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Efil Ekonomi Araştırmaları Dergisi
Efil Journal of Economic Research

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Çankaya/ANKARA - TÜRKİYE
Telefon : (+90 312) 442 52 10 - 11
GSM : (+90 541) 232 00 95
E-posta : info@efiljournal.com

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Efil Ekonomik Araştırmalar Dergisinin bu sayısı, kurucu editörümüz Prof. Dr. Ömer Faruk Çolak'ın kaybının ardından çıkardığımız ilk sayı; bu yüzden içimiz biraz buruk. Yine de Dr. Çolak'ın belirlediği doğrultu ve hedeflere uygun yeni bir sayıyı çıkarabildiğimiz için mutluyuz. Dergimizin hem Türkiye'nin hem de dünyanın öndegelen akademik dergilerinden birisi olması, Türkiye'de akademik iktisat tartışmalarının gerçekleşeceği çoğulcu bir platform haline gelmesi ve özellikle genç akademisyenlerin kendilerini ifade edebilecekleri bir ortamı sağlayabilmesi konusundaki çabamıza hem yazılarıyla hem de hakem olarak değerlendirmeleriyle destek veren bütün akademisyenlere minnetimiz sonsuz. Dergimize gelen yazıların hep birlikte belirlediğimiz hedeflere ulaşmasına katkıda bulunan hakemlerimiz de özel bir teşekkürü hakediyor. Bu gelişmeler, geleceğe ilişkin olarak Dr. Çolak'ın vizyon ve hedeflerinin gerçekleşmesi konusundaki umut ve kararlılığımızı artırıyor. Yazar ve hakemlerimiz sayesinde geleceğe çok daha güvenli bir biçimde bakabiliyoruz.

Bu sayımızda iki özgün araştırma makalesi yer alıyor. Özge Selvi Yavuz ve Devrim Dumludağ'ın yazdıkları makale, gelir dalgalanmaları ve yaşam memnuniyeti arasındaki ilişkiyi konunun davranışsal yönlerine odaklanarak ele alıyor. Çalışma, Alman Sosyo-Ekonomik Paneli veri setini kullanarak, gelir dalgalanmalarının etkilerinin kazanç-kayıp asimetrisi gösterdiğini ortaya koyan çeşitli ekonometrik modeller tahmin ediyor. Bu sayının diğer makalesinde, Alper Duman ve Ece Tahminci 118 ülkeyi kapsayan bir panel veri seti kullanarak, kurumsal kalitenin yatırımın bir belirleyicisi olma rolünü araştırıyorlar. Bulgular gelir ile düzeltilmiş kurumsal kalitenin yatırımları olumlu etkilediği gösteriyor ve yazarlar gelir ile düzeltilmiş yönetişim sıralamalarının kurumsal reform bağlamındaki rolü için bir tartışma sunuyorlar.

Dergimiz, yapay zeka araçlarının yaşamın her alanında gittikçe daha yoğun biçimde kullanıldığı ve akademik araştırma pratiklerinin hızla değişmekte olduğu bu "zor" zamanlarda, nitelikli araştırma makaleleri ile iktisat bilimine katkı yapma amacını korumaktadır. Önceki sayılarda olduğu gibi, dergimize gönderilen makaleler için, hem değerli yazarlarımıza hem de görüşlerine başvurduğumuz değerli hakemlerimize teşekkürü bir borç biliriz.

Dr. Hüseyin Özel & Dr. M. Aykut Attar

Executive Summary

This issue of the *Efil Journal of Economic Research* is the first one published after the untimely passing of our founding editor Professor Ömer Faruk Çolak, and this makes us somewhat sorrowful. Yet, we are also happy to be able to prepare an issue that conforms to the very direction and objectives determined by himself. Our determination and persistence to publish contributions to the development of economic science in Turkey and worldwide, to create an academic platform that allows participants to contribute and discuss pressing economic problems and their solutions, and to encourage young academics to express themselves through their contributions is as strong as ever. We are grateful to the contributors and the referees for their help to make our *Journal* to be a foremost academic platform which has high academic standards. The referees of this issue deserve special thanks for their quick responses and high academic standards they maintain in reviewing the contributions. Their efforts and contribution make us hopeful and more optimistic in our effort to fulfill Dr. Çolak's vision and objectives. Thanks to all these contributions by the authors and the referees, we are now more confident regarding the future of the *Efil Journal.*

