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RESEARCH PAPER

The Determinants of Countercyclical Job Satisfaction in the Public Sector

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Abstract
Job satisfaction is sensitive to economic fluctuations; it rises during economic growth and falls in recessions. Job satisfaction also depends on relative comparisons. For workers less affected by business cycles-as is typical in the public sector-job satisfaction may thus be countercyclical due to comparisons with other sectors. Previous laboratory results confirm this countercyclical trend. This study reports new results from the German Socio-Economic Panel confirming the overall countercyclical job satisfaction trend but also revealing this trend is present only among men, not women. We consider three possible drivers of this gender gap. Competitiveness and pro-sociality differ between men and women both in the laboratory and in the field and plausibly interact with job satisfaction countercyclicality. Another potential explanation of countercyclicality is that men are more commonly the primary household providers. We conducted an experiment to explore these three channels. The experiment replicated the countercyclical job satisfaction trend. While identifying a significant gender gap in competitiveness, pro-sociality, and job satisfaction, we found no difference in job satisfaction cyclicality between men and women, nor a correlation with these traits. Our findings suggest that the fundamental gender differences we identified in the laboratory do not drive the gender differences observed in the survey data.

Keywords Public sector · Incentives · Subjective well being · Job satisfaction · Laboratory experiment · Gender differences

JEL Classification C91 · J28 · J45

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1 Introduction

In recent decades, subjective well-being has garnered significant attention in economic research (Frey & Stutzer, 2001; Frey, 2010). Policymakers, national leaders, and economists have started to consider subjective well-being as a crucial indicator of economic performance. Consequently, several countries have incorporated well-being indices into traditional economic success measures, such as GDP.[1] Since people spend a considerable portion of their lives at work, job satisfaction emerges as a vital component of subjective well-being (Sousa-Poza & Sousa-Poza, 2000; Bowling et al., 2010; Dawson et al., 2014). Enhancing job satisfaction can also bolster economic efficiency by reducing job separations and augmenting productivity (Clark, 2001; Bryson et al., 2017; Platis et al., 2015).

Subjective well-being is predominantly sensitive to relative comparisons rather than absolute ones (Luttmer, 2005; Ferrer-i Carbonell, 2005; Carlsson et al., 2007; Clark et al., 2008; McBride, 2010). Specifically, an individual's job satisfaction is sensitive to their relative income level (Clark & Oswald, 1996; Hamermesh, 2001; Card et al., 2012). In a two-sector economy, public sector remuneration is typically less susceptible to economic fluctuations than private sector remuneration. As a result, economic growth may worsen the relative position of public sector workers compared to their private sector counterparts, even if their absolute income increases. In line with this reasoning, Ravid et al. (2017) found in a laboratory experiment that job satisfaction in the public sector correlates negatively with economic cycles. Consequently, when external market conditions improve for all, job satisfaction declines for public sector workers, who are less affected.

This study extends the findings of Ravid et al. (2017) by employing a two-stage research methodology. The first stage analyzes a large dataset survey panel based on the German Socio-Economic Panel (Goebel et al., 2019) involving 30,000 individuals surveyed over 30 years (1984-2015). The study examines whether the countercyclical public-sector job satisfaction observed in the laboratory by Ravid et al. (2017) also exists in real-world conditions. The results confirm the countercyclical effect observed in the laboratory, thereby corroborating the previous laboratory findings with real-world data. Interestingly, the survey also reveals a gender difference, as the countercylicality is only apparent for men but not for women. In the next part of the paper, we report a laboratory experiment that investigates the gender disparity detected in the survey data.

The potential explanations fall into two categories: first, generalizable gender differences that can be identified and analyzed in a laboratory setting; and second, labor market traits correlated with gender that aren't replicable in laboratory settings.[2] For each of these categories, we identify relevant factors and examine their impact on the countercyclicality of job satisfaction.

In the first category, we consider three possible explanations: First, women tend to report higher job satisfaction than men (Clark, 1997; Hodson, 1989; Sousa-Poza & Sousa-Poza, 2000, 2003), even though they earn less and often hold lower-ranking positions (Card et al., 2015; Blau & Kahn, 2017), which suggests they might be less sensitive to relative comparisons; Second, women are less likely to enter competitive environments than men

[1] Examples include Bhutan pioneering the incorporation of well-being indices by establishing the Gross National Happiness Index; the UK implementing measures of national well-being in 2011 through the Office for National Statistics; and New Zealand initiating a 'Well-being Budget' in 2019 that goes beyond GDP to emphasize the well-being of its citizens.

[2] The controlled environment of the laboratory allows us to determine if the observed gender disparities are inherent by eliminating any potential extrinsic variables associated with gender.

(Niederle & Vesterlund, 2007, 2011; Gneezy et al., 2003) and tend to be more risk-averse than men (Jianakopolos & Bernasek, 1998; Croson & Gneezy, 2009), preferring less risky jobs with more stable pay, which could indicate a reduced emphasis on relative income comparisons; third, women are generally more likely to display pro-social behavior (Olsson et al., 2021; Espinosa & Kovářík, 2015; Eagly & Crowley, 1986). Such pro-social females could be less affected by relative comparisons and thus respond less intensely to job satisfaction countercyclicality.[3] If these basic gender differences can be replicated in the laboratory, we hypothesize that they also drive the gender effects observed in the survey.

In the second category, we propose the role of the household provider as a potential influencer. Typically, women occupy lower-ranking positions and receive lower salaries, rendering them less likely to be the primary household provider (Loscocco & Spitze, 2007; Bielby & Bielby, 1992). We hypothesize that primary providers, due to their heightened financial responsibility, may display more sensitivity towards salary comparisons. While this variable correlates with gender in real-world labor market data, it is not inherently tied to gender and may not be present in the laboratory. To examine this explanation, our experiment simulated a household with two unequal providers: the primary provider responsible for the majority of household income and a secondary provider contributing significantly less. We then tracked their job satisfaction within a simulated two-sector economy experiencing business cycles.

In our laboratory experiment, we seek to address four research questions. First, we investigate whether the lab experiment can replicate the main countercyclical effect of job satisfaction in the public sector. Second, we examine if the lab experiment can reproduce the observed gender differences in the countercyclical effect as observed in the SOEP survey data. Third, we explore whether the fundamental gender differences- competitiveness and pro-sociality-impact the countercyclical effect. Lastly, we probe whether having increased responsibility for others' payments, as is typically the case for household providers, could explain the countercyclical effect.

Our results confirm the first question, as the experiment successfully replicates the countercyclical effect found in both the SOEP survey data and the previous laboratory experiment by Ravid et al. (2017). Our findings reveal that women report higher job satisfaction, exhibit more pro-social behaviors, and show less competitiveness compared to men, consistent with existing gender-based literature. However, contrary to our second and third research questions, we find no correlation between gender and the countercyclical effect, nor between the countercyclical effect and either competitiveness or pro-sociality. Thus, we conclude that the gender disparities observed in the survey data are not driven by inherent gender differences that can be replicated in a laboratory setting.

Concerning the last question, our findings do not identify a correlation between household provider type and the countercyclical effect. We propose two potential explanations: First, our experimental settings might not fully capture the meaning of being the primary provider in real-life conditions. Second, the observed gender differences in the survey may be influenced by another gender-correlated factor, unique to the labor market, that we did not examine. In the discussion section, we propose two potential unexplored factors that could explain the observed gender disparities in the survey data.

[3] Drawing from the Social Value Orientation test, we categorize individuals into two groups: pro-self individuals, who focus on maximizing personal gains with limited regard for others, and pro-social individuals, who express concern for the wellbeing of others. Our hypothesis posits that pro-self individuals may be more sensitive to relative comparisons, thereby reacting more strongly to the countercyclical effect.

The remainder of the paper is organized as follows: In Sect. 2, we present the methodology and results of the real-world survey analysis. Section 3 describes the experimental design and implementation; Sect. 4 describes the experiment results; and finally, Sect. 5 concludes.

