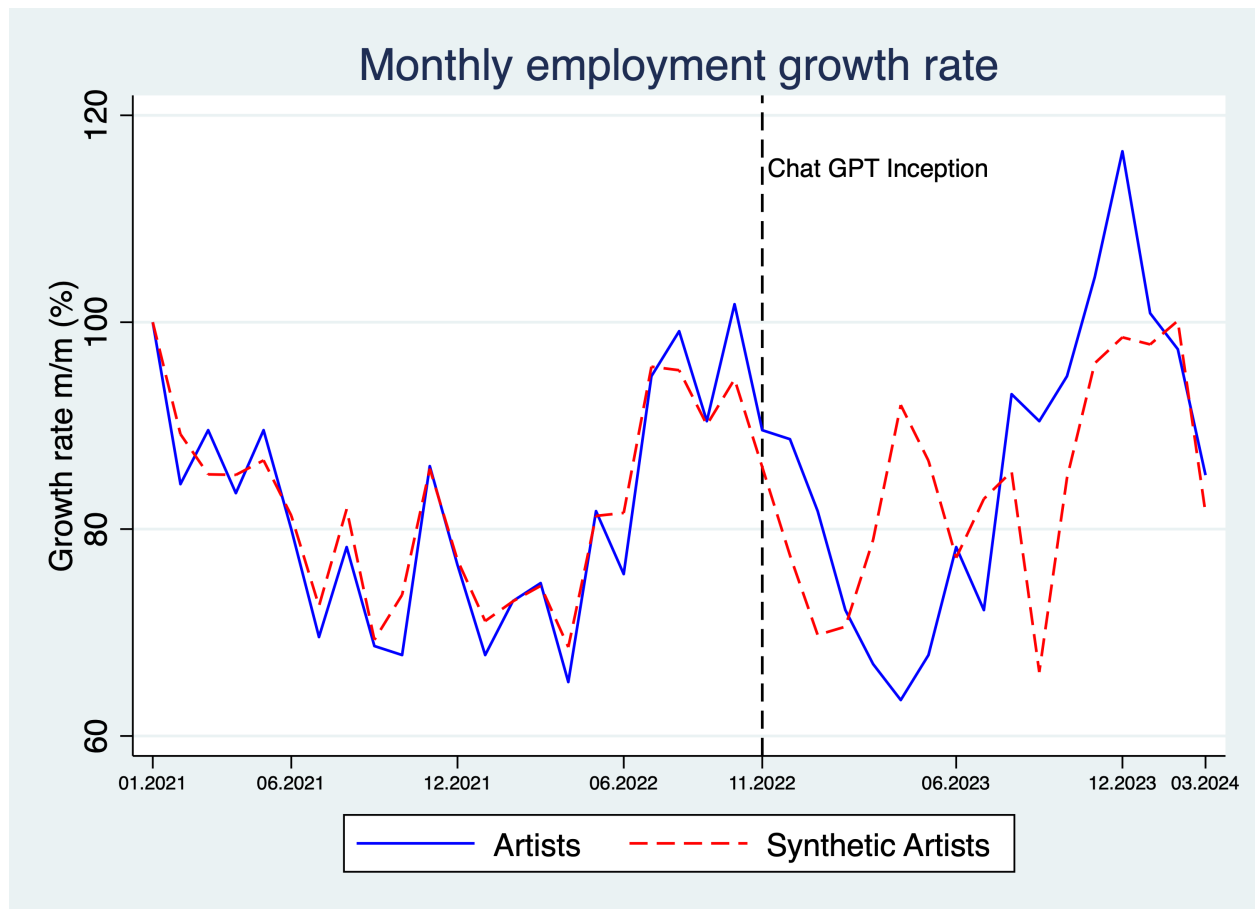
Figures

Figure 1: Changes in employment in 20 most endangered occupations



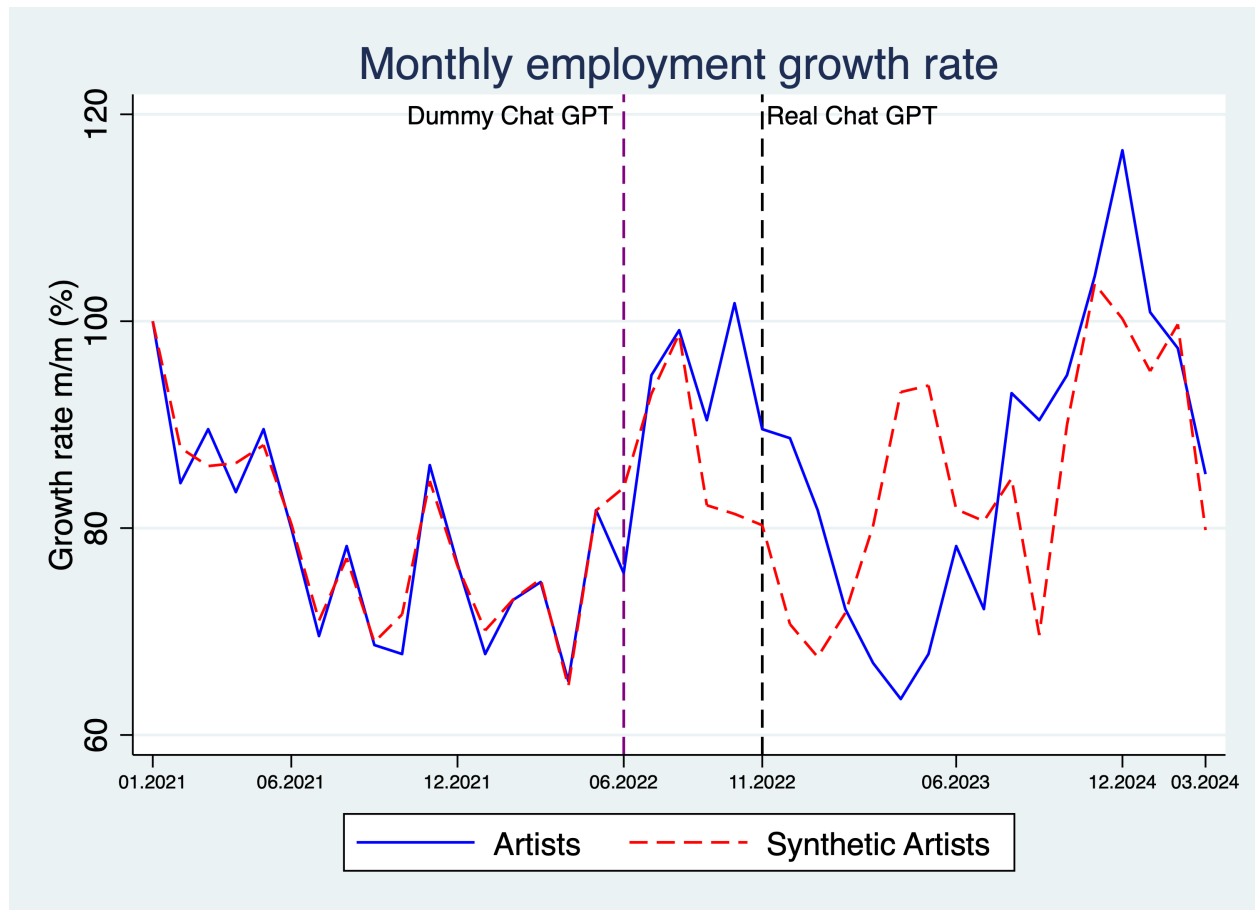
Notes: These figure shows the employment in the ten most endangered occupations + Artists in the period of 01.2021 - 03.2024. The endangered occupations include Telemarketers, Postsecondary Teachers, Social Scientist, Lawyers, School psychologist, Procurement Clerks, Human Resources Specialists, Management Analysts, Loan interviewers and clerks and Public Relations Specialists.

Figure 2: Impact of ChatGPT Inception on Monthly Employment Growth Rate of Artists