There are two original research articles in this issue. The first article, written by Özge Selvi Yavuz and Devrim Dumludağ, studies the relationship between income fluctuations and life satisfaction by focusing on the behavioral aspects of the topic. The study uses the German Socio-Economic Panel dataset and estimates various econometric models to show that the effect of income fluctuations exhibits the gain-loss asymmetry. In the second article of this issue, Alper Duman and Ece Tahminci investigate the role of institutional quality as a determinant of investment by using a panel dataset covering 118 countries. Their results demonstrate that income-adjusted institutional quality positively affects investment, and the authors present a discussion of the role of income-adjusted governance rankings in the context of institutional reforms.

In these "challenging" times when artificial intelligence tools are being used with increasing intensity across all areas of life and academic research practices are rapidly evolving, our journal remains committed to its aim of contributing to economics through high-quality research articles. As in previous issues, we express our gratitude both to our esteemed authors and to the valued reviewers whose opinions we have sought for the manuscripts submitted to our journal.

Dr. Hüseyin Özel & Dr. M. Aykut Attar

İÇİNDEKİLER

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Research Article

Income Fluctuations and Life Satisfaction: A Gain-Loss Asymmetry Perspective - Evidence from the German Socio-Economic Panel

Ozge Selvi Yavuz Department of Public Finance, Tekirdag Namık Kemal University osyavuz@nku.edu.tr, ORC-ID: 0000-0001-7369-3395.
Devrim Dumludag (*Corresponding Author*) Department of Economics, Marmara University, Istanbul dumludag@marmara.edu.tr, ORC-ID: 0000-0002-4366-2317.

Abstract

The primary aim of this paper is to explore the impact of real-life income fluctuations on individuals, focusing specifically on "gain-loss asymmetry"—a phenomenon where losses exert a more pronounced psychological effect than equivalent gains. By analyzing data from the German Socio-Economic Panel (SOEP), this study evaluates the effects of actual income changes on experienced utility, distinguishing between real income variations and anticipated changes. Self-reported life satisfaction is used as a proxy for experienced utility, with income changes determined by comparing current net real household income to that of the previous five years. Employing an ordinary least squares model with a two-way fixed effect estimator, our findings reveal that income losses significantly and negatively affect life satisfaction compared to equivalent gains, with the exception of the first lag. Beyond the first lag, losses exert a significantly greater impact than gains. Notably, the gain-loss asymmetry is more pronounced among middle-income individuals, while categorical losses are more impactful for higher-income groups.

Keywords: *Gain-Loss Asymmetry, Life Satisfaction, Income Fluctuations, Loss Aversion, SOEP, Experienced Utility*

JEL Codes: *D03, I31, D91, C23*

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Araştırma Makalesi

Gelir Dalgalanmalarının Yaşam Memnuniyeti Üzerindeki Etkisi: Kazanç–Kayıp Asimetrisi ve SOEP Verileri

Özge Selvi Yavuz Department of Public Finance, Tekirdag Namık Kemal University
osyavuz@nku.edu.tr ORCID: 0000-0001-7369-3395
Devrim Dumludağ (*Sorumlu Yazar*) Department of Economics, Marmara University, Istanbul
dumludag@marmara.edu.tr ORCID: 0000-0002-4366-2317

Öz

Bu çalışmanın temel amacı, gerçek hayatta yaşanan gelir dalgalanmalarının bireyler üzerindeki etkisini incelemek ve özellikle "kazanç–kayıp asimetrisi" olarak adlandırılan olguya odaklanmaktır. Bu olgu, kayıpların psikolojik etkisinin, eşdeğer büyüklükteki kazançlara kıyasla daha güçlü olmasını ifade etmektedir. Alman Sosyo-Ekonomik Paneli (SOEP) verileri kullanılarak gerçekleştirilen bu çalışmada, gerçekleşmiş gelir değişimlerinin deneyimlenen fayda üzerindeki etkileri analiz edilmekte ve fiili gelir değişimleri ile beklenen değişimler arasında ayrım yapılmaktadır.