2 Evidence from a Real-World Panel Survey

In this section, we delve into real-world data to explore the dynamics of job satisfaction in the public sector during economic fluctuations. Using data from the German Socio-Economic Panel (SOEP) (Goebel et al., 2019), our objective is to validate the the laboratory findings of Ravid et al. (2017), and to probe potential moderating factors. The SOEP, an extensive longitudinal survey, includes annual data from approximately 12,000 German households, providing a rich source for our analysis. The dataset included the years 1984 to 2015, capturing a period of significant economic changes in Germany. However, in our analysis, we specifically focuses on the post-1990 era, the period after German reunification, to ensure a uniform metric for economic growth across the unified country. The analysis was restricted to employees within the public and private sectors, based on participants' self-reported sector of employment. We excluded self-employed individuals, the unemployed, those who had negative income, and participants who switched sectors during the study period.

To assess the relationship between job satisfaction and economic cycles, and to explore gender-specific differences, we employed Random-effects GLS regressions. This approach is particularly suitable for panel data, allowing us to model individual-specific variations. We adjusted the standard errors for clustering at the individual level, addressing potential correlations in the repeated observations for each individual. The dependent variable in our regression was job satisfaction, rated on an 11-point scale from 0 (lowest satisfaction) to 10 (highest satisfaction). Our primary independent variable was the annual GDP per capita growth percentage in Germany, a national-level indicator representing economic cycles. This measure, which is expressed as a percentage, indicates the year-over-year change in GDP per capita, thereby serving as a barometer for economic conditions. We obtained this data from the World Bank database (WorldBank, 2023). We also considered sector type as a key independent variable, distinguishing between public (0) and private (1) sector employment. An interaction term between these two indipendent variables-sector type and GDP growth-was included to examine how the impact of economic fluctuations on job satisfaction differs between sectors. Our analysis was segmented into three groups: the overall workforce, and male and female workers separately, to identify any gender-based disparities.

The results of the regressions are presented in Table 1. The analysis of the total worker group (column 1) reveals a positive and statistically significant interaction effect (0.0113, $p = 0.001$) between annual GDP Per Capita Growth percentage and sector type (row 3). This finding suggests that, across all surveyed workers, job satisfaction in the public sector tends to rise during economic downturns and fall during periods of economic growth, compared to the private sector. This empirical observation aligns with the countercyclical job satisfaction trend in the public sector, previously reported in laboratory study by Ravid et al. (2017).

Moreover, our findings reveal a notable gender disparity in this trend. For male workers (column 3), the interaction effect is markedly positive (0.0237) and statistically significant

Table 1 Regression analysis of job satisfaction by sector, GDP growth, and gender in the SOEP survey

Variables	Job satisfaction		
	Total Workers	Female Workers	Male Workers
Sector Type (Private=1, Public=0)	−.2351***	−.1713***	−.3121***
	(.0217)	(.0079)	(.0308)
Annual GDP Per Capita Growth (%)	−.0080	−.0037	−.0139*
	(.0069)	(.0079)	(.0081)
Sector Type · GDP Per Capita Growth	.0113***	.0017	.0237***
	(.0057)	(.0054)	(.0074)
Observations	135076	62276	72800

Note: Robust standard errors clustered on individuals in parentheses.

*** $p < .01$, ** $p < .05$, * $p < .1$

($p < 0.001$), indicating a pronounced sensitivity of their job satisfaction to economic fluctuations. In contrast, female workers (column 2) show a negligible and statistically insignificant interaction effect (0.0017, $p = 0.755$), suggesting their job satisfaction remains largely unaffected by economic cycles. Consequently, we conclude that the countercyclical impact of GDP on job satisfaction in the public sector is more pronounced among male workers than female workers. For further analysis of SOEP data, including population statistics, job satisfaction trends, GDP data over the study period, and analysis by working age groups for enhanced robustness, please refer to Sect. A.1 in the Appendix.

The survey data findings, particularly the gender disparities, underscore the need for further investigation. In the following section, we delve into a laboratory experiment to investigate potential reasons for these gender differences in the countercyclical effect.

3 Experimental Design and Procedure

3.1 The Environment

The purpose of the experiment is to complement the findings of the survey data by replicating the main countercyclical effect and exploring the determinants of such differences. Drawing on the paradigm presented by Ravid et al. (2017) our laboratory experiment emulates a two-sector economy experiencing economic cycles, with sectors uniquely characterized by their payment structures. In this simulated market, participants perform a real-effort task, the slide task (Gill & Prowse, 2011). Their remuneration is contingent on both their performance and the state of the economy.

Participants are given 60 s to center as many of the 36 sliders as possible using only the mouse, with the total productivity for the round defined by the number of sliders successfully centered within the allocated time. The experiment mirrors a market susceptible to economic volatility, where the state of the economy is expressed on a scale from -5 (worst) to +5 (best) and is announced at the beginning of each round. We specifically designed the "private" sector's payment to exhibit higher sensitivity to individual performance and

economic shifts than the "public" sector, enhancing the experiment's realism.[4] We capture these differences by means of a coefficient that determines payoff sensitivity to the state of the economy and the worker's productivity.

We extend the previous experiment by testing whether elements such as gender, willingness to compete, job satisfaction, and social value orientation moderate the countercyclical effect. To disentangle the potential impact of being the primary income provider, we have incorporated a provider treatment, that mimics a two-provider household, wherein the primary provider contributes 80% and the secondary provider 20% of the total household income.[5] This strategic experimental design enables us to evaluate if the outcomes from the survey data truly mirror inherent gender disparities and further allows us to scrutinize the factors precipitating such disparities.

3.2 Experimental Procedure

The experiment was conducted at the Experimental Economics Laboratory at the Department of Economics of Ben-Gurion University of the Negev and programmed using z-Tree (Fischbacher, 2007). Participants were recruited using ORSEE (Greiner, 2015). The experiment included 72 subjects, consisting of 37 females and 35 males, across seven sessions. Each session consisted of 31 rounds, divided into three stages and lasted approximately 50 min. The average payout was 50 NIS, equivalent to approximately $15. Participants were presented with on-screen instructions and had the opportunity to privately ask questions. The experiment began once all participants confirmed their understanding of the instructions. Participants were randomly assigned to either the public or private sectors, with sector affiliation remaining fixed throughout the session.

Each round consisted of four phases. First, participants were informed of the current state of the economy, which was predetermined and uniform for all participants. Second, participants performed the effort task. During this task, participants could observe the remaining time, the state of the economy, their cumulative output, their cumulative salary, and the salary of a hypothetical worker with identical output in the other sector. Third, after the completion of the task, participants received summary feedback from each round, which included all of the aforementioned parameters. Lastly, participants ranked their satisfaction with the round on a scale of 1 to 7 in four dimensions: general satisfaction, salary satisfaction, performance satisfaction, and sector affiliation satisfaction. Refer to Sect. A.3 in the Appendix for a screenshot of the effort task, the feedback screen, and the satisfaction questionnaire screen.

The payoff for each round was determined by the sector coefficient, the state of the economy, and the individual's productivity according to the following formula:

$$\pi_{it} = 50 + \left(M_t + \frac{P_{it} - 12}{2} \right) \cdot S_i, \tag{1}$$

where $M_t \in \{-5, -4, \ldots, 5\}$ denotes the state of the economy, $P_i \in \{0, 1, \ldots, 36\}$ denotes the individual's productivity, $S_i \in \{1, 4\}$ denotes the sector coefficient (public and private, respectively), and π_{it} denotes the payoff for each round. Thus, sensitivity to changes in the

[4] We use the terms private sector and public sector rather than sector 1 and sector 2 in order to make the experiment seem more realistic.

[5] These proportions have been selected arbitrarily with the aim of replicating a household scenario where one individual predominantly shoulders the financial responsibilities.

state of the economy and productivity is four times greater in the private sector than in the public sector. The salary of a worker in the public sector ranges from 39 to 67, as compared to 6 to 118 in the private sector.[6] The instructions did not inform participants of the exact payoff function but did indicate that wages increase with the state of the economy and with individual productivity, and are more sensitive to both factors in the private sector.