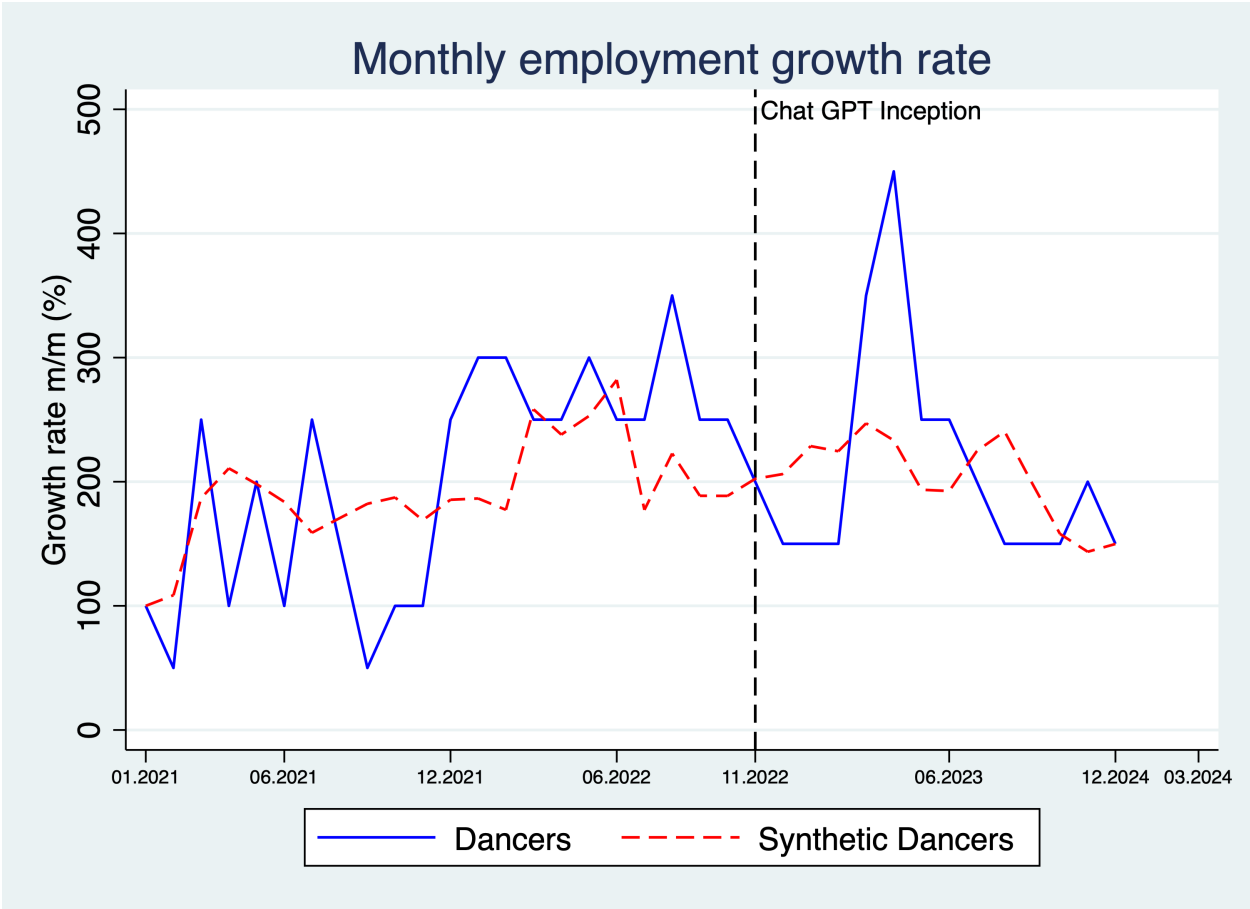
Notes: This graph depicts the monthly employment growth rate (month-over-month percentage change) for artists and synthetic artists from January 2021 to March 2024. The solid blue line represents the employment growth rate for artists, while the dashed red line represents the employment growth rate for synthetic artists.

Figure 3: Impact of 'dummy' ChatGPT Inception on Monthly Employment Growth Rate of Artists



Notes: In this graph control group has been treated with AI treatment 6 months prior to the real ChatGPT inception. If the AI treatment has a real impact on artist employment paths should not derive upon 'dummy treatment' but only after the real ChatGPT appeared. The solid blue line represents the employment growth rate for artists, while the dashed red line represents the employment growth rate for synthetic artists.

Figure 4: Impact of ChatGPT Inception on Monthly Employment Growth Rate of Dancers



Notes: This graph control group has been selected as Artist, which is occupation not threatened by AI. If the model estimates are correct, the path of real Dancers should not diverge negatively compared to synthetic artists after ChatGPT he solid blue line represents the employment growth rate for dancers, while the dashed red line represents the employment growth rate for synthetic dancers.