Anahtar Kelimeler: *Kazanç–Kayıp Asimetrisi, Yaşam Memnuniyeti, Gelir Dalgalanmaları, Kayıptan Kaçınma, SOEP, Deneyimlenen Fayda*

Jel Kodları: *D03, I31, D91, C23*

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1. Introduction

Does an increase in income lead to greater life satisfaction? Conversely, how does a reduction in income affect our sense of well-being? Common intuition suggests a direct, positive relationship between income and happiness. However, the field of happiness economics presents a more nuanced picture.

The concept of Easterlin's paradox, first identified by Easterlin in 1974 and revisited in 1995, challenges the straightforward link between income and happiness. It demonstrates that, despite significant income growth, happiness levels in many countries have remained relatively unchanged. This paradox has generated considerable debate and fostered a substantial body of literature aimed at exploring the complexities of the income-happiness relationship. Foundational research by scholars such as Diener and Oishi (2000), Frey and Stutzer (2000), and Hagerty (2000) established the positive correlation between national income levels and average happiness on an international scale. These studies laid the groundwork for further exploration. Diener and Biswas-Diener (2002) extended this research by incorporating time-series analyses, which illustrated that economic growth in developed countries has a marginal impact on subjective well-being.

Easterlin's explanation for this paradox suggests that beyond a certain income threshold, increased income does not associate with increasing happiness. This phenomenon occurs as individuals' aspirations and expectations rise alongside their income (Easterlin, 2001). This perspective is in line with the hedonic adaptation theory, which posits that individuals adjust to their current income levels, eventually returning to their previous level of happiness after experiencing income growth. The concept of hedonic adaptation, initially proposed by Brickman in 1971, indicates that the happiness boost from income increases is only temporary. Stutzer (2004), Burchardt (2005), Ferrer-i-Carbonell & Van Praag (2008), Clark et al. (2008), and Dumludag (2014) explored this further, uncovering an asymmetry in how individuals react to economic losses versus gains.[1]

1 Another aspect of the Easterlin Paradox is the relative income concept proposed by Duesenberry (1949), where individuals` happiness are based on the disparity between their income and that of a reference group in their circle.

This study delves into the dynamics of income changes over a five-year period and their impact on life satisfaction, focusing on the phenomenon of loss aversion as described by prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1991; Thaler et al., 1997). Unlike much of the existing literature that relies on experimental data, our study extends this body of work by examining the effects of actual income changes on experienced utility, adopting a "gain-loss asymmetry" approach from a reference-based perspective.

Much of the existing literature on loss aversion is based on experimental data concerning expected utility, often derived from betting or controlled experiments (e.g., Benartzi & Thaler, 1995; Thaler et al., 1997; Schmidt & Traub, 2002; Erev et al., 2008). Our study aims to build upon this foundation by examining the effects of actual income changes on experienced utility. Given our emphasis on real rather than anticipated changes, we use the term "gain-loss asymmetry" to describe our approach, analyzing the relationship between income changes and life satisfaction from a reference-based perspective.

In light of the asymmetrical findings derived from research on hedonic adaptation and relative happiness, there have been attempts to explain life satisfaction and consequently utility in view of prospect theory. Contributions from Boyce et al. (2013, 2016) have enhanced our understanding by demonstrating how loss aversion in income changes and personality traits like conscientiousness affect these dynamics. Early work by Vendrik and Woltjer (2007), followed by Leites and Ramos (2022), applied prospect theory to the study of life satisfaction, with a particular focus on the effects of losses in comparison to a social reference group. Their research consistently found that losses exert a more significant impact on life satisfaction than gains, a conclusion supported by Fang and Niimi (2017) in their examination of future income expectations. More recent analyses by Yaman et al. (2023) have furthered this inquiry by contrasting expected utility and prospect theory in the realm of life satisfaction. Their work uncovered detailed insights, notably how reductions in losses lead to increased life satisfaction, highlighting the intricate relationship between income changes and subjective well-being.

At the macroeconomic level, Patiño et al. (2022) and Hovi and Laamanen (2017) expanded the scope of research by investigating the asymmetric impacts of economic fluctuations on subjective well-being. Using large-scale datasets like the Eurobarometer, they discovered that economic downturns have a more profound and enduring effect on life satisfaction than economic upswings.