The 31 rounds of the experiment were divided into the following three stages:

1. Practice Stage: three rounds in which the participants familiarize themselves with the effort task.
2. Basic Stage: fourteen rounds in which participants performed the effort task and received payment based on their sector affiliation, the state of the economy, and their productivity.
3. Provider Stage: fourteen rounds identical to the Basic Stage, except participants were randomly paired to simulate a household scenario. In this setup, the primary provider contributes 80% and the secondary provider contributes 20% to the total household income, as given by formula 1. Participants were paid equally based on their joint household income.[7]

Upon completion of the three stages of the effort task, participants proceeded to complete the following three assignments:

1. Personal questionnaire: Participants completed a short survey that asked about their basic information and life preferences. Refer to Sect. A.4 in the Appendix for the list of questions.
2. Social Value Orientation (SVO) test: Participants were asked to make six allocation decisions between themselves and another participant, with their choices used to determine their social orientation: individualistic, Competitive, Cooperative, or Altruistic, as per Murphy et al. (2011).
3. Competitiveness test: Participants were randomly paired and competed in two additional rounds of the slider task. Their choice between a guaranteed or performance-based reward in the second round served as an indicator of their willingness to compete, following the method of Niederle & Vesterlund (cf. 2007).

The experiment concluded with a screen displaying the total earnings accumulated from all stages: the Basic stage, the provider stage, the SVO test, and the competitiveness test.

3.3 Hypotheses

Our initial aim is to replicate the countercyclical patterns in job satisfaction as discerned in both the laboratory experiment by Ravid et al. (2017) and our analysis of the SOEP survey data. Accordingly, our first hypothesis suggests that relative comparisons lead to countercyclical effects on job satisfaction in the public sector.

[6] The payoff function produces identical salaries in both sectors when the economy is in a neutral state of zero and at an average output of 12.

[7] In this stage, the feedback screen also included the partner's salary and the total household income. The satisfaction questionnaire also included satisfaction with household income and with being the primary or secondary provider.

Hypothesis 1 General satisfaction in the public (private) sector decreases (increases) with the state of the economy.

Beyond general satisfaction, we also examine three specific measures of satisfaction: satisfaction with sector affiliation, salary, and performance. We hypothesize that satisfaction with sector affiliation and salary may vary inversely with economic cycles, but this might not apply to satisfaction with performance. This is because performance satisfaction is predominantly related to personal achievement and might be less susceptible to external comparisons. These additional measures can illuminate the factors affecting the countercyclical effect.

Next, we extend the scope of the previous experiment to investigate whether the gender difference in job satisfaction countercyclality also exists in the lab, leading to the following hypothesis:

Hypothesis 2 Men respond more strongly to job satisfaction countercyclicality than women.

Following this, we investigate two potential mechanisms contributing to this gender disparity: inherent gender differences and gender-correlated factors. Starting with inherent gender differences, we examine job satisfaction, willingness to compete, and prosocial behavior. As auxiliary hypotheses, we anticipate that our experimental data will mirror these fundamental gender disparities. Specifically, we expect female participants to report higher job satisfaction, to display more pro-social behavior, and to show a lower propensity to compete. If the results reveal some of these gender disparities, they may also account for the gender effects observed in the survey data.

Next, we explore whether these fundamental gender disparities influence countercyclicality. We hypothesize that individuals with an increased willingness to compete, given their tendency to engage more in relative comparisons, may exhibit a stronger response to job satisfaction counterciclality.

Hypothesis 3 Individuals with a higher willingness to compete respond more strongly to job satisfaction countercyclicality.

We then probe if pro-self individuals, those focusing on maximizing personal gains with minimal regard for others, display a higher sensitivity to relative comparisons.

Hypothesis 4 Pro-self individuals react more strongly to job satisfaction countercyclicality.

Lastly, we explore the second potential mechanism: gender-correlated factors in the labor market. Specifically, we assess whether the role of the primary provider within a household influences the countercyclical effect due to the associated added responsibilities. This leads to our final hypothesis:

Hypothesis 5 Primary providers react more strongly to job satisfaction countercyclicality.

Table 2 Regression results for the countercyclical effect on job satisfaction dimensions

Variables	Job satisfaction			
	(1)	(2)	(3)	(4)
	General	Salary	Sector	Output
Sector type (Private=1, Public=0)	−1.114***	−1.959***	−1.801***	−0.849**
	(0.379)	(0.378)	(0.397)	(0.405)
Market state	−0.073***	−0.028**	−0.276***	0.019
	(0.014)	(0.014)	(0.014)	(0.014)
Sector type · Market State	0.333***	0.367***	0.564***	0.126***
	(0.019)	(0.019)	(0.020)	(0.020)
Period	−0.023***	−0.009	−0.013	−0.013
	(0.008)	(0.008)	(0.009)	(0.009)
Productivity	0.090***	−0.047***	−0.117***	0.202***
	(0.017)	(0.017)	(0.018)	(0.018)
Sector type · Productivity	0.122***	0.185***	0.207***	0.094***
	(0.025)	(0.025)	(0.026)	(0.026)
Observations	1,008	1,008	1,008	1008
Number of subjects	72	72	72	72

Note: Robust standard errors clustered on individuals in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

4 Experimental Results

4.1 Replication of Previous Study Results

Our initial goal was to validate and replicate the overall countercyclical effect of job satisfaction before delving into gender differences and other potential moderators within this phenomenon. To accomplish this, we conducted a series of mixed-effects linear regressions during the Basic stage (rounds 3 to 17) of our experiment. This method is particularly suited to the mixed design of our experiment, which combines between-subjects elements (fixed sector affiliation) and within-subjects elements (repeated measures across rounds). Mixed-effects models allow us to capture individual-level random variations effectively, ensuring results consistency. To further ensure robust inference, standard errors were clustered by individual to acknowledge the correlation within each participant's observations across multiple rounds. This approach, complemented by additional analyses using individual fixed effects, bolsters the reliability of our findings by appropriately addressing within-subject correlations alongside the fixed effects of sector affiliation.

Our dependent variables comprised four distinct dimensions of job satisfaction: general satisfaction, satisfaction with salary, satisfaction with sector affiliation, and satisfaction with performance, each measured on a 1 to 7 scale. The key independent variables in our analysis were the Market State, represented as a continuous variable from − 5 to + 5 to capture economic fluctuations, and Sector Type, categorized as public (0) or private (1). We also included an interaction term between sector type and market state to measure how the relationship between job satisfaction and the market state differ between the public and

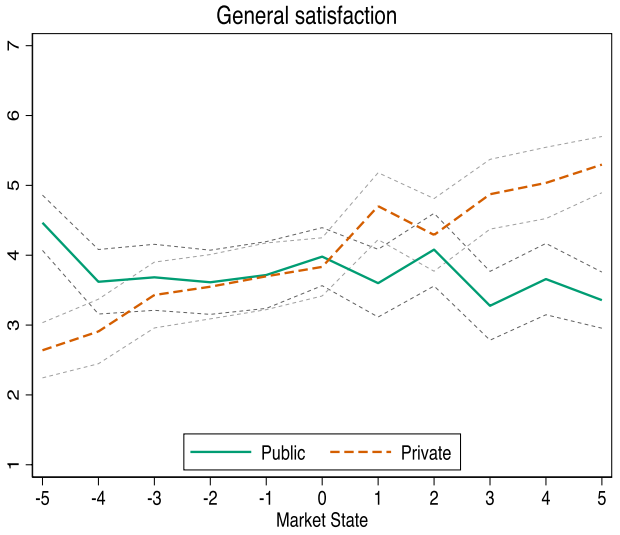


Fig. 1 General staisfaction

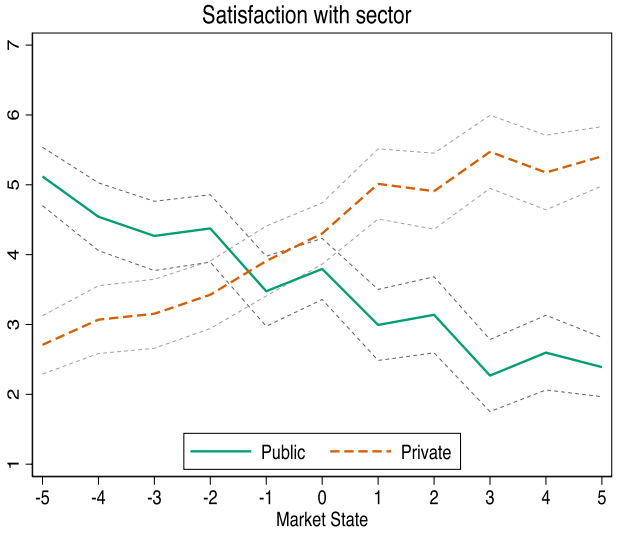


Fig. 2 Sector staisfaction

the private sectors. Additionally, we incorporated round (time) and productivity (output) as variables. An interaction between sector type and productivity was also included to examine how productivity's impact on job satisfaction varies between sectors.