The work of Boyce et al. (2013, 2016), as previously discussed, aligns with our research interests, despite differences in model specifications. They analyzed life satisfaction using lagged values of the dependent variable, changes in income compared to the previous year, and a dummy variable to indicate the occurrence of a loss. Additionally, their study excludes income levels as an explanatory variable, while they support the notion of loss aversion, it remains unclear if income changes affect life satisfaction more than income levels or if loss aversion would persist when income levels are considered. Conversely, Yaman et al. (2023) assessed the impact of changes in income, employment, and health status on life satisfaction by looking at one-year intervals. In contrast, Di Tella et al. (2010) and Fang and Niimi (2017) delved into the asymmetric effects by focusing on anticipated changes in individuals' income. Di Tella et al. (2010) examine long-term adaptation to changes in income and social status, and they also explore the concept of loss aversion. Their model treats income changes as independent variables and incorporates loss aversion by allowing for asymmetric effects of gains and losses from the present to the next period, based on the assumption that future income closely aligns with anticipated income. Fang and Niimi (2017) employ a similar methodology using data from the Japanese Household Survey. This model presumes that individuals have realistic expectations about their future incomes and only accounts for symmetric effects of past income changes. We consider Di Tella et al.'s modeling strategy to be the most effective for observing the impact of loss aversion. However, our approach differs by focusing on the asymmetric effects of already-realized income changes on current life satisfaction.

While there are only a few studies that delve into life satisfaction through the lens of gain-loss asymmetry, our research distinguishes itself by investigating individuals' past income levels over a five-year period as a foundational reference point, in contrast to the majority of studies which base their findings on comparisons with a designated reference group. At its core, our study examines whether individuals use their past income levels as reference points and further investigates how changes in income affect life satisfaction. This investigation is carried out through a detailed analysis using both quantitative variables and categorical representations, employing dummy variables with various model specifications. Moreover, our study extends the exploration of gain-loss asymmetry across different income categories, offering a comprehensive look at the nuances of how income fluctuations impact subjective well-being.

By exploring the effects of actual income changes on experienced utility, this study aims to bridge a gap in existing literature that has predominantly concentrated on expected or decision utility. Such insights are crucial for informing welfare literature and shaping policy implications, underscoring the importance for policymakers to address the adverse effects of income losses—potentially prioritizing these efforts over the emphasis on income gains. In doing so, our work contributes to the growing body of evidence elucidating the complex relationship between income, loss aversion, and life satisfaction, thereby offering a pivotal resource for both academic and practical applications in economics and welfare policy.

The structure of this paper is as follows: Initially, we will provide descriptive statistics related to income and variables derived from income, such as gains and losses. Subsequently, we will discuss our model and the strategy employed for its prediction, followed by the presentation of regression results. In the discussion and conclusion section, we will address the regression findings and offer policy recommendations.

2. Descriptive Data

This study utilizes data from the German Socio-Economic Panel (SOEP), developed by the German Institute for Economic Research (DIW Berlin) (Goebel et al., 2019). The SOEP is a longitudinal survey that collects data on a variety of aspects, including education, employment, income, health, and life satisfaction, from the same cross-sectional units over time. Our analysis includes both household and individual survey data spanning from 1991 to 2019, involving responses from 84,044 individuals.

Panel data was chosen for its ability to analyze changes at both the personal and household levels over time, which is essential for examining individual income variations over a five-year period. The extensive use of the SOEP in research on happiness, social inequality, poverty, and social mobility renders it particularly suitable for this study. Given the unbalanced nature of the panel, we selected appropriate statistical estimators to accommodate this characteristic.

To offer insights into the amounts of losses and gains and to elucidate the relevant variables, we present summary statistics before their logarithmic transformation. Table 1 presents a range of statistics on the monthly household net income of panel participants, expressed in euros. The first section of the table displays the individuals' monthly after-tax household net income as recorded in the dataset. It reveals that the average monthly household net income is €2,648. This average varies by up to €1,442 across the 84,044 individuals in the panel and fluctuates by as much as €711 over the years for each individual.

The second section of Table 1 illustrates the monthly household net income adjusted for the Consumer Price Index (CPI) based on 2015 prices. After adjusting for CPI, the average household net income stands at €2,944. This adjusted figure shows a variation of up to €1,513 between individuals and up to €767 over the duration of an individual's participation in the panel.

The third section details the monthly net household income, further adjusted for both inflation and household size. With these adjustments, the average monthly household income is €1,797. The standard deviation between groups for this adjusted income is €890, while the standard deviation within groups is €434.