The results of these regressions are illustrated in Table 2. Figures 1, 2, 3 and 4 provide a visual interpretation of these findings.

Our analysis, begining with general job satisfaction (Column 1), identifies a distinct countercyclical trend. The negative Market State coefficient (−0.073) in row 2 indicateds that job satisfaction in the public sector decreases with economic growth. Conversely, the private sector shows an increase in job satisfaction with economic growth, as indicated by the positive interaction effect (0.333) between Sector Type and Market State in row 3. This countercyclical trend is visually depicted in Fig. 1, aligning with Hypothesis 1.

Fig. 3 Salary staisfaction

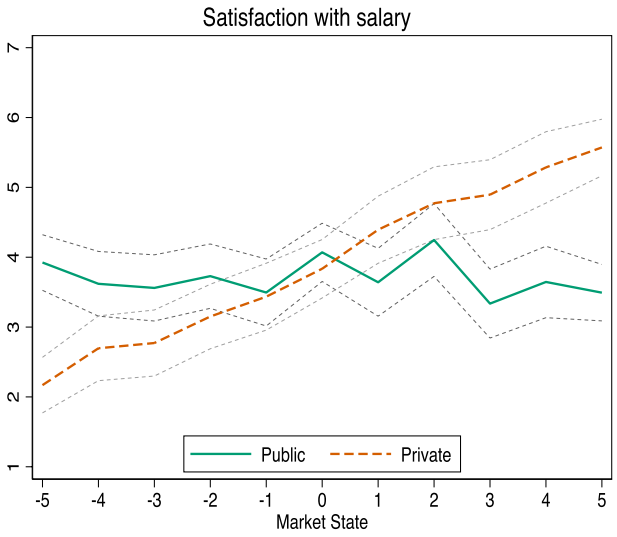
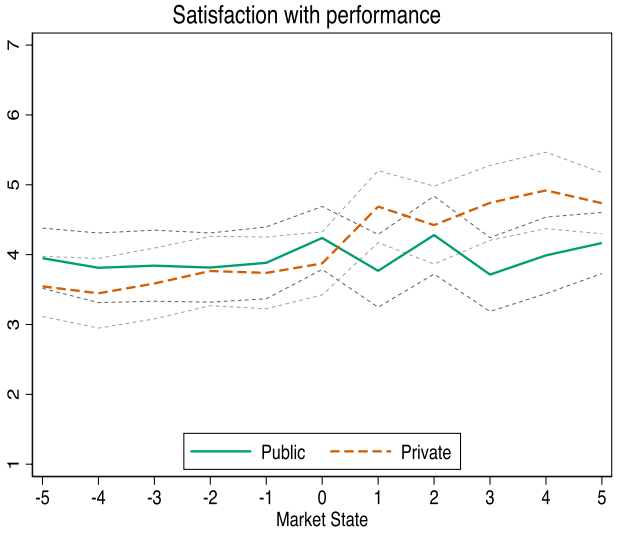


Fig. 4 Performance staisfaction



The trend extends to satisfaction with salary (Column 2) and sector affiliation (Column 3), where the negative coefficients for Market State in row 2 suggest that these satisfactions decline in the public sector during times of economic growth. Conversely, the positive interaction terms between Sector Type and Market State in row 3 indicate an increase in satisfaction within the private sector under similar conditions of economic growth. These observations are further illustrated in Figs. 2 and 3. In contrast, satisfaction with productivity (Column 4) is less affected by economic changes, as suggested by the insignificant Market State coefficient and as visualized in Fig. 4. This likely stems from its association with personal achievement rather than external economic conditions. However, the significant interaction between market state and sector type indicates that that relative comparisons still play a role.

Overall, these results replicate the findings of the Ravid et al. (2017) experiment and also align with the results from the SOEP data survey analysis discussed previously in Sect. 2. For in-depth analyses of our experiment data, including summary statistics and robustness checks, please see the Sect. A.2 in the Appendix.

4.2 Gender Impact on the Countercyclical Effect

In the next phase of our analysis, we explored gender disparities and additional potential moderators that could influence the countercyclical effect on job satisfaction. This effort aimed to identify the underlying reasons for the gender differences observed in the SOEP survey data.

To conduct this part of the analysis, we applied the regression framework previously outlined in Sect. 4.1, treating general job satisfaction as the dependent variable and maintaining the same set of independent variables. This round of regression analyses focused on evaluating the influence of four distinct moderators on job satisfaction: gender, competitiveness level, prosociality level, and provider type.[8] In our regression, gender coding assigned males as 1 and females as 0. Competitiveness level was determined through participants competitiveness test assignment, categorizing them as either Competitors (1) or Non-Competitors (0). The prosociality level was determined based on participants' responses in the Social Value Orientation (SVO) test, classifying them as either individualistic (1) or prosocial (0).[9] The provider type was defined according to participants' roles in the Provider Stage as either Primary Provider (1) or Secondary Provider (0). Table 3 details the outcomes of these regression analyses. To provide a visual interpretation of how each moderator influences job satisfaction across different market states, Figs. 5, 6 and 7 plot the predictions of the regressions by the state of the economy for each of the four characteristics side by side.

Beginning our analysis with gender (column 1), we examined the interaction effect between market state, sector type, and gender on job satisfaction (row 10). This interaction shows no statistical significance, indicating that the countercyclical effect on job satisfaction does not differ between genders. Figure 5 supports this finding by further visualizing no noticeable countercyclical disparity between genders. Consequently, we reject hypothesis 2.

The absence of detectable gender differences in the countercyclical effect within our experimental data could stem from three possibilities. First, the relevant factors- competitiveness, pro-sociality, and job satisfaction-might not actually differ between genders in our settings. Second, these factors may not contribute to the observed effect. Third, it could be a combination of both of these circumstances. We explore these possibilities in the following two sections.

[8] The examination of gender, competitiveness, and prosociality took place during the Basic stage of the experiment (rounds 4 to 17) while the analysis of provider type was conducted during the Provider stage (rounds 18 to 31).

[9] To simplify the categorization, the study combined the Individualistic and Competitive categories with the Cooperative and Altruistic categories, resulting in two broad categories: individualistic and prosocial.

Table 3 Regression results for potential moderators

Variables	Dependent Variable: General Satisfaction			
	Gender	Compete	Pro-sociality	Provider
Sector type (Private=1, Public=0)	−1.401***	−1.143**	−0.839*	−1.599***
	(0.433)	(0.448)	(0.416)	(0.492)
Market state	−0.081***	−0.067***	−0.075***	−0.105***
	(0.019)	(0.021)	(0.018)	(0.018)
Sector type · Market State	0.351***	0.330***	0.304***	0.384***
	(0.027)	(0.027)	(0.026)	(0.025)
Period	−0.024***	−0.024***	−0.024***	−0.003
	(0.009)	(0.009)	(0.009)	(0.008)
Productivity	0.092***	0.088***	0.088***	0.079***
	(0.018)	(0.018)	(0.018)	(0.018)
Sector type · Productivity	0.121***	0.125***	0.131***	0.103***
	(0.026)	(0.026)	(0.026)	(0.026)
Moderator	−0.773**	−0.027	−0.438	−0.443
	(0.331)	(0.336)	(0.324)	(0.372)
Moderator · Sector type	0.609	−0.054	−0.691	0.806
	(0.466)	(0.478)	(0.453)	(0.526)
Moderator · Market State	0.016	−0.012	0.003	−0.031
	(0.028)	(0.028)	(0.028)	(0.025)
Moderator · Sector type · Market State	−0.039	0.003	0.058	−0.013
	(0.039)	(0.039)	(0.039)	(0.036)
Observations	1,008	1,008	1,008	1,008
Number of subjects	72	72	72	72

Note: Robust standard errors clustered on individuals in parentheses

*** p<0.01, ** p<0.05, * p<0.1

*G*ender: Male=1, Female=0; Compete: Competitor=1, Non Competitor=0; Pro-sociality: Prosocial=0, Individualistic=1; Provider: Primary=1, Secondary=0

4.3 Exploring Gender Differences in Our Data

Regarding the first possibility, we successfully identified, as anticipated, three fundamental gender disparities in the experimental results, consistent with existing literature. Table 4 explores how competitiveness, prosociality, and job satisfaction vary between male and female participants in our experiment.

First, the data shows a distinct difference in competitiveness between genders, with women displaying less competitiveness compared to men, opting for competition significantly less often, a finding that aligns with previous literature (Niederle & Vesterlund, 2007, 2011; Gneezy et al., 2003). In the experiment, almost two-thirds of the male participants (62.9%) chose competition, compared to merely a third of the female participants (35.1%).[10] This disparity obviously carries statistical significance, according to Fisher's Exact Test ($p < 0.001$), indicating a highly significant difference between the genders.

[10] We use general satisfaction as the satisfaction measure for this test.

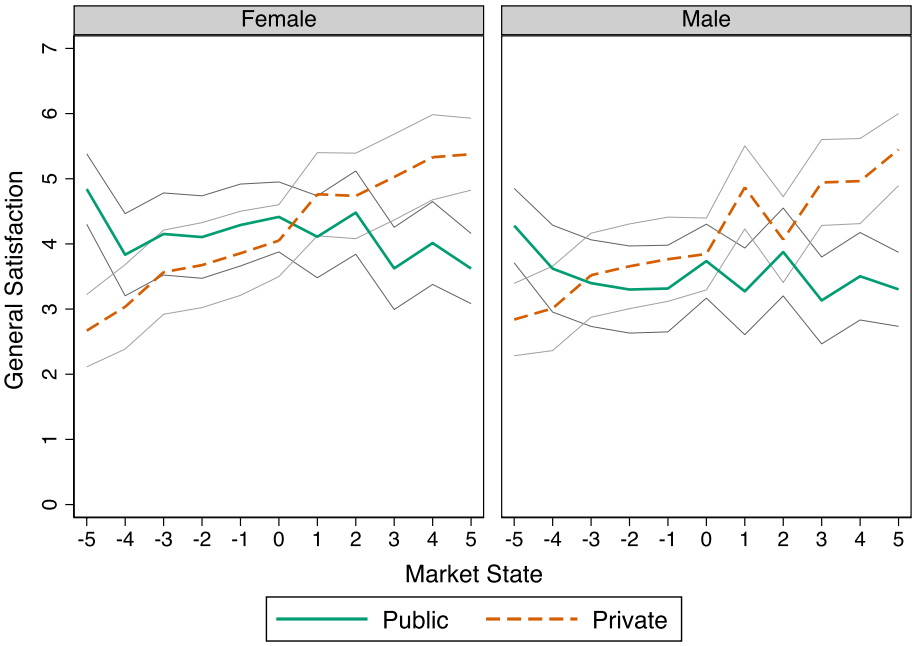


Fig. 5 Impact of Gender on Countercyclical Job Satisfaction Across Sectors

Table 4 Gender differences in competitiveness, prosociality, and job satisfaction across basic and provider stages

Gender	Competitiveness (%) Non Competitor / Competitor	Prosociality (%) Prosocial / Individualistic	Job Satisfaction Average
Female	64.9 / 35.1	62.1 / 37.9	4.18
Male	37.1 / 62.9	47.6 / 52.4	3.87

Second, the experimental results revealed a gender difference in pro-social behavior, with women demonstrating a higher level of pro-social behavior compared to men. This finding is consistent with previous literature (Olsson et al., 2021; Eagly & Crowley, 1986). The participants' choices in the SVO test allowed for the computation of the SVO angle, which assessed their social value orientation as either prosocial or individualistic. Our results show that among female participants, 62.1% were identified as Prosocial and 37.9% as Individualistic. For male participants, 47.6% were identified as prosocial, and 52.4% as Individualistic. Once again, the observed disparity is statistically significant, supported by Fisher's Exact Test ($p < 0.001$).

Third, our analysis reveals a significant gender disparities in job satisfaction, with women reporting a notably higher average score (4.18) compared to men (3.87). This difference is statistically significant ($p < 0.001$) according to a t-test, underscoring a distinct gap in job satisfaction levels between genders. This finding is further supported by the

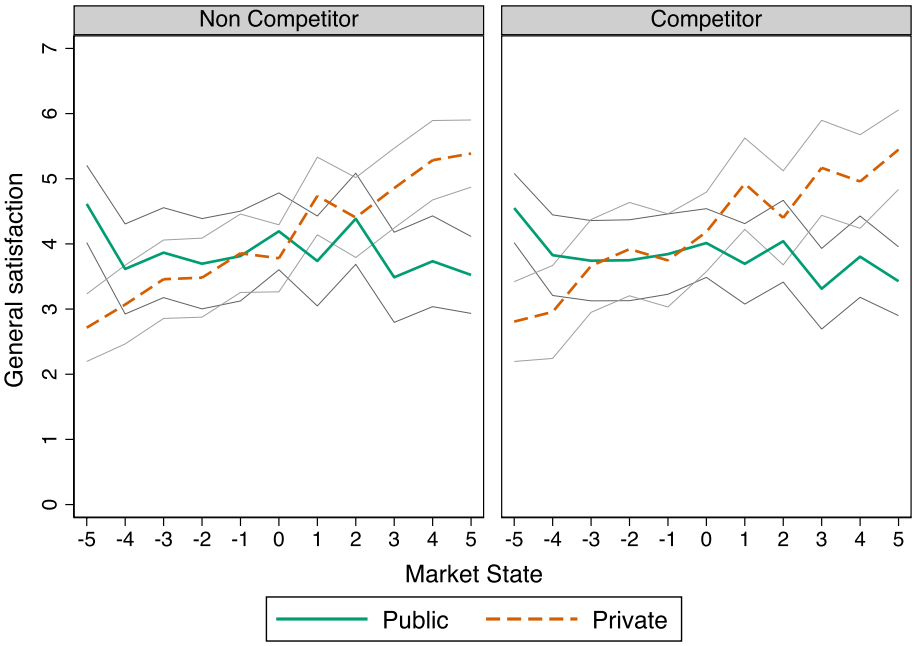


Fig. 6 Impact of competitiveness on countercyclical job satisfaction across sectors

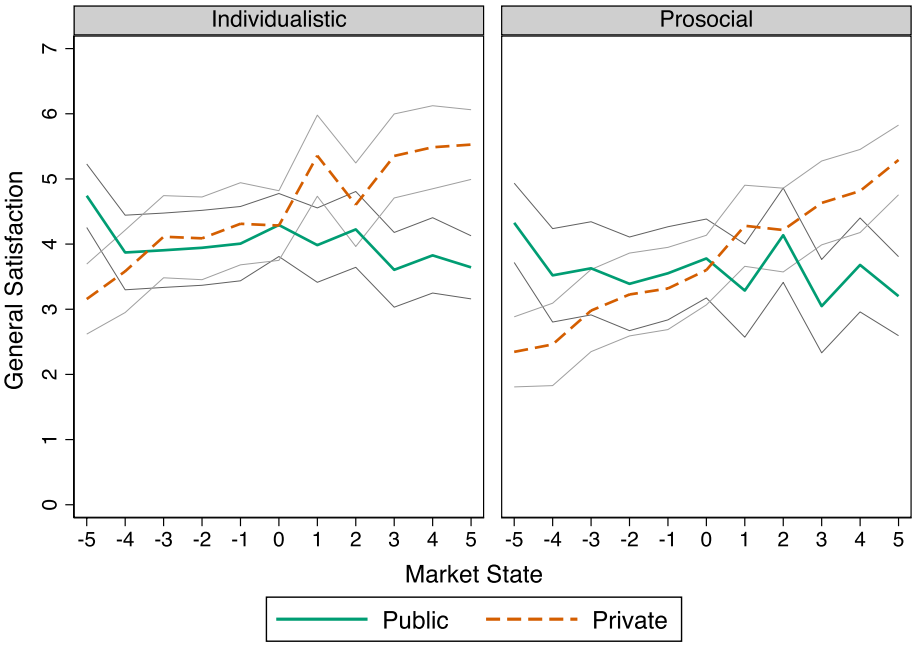


Fig. 7 Impact of pro-sociality on countercyclical job satisfaction across sectors

regression analysis in Table 3, where the coefficient for males in column 1, row 7 is significantly negative (−0.773), indicating that men report lower job satisfaction compared to women. These observations align with existing research, reinforcing the narrative that women tend to experience higher job satisfaction than men (Clark, 1997; Sousa-Poza & Sousa-Poza, 2003).

4.4 Impact of Gender-Based Factors on Countercyclicality

Following the identification of fundamental gender differences within our experimental settings, we extend our investigation to examine how these gender differences influence the countercyclical nature of job satisfaction.

Initially, we assess the role of competitiveness. The interaction effect between market state, sector type, and competitiveness on job satisfaction, presented in column 2 in Table 3, is statistically insignificant. This suggests that there is no countercyclical difference between competitive and non-competitive individuals. Figure 6 visually reinforces this conclusion, displaying no discernible countercyclical differences between competitive and non-competitive participants. We conclude that willingness to compete does not impact the countercyclical effect, leading us to reject Hypothesis 3.

Next, we shift to pro-sociality to explore its potential influence on the countercyclical effect. Once again, Fig. 7 and the interaction effect between market state, sector type, and pro-sociality in column 3 in Table 3 demonstrate no significant influence of pro-sociality on the countercyclical effect and, consequently, dismiss hypothesis 4.

In analyzing our final two observations-the identification of significant gender disparities in competitiveness, pro-sociality, and job satisfaction in our experiment, and the dismissal of their impact on countercyclical job satisfaction-we conclude that these inherent gender differences do not drive the gender disparity in countercyclicality observed in survey data. Therefore, the observed gender disparity in the survey data is not replicable in a laboratory setting, suggesting it may be influenced by gender-related factors unique to the labor market. We explore one of these factors further in the next section.

4.5 Impact of Gender-Correlated Factors on Countercyclicality

Consequently, we consider an alternative explanation for the observed gender disparity in the countercyclical effect, the final moderator in the table: provider type. The responsibility for household financial support shows gender correlation in the labor market, where women commonly occupy lower-ranking positions, but it is not expected to replicate in the lab as it is not an inherent gender characteristic. However, Fig. 8 and the insignificant triple interaction term between market state, sector type, and provider type in column 4 of Table 3 dismiss any influence of the household provider type on the countercyclical effect, thereby rejecting hypothesis 5.

The lack of observed provider type impact on the countercyclical effect in our experiment may be attributed to the limitations of laboratory settings in capturing the real-world

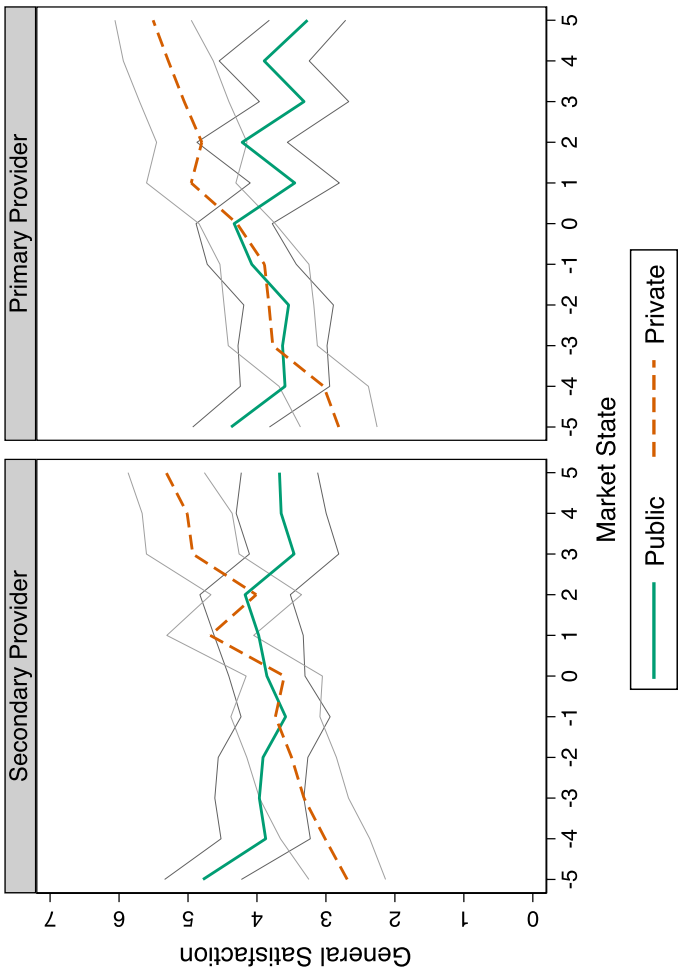


Fig. 8 Impact of household provider status on countercyclical job satisfaction across sectors

responsibilities associated with being a primary provider. Alternatively, the gender disparity found in the survey data could be due to another unexamined gender-correlated factor, suggesting further research into gender-linked influences on observed real-world labor market countercyclicality.

5 Discussion

This study expands the current knowledge of the countercyclical nature of job satisfaction in the public sector and its driving factors. Following the labratory findings of Ravid et al. (2017), we initially examined the countercyclical effect through large survey data from the German Socio-Economic Panel. The survey data confirmed the countercyclical effect but exposed a gender difference in job satisfaction countercyclicality: it was present among men but not women, prompting further laboratory investigation.

Subsequently, we conducted a controlled laboratory experiment that successfully replicated the countercyclical effect, reinforcing the findings of the prior lab work. Despite discovering gender-based variations in competitiveness, pro-sociality, and job satisfaction, these variations, along with gender itself, showed no impact on job satisfaction cyclicality. This led us to conclude that the gender disparities observed in survey data do not stem from any fundamental gender differences that can be reproduced in a lab setting. Alternatively, the gender disparity in countercyclicality observed in real-world surveys may be attributed to factors correlated with gender, unique to the labor market.

We proposed the role of the household provider as a potential gender-correlated factor in this countercyclical effect. However, our experiment did not detect any impact of this factor on job satisfaction countercyclicality. This finding could be due to one of two potential reasons: first, the inability of our experiment settings to accurately reflect the real-world pressures of being a primary provider; or second, the influence of another unexamined gender-correlated factor.

For further research, we suggest analyzing two potential labor market variables: the type of industry and the gender wage gap. Industries demanding physical labor, such as construction and manufacturing,[11] are typically male-dominated (Torre, 2019; Bergmann, 2011). These industries tend to be more sensitive to economic fluctuations (Berman & Pfleeger, 1997; Behun et al., 2018), potentially amplifying countercyclical effects, especially during significant shifts in employment. These might explain the increased men's sensitivity to job satisfaction cyclicality. Similarly, the enduring gender wage gap in the labor market (Maier, 2007; Altonji & Blank, 1999), which could widen during intense economic fluctuations, might enhance sensitivity among higher-earning men due to greater salary variance.

Furthermore, a detailed exploration of labor market dynamics and household contexts in needed to uncover additional factors potentially influencing gender-driven countercyclical job satisfaction. Differences in employment status, notably between full-time and

[11] Other examples include: Oil and Gas, Mining, Logistics and Trucking, Forestry and Fishing, Waste management, and Remediation Services.

part-time roles, may emerge as crucial, especially when individual earnings aren't the primary income source, such as for working pensioners or students. The complexity of household types-from partner and single-parent households to variations in income levels and earning relations within households-could further shapes gendered experiences of job satisfaction. Additionally, social policies, particularly those affecting public sector employment, add another layer of nuance by influencing job security and pension benefits, thereby potentially impacting gender-specific patterns in sectors and job satisfaction. Consequently, future research should investigate these aspects, ideally integrating survey data and experimental methods to uncover the subtle influences on gender-related job satisfaction dynamics.

Appendix

Supplementary Statistical Analyses of the SOEP Survey Data

This appendix section provides additional statistical analyses of the SOEP Survey data. It offers summary statistics of the study population, an examination of job satisfaction and GDP data across the study period, and analysis segmented by working age groups, aimed to further solidify the robustness of our findings.

Descriptive Statistics

Table 5 provides a breakdown of the overall study population by gender and age.

Table 6 displays the employment distribution across public and private sectors by gender, excluding unemployed and self-employed workers.

Table 5 Population statistics by gender and age

Gender	Number of Observations	Mean age (S.D.)	Min age	Max age
Male	155,109	41.67 (12.01)	16	90
Female	136,019	41.12 (11.59)	17	87
Total	291,128	41.40 (11.81)	16	90

Table 6 Distribution of workers in the public and private sectors by gender

Gender	Private sector	Public sector	Total
Male	73,051	17,615	90,666
Female	56,196	24,579	80,775
Total	129,247	42,194	171,441

Table 7 presents a comparison of job satisfaction levels among Germany's overall population, as measured in the SOEP survey, against Germany's GDP per capita growth percentages, sourced from the World Bank database, throughout the study period.

Table 7 Mean Job Satisfaction and GDP per Capita Growth in Germany by Year, 1990-2015

Year	Mean Job Satisfaction	GDP per Capita Growth (%)
1990	7.245	4.352
1991	6.923	4.345
1992	7.206	1.152
1993	7.007	−1.605
1994	6.986	2.103
1995	6.983	1.439
1996	6.972	0.526
1997	6.948	1.700
1998	7.006	1.964
1999	7.002	1.921
2000	7.179	2.823
2001	7.181	1.525
2002	7.136	−0.168
2003	7.111	−0.765
2004	7.006	1.192
2005	6.990	0.764
2006	7.002	3.817
2007	6.963	3.399
2008	6.956	1.275
2009	6.968	−5.379
2010	6.949	4.240
2011	7.024	3.634
2012	7.064	2.206
2013	7.164	−1.599
2014	7.183	3.038
2015	7.164	1.183
Average	**7.007**	**1.343**

Table 8 Gender differences in the countercyclical effects on job satisfaction across age groups

Age Group	Total Workers	Female Workers	Male Workers
Non-working age (Under 25, Over 65)			
Private sector × GDP Growth	.0459**	.0529	.0424
Observations	9,579	4,759	4,820
Working Age (25-64)			
Private sector × GDP Growth	.0111***	-.0019	.0221***
Observations	124,487	57,025	67,462

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Significance for interaction effect only

Robustness Check

To enhance the robustness of our findings from the SOEP data regarding the nature of the gender differences in the countercyclical effect, we conducted an additional regression replicating the methodological framework outlined in the Sect. 2. This involved distinguishing between a working-age group (25-64 years) and those outside this range (under 25 and over 65 years). Table 8 presents the interaction effect of sector type and GDP growth on job satisfaction, segmented by gender and across these age groups. The results confirm the persistence of the overall countercyclical trend in job satisfaction across both age groups. However, the gender disparity in this effect is observed exclusively within the working-age group, in contrast to the non-working age group, which exhibits no significant gender differences.

These results reinforce our study's conclusion that gender disparities observed in countercyclical job satisfaction stem more from labor market dynamics and gender-related roles than from inherent gender differences. The absence of consistent gender disparities across both age groups discounts inherent gender differences as the primary cause. For the working-age group, gender-correlated factors such as occupational types, household responsibilities, and childcare significantly are more pronounced, contributing to the gender gap in job satisfaction. On the other hand, the non-working age group, which predominantly includes students and retirees, shows diminished gender disparities in job satisfaction. This group is characterized by less pronounced gender-differentiated household responsibilities and work commitments, with a tendency towards part-time or reduced-hour engagements.

Table 9 Descriptive statistics of key performance and satisfaction variables across basic and provider stages

Variable	Obs	Mean	Std. Dev	Min	Max
Output	2,016	12.38	3.49	0	23
Salary	2,016	50.27	11.05	10	86
General satisfaction	2,016	4.03	1.61	1	7
Salary satisfaction	2,016	3.90	1.63	1	7
Sector satisfaction	2,016	4.01	1.86	1	7
Output satisfaction	2,016	4.24	1.69	1	7

Table 10 Basic stage analysis: market state, sector performance, and job satisfaction (Rounds 4-17)

Round	Market state	Sector	Avg. output	Avg. salary	Avg. job satisfaction
4	0	Public	10.33	49.17	4.14
		Private	11.14	48.28	3.83
5	2	Public	11.44	51.72	4.25
		Private	10.42	54.83	4.28
6	4	Public	11.69	53.85	3.83
		Private	10.92	63.83	5.11
7	5	Public	11.53	54.76	3.53
		Private	11.25	68.50	5.44
8	3	Public	11.08	52.54	3.36
		Private	10.81	59.17	4.86
9	1	Public	11.69	50.85	3.72
		Private	10.81	51.61	4.72
10	-1	Public	12.14	49.07	3.86
		Private	11.00	44.00	3.72
11	-3	Public	12.39	47.19	3.83
		Private	11.17	36.33	3.47
12	-5	Public	12.19	45.10	4.61
		Private	11.17	28.33	2.83
13	-4	Public	11.94	45.97	3.69
		Private	11.69	33.39	3.03
14	-2	Public	12.53	48.26	3.72
		Private	12.42	42.83	3.81
15	-5	Public	12.86	45.43	4.56
		Private	12.61	31.22	2.75
16	0	Public	13.03	50.51	4.03
		Private	12.72	51.44	4.28
17	5	Public	11.64	54.82	3.31
		Private	12.36	70.72	5.47

Supplementary Statistical Analyses of the Experimental Data

This section extends the statistical examination of our experimental findings, presenting additional analyses of the data. It aims to provide a more comprehensive view by presenting descriptive statistics for key variables and conducting supplementary regression analyses to affirm the study's conclusions.

Descriptive Statistics

Table 9 presents descriptive statistics for participants' productivity, salary, and four dimensions of job satisfaction across the Basic and Provider stages.

Tables 10 and 11 provide detailed statistics for each round during the Basic Stage (rounds 4-17) and the Provider Stage (rounds 18-31), respectively. These tables include the

Table 11 Provider stage analysis: market state, sector performance, and job satisfaction (Rounds 18-31)

Period	Market state	Sector	Avg. output	Avg. salary	Avg. job satisfaction
18	0	Public	13.53	50.76	4.36
		Private	12.06	50.11	4.17
19	2	Public	13.06	52.53	3.75
		Private	12.92	59.83	4.58
20	4	Public	13.58	54.79	3.75
		Private	13.03	68.06	5.00
21	5	Public	13.64	55.82	3.28
		Private	12.94	71.89	5.39
22	3	Public	13.19	53.60	3.86
		Private	12.89	63.33	4.69
23	1	Public	12.72	51.36	3.97
		Private	12.78	55.56	4.36
24	-1	Public	13.53	49.76	3.94
		Private	12.22	46.44	3.67
25	-3	Public	12.31	47.15	3.94
		Private	11.89	37.78	3.11
26	-5	Public	13.83	45.92	4.42
		Private	12.36	30.72	2.92
27	-4	Public	14.19	47.10	4.47
		Private	12.75	35.50	3.06
28	-2	Public	13.14	48.57	4.08
		Private	12.67	43.33	3.58
29	-5	Public	13.75	45.88	5.17
		Private	12.78	31.56	2.64
30	0	Public	13.36	50.68	4.11
		Private	12.97	51.94	4.11
31	5	Public	13.69	55.85	3.22
		Private	14.67	75.33	6.00

market state announced for each round and the average productivity, salary, and general job satisfaction across sectors.

Robustness Check

To address the concern that productivity might mediate the relationship between economic fluctuations and job satisfaction in our experiment, we executed additional regression analyses, this time without including productivity as a control variable. These analyses, presented in Table 12 and 13 replicate the regression from Tables 2 and 3 in Sect. 4. The persistence of a significant interaction term (Sector Type · Market State) in both tables demonstrates that the countercyclical effect on job satisfaction is robust, even without productivity in the model. This finding reinforces productivity's status as a control variable

Table 12 Regression results for the countercyclical effect on job satisfaction dimensions excluding productivity

Variables	Job satisfaction (without productivity)			
	(1)	(2)	(3)	(4)
	General	Salary	Sector	Output
Sector type (Private=1, Public=0)	0.238	0.179	0.629*	0.134
	(0.227)	(0.234)	(0.259)	(0.253)
Market state	−0.073***	−0.019*	−0.263***	0.013
	(0.015)	(0.015)	(0.015)	(0.017)
Sector type · Market State	0.330***	0.354***	0.546***	0.130***
	(0.021)	(0.020)	(0.021)	(0.023)
Period	−0.002	−0.001	−0.013	0.021*
	(0.009)	(0.009)	(0.009)	(0.011)
Observations	1,008	1,008	1,008	1008
Number of subjects	72	72	72	72

Robust standard errors clustered on individuals in parentheses

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 13 Regression results for potential moderators excluding productivity

Potential moderators	Dependent Variable: General Satisfaction			
	(1)	(2)	(3)	(4)
	Gender	Compete	Pro−sociality	Provider
Sector type (Private=1, Public=0)	−0.012	0.138	0.438	−0.305
	(0.281)	(0.333)	(0.296)	(0.374)
Market state	−0.086***	−0.065**	−0.076***	−0.095***
	(0.024)	(0.025)	(0.023)	(0.026)
Sector type · Market state	0.351***	0.320***	0.305***	0.392***
	(0.043)	(0.040)	(0.036)	(0.044)
Period	−0.002	−0.002	−0.002	0.007
	(0.012)	(0.012)	(0.012)	(0.008)
Moderator	−0.594*	−0.071	−0.419	−0.325
	(0.340)	(0.355)	(0.348)	(0.427)
Moderator · Sector type	0.514	0.193	−0.326	0.749
	(0.445)	(0.456)	(0.434)	(0.519)
Moderator · Market state	0.028	−0.014	0.006	−0.042
	(0.032)	(0.033)	(0.031)	(0.036)
Moderator · Sector type · Market state	−0.042	0.020	0.048	0.013
	(0.055)	(0.054)	(0.053)	(0.059)
Observations	1,008	1,008	1,008	1008
Number of subjects	72	72	72	72

Note: Robust standard errors clustered on individuals in parentheses.

*** $p < .01$, ** $p < .05$, * $p < .1$

Gender: Male=1, Female=0; Compete: Competitor=1, Non Competitor=0; Pro-sociality: Prosocial=0, Individualistic=1; Provider: Primary=1, Secondary=0

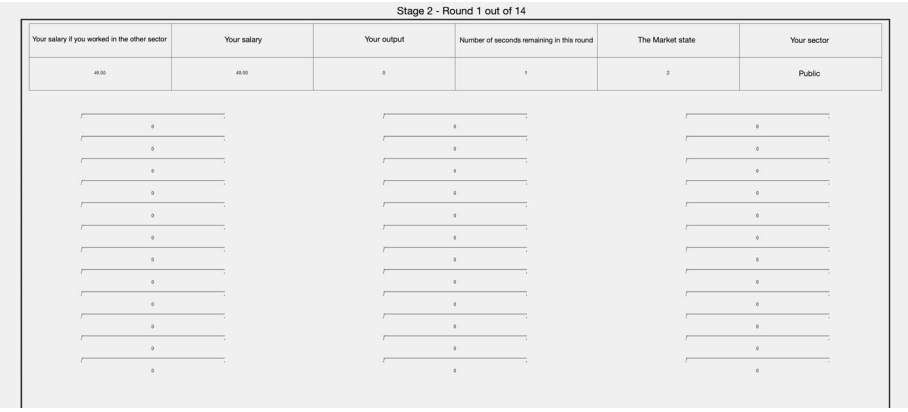


Fig. 9 The effort task screen

rather than a mediator in our study, confirming the validity of our initial results (Fig. 9, 10 and 11).

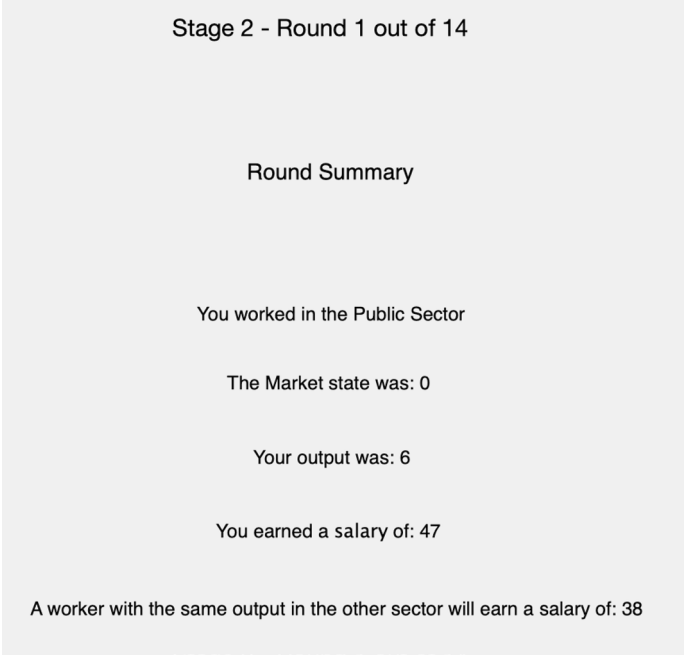


Fig. 10 The feedback screen

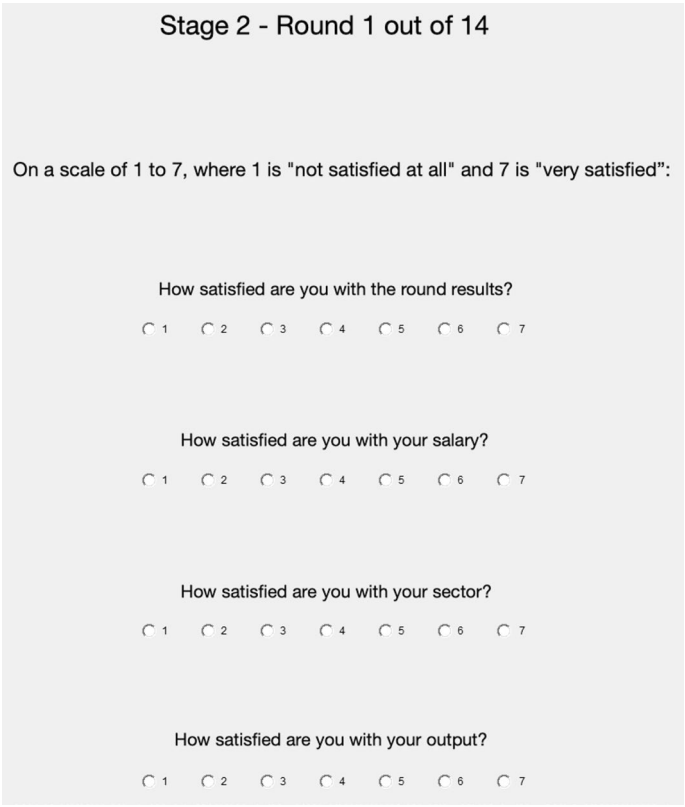


Fig. 11 The satisfaction questionnaire screen

Experimental Screens

Experiment Questionnaire

You are asked to fill out a short personal questionnaire. The questionnaire is anonymous. Please choose one of the possible answers in brackets:

- Gender (Male, Female)
- Marital status (Married, Single, Other)
- What faculty do you study at? (Management, Health Sciences, Engineering, Humanities, Social Sciences, Other)
- Do you work while you are studying? (Yes, No)
- How would you define your political opinions? (Left, Center, Right, Prefer not to Answer)

Please indicate the extent to which you agree with each of the following statements on a scale of 1 to 7, where 1 represents “Totally Disagree” and 7 represents totally agree“:

1. Achieving a high income is important to me.
2. Finding love and being in a successful relationship are important to me.
3. Success is important to me.
4. The happiness of my friends is important to me.
5. If a relative of mine was in financial trouble, I would help him as much as I could.
6. I enjoy collaborating with others.
7. My happiness depends to a great extent on the happiness of those around me.

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Declarations

Conflict of interest The author has no relevant financial or non-financial interests to disclose. The author has no Conflict of interest to declare that are relevant to the content of this article. The author certifies that he has no affiliations with or involvement in any organization or entity with any financial or non-financial interest in the subject matter or materials discussed in this manuscript. The author has no financial or proprietary interests in any material discussed in this article.

Human and Animal Rights Research involving Human Participants: This study involved human participants and was conducted in accordance with relevant laws and institutional guidelines.

Informed Consent Informed consent was obtained from all individual participants included in the study. Participants were fully informed about the nature of the research, their role in it, and their rights, including the right to withdraw from the study at any point.

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