Table 1: Household Monthly Net Income Summary Statistics

	Mean	St. Dev.	Min.	Max	Obs.
Household Monthly Net Income (€)					
General	2647.893	1461.1	460	9000	N = 560381
Between Groups		1441.9	460	9000	n = 84044
Within Group		710.6	-3399.1	9089.7	T-bar = 6.6
Household Monthly Net Income Adjusted by CPI (€) (2015 = 100)					
General	2943.782	1556.8	436.8	12633.7	N = 560381
Between Groups		1512.7	436.8	11708.4	n = 84044
Within Group		766.6	-4128.1	11057.9	T-bar = 6.6
Household Monthly Net Income Adjusted by CPI and Household Size (€)					
General	1796.984	909.3	168.7021	11573.9	N = 560381
Between Groups		889.9	196.3933	9132.3	n = 84044
Within Group		433.8	-3931.4	9422.7	T-bar = 6.6

Table 2 shows the distribution of monthly household net income by income group categories. The relevant income categories are based on the classification of the German Federal Statistical Office (The Federal Statistical Office, 2021).

Table 2: Income Categories

Household Monthly Income (€)	General		Between Groups		Within Group
	Frequency	%	Frequency	%	%
Under 1250 EUR	77457	13.82	24597	29.27	54.34
1251-2500 EUR	239721	42.78	52250	62.17	66.07
2501-3500 EUR	122194	21.81	36230	43.11	47.67
3501-5000 EUR	83146	14.84	25890	30.81	48.59
5000 EUR and more	37863	6.76	12088	14.38	52.17

(n = 84044)

Table 2 highlights the dominance of the "€1,251-€2,500" income bracket, which comprises 43% of the dataset, indicating a significant concentration of households within the lower-middle income range. The stability of this income category is evidenced by a 66% rate, suggesting consistent economic conditions for a large segment of the population over time. In contrast, the “€5,000 and more” category is the least prevalent, making up only 7% of the dataset. Notably, the “€1,251-€2,500” income range also boasts the highest inclusion rate at 62%, in comparison to the “€5,000 and more” category, which has the lowest inclusion rate at 14%. Despite representing the highest income group, the “€5,000 and more” category ranks third in terms of stability.

Table 3: Gain Variables Summary Statistics

€	Mean	St. Dev.	Min.	Max.	Obs.
Gain compared to last year ($Y_t - Y_{t-1} > 0$)					
General	295.9344	362.4165	.0001221	8878.9	N=230503
Between Groups		296.0561	.0003662	6651.5	n=55903
Within Group		280.2576	-3600.427	7943.7	T-bar= 4.12327
Gain compared to two years ago ($Y_t - Y_{t-2} > 0$)					
General	342.3965	396.1782	.0089111	9023.975	N=215847
Between Groups		318.1908	.0461426	7743.703	n=48351
Within Group		304.4406	-3710.348	8153.911	T-bar= 4.46417
Gain compared to three years ago ($Y_t - Y_{t-3} > 0$)					
General	382.1025	425.4549	.0079346	8749.314	N = 193833
Between Groups		340.639	.2788086	6864.574	n = 41290
Within Group		322.2526	-3197.974	8102.413	T-bar = 4.69443
Gain compared to four years ago ($Y_t - Y_{t-4} > 0$)					
General	420.69	454.5947	.0061035	9164.147	N = 172031
Between Groups		371.4494	.1027832	9164.147	n = 36167
Within Group		335.1955	-3172.12	8088.839	T-bar = 4.75657
Gain compared to five years ago ($Y_t - Y_{t-5} > 0$)					
General	451.2329	476.0868	.006958	8873.676	N = 152910
Between Groups		386.6126	.055542	7129.767	n = 32324
Within Group		343.8323	-4007.262	7946.404	T-bar = 4.73054

Table 3 outlines the gain variables, derived from the monthly household net income after adjusting for inflation and household size. These variables range from €296 to €451, following adjustments for the Consumer Price Index (CPI) and household size. The standard deviation for these gains varies between individuals, falling within the range of €362 to €476. The average gain observed among panel participants may differ from the general average for individuals by €296 to €387. Notably, the relatively high standard deviation within groups—approximately €280 to €344—compared to between groups—around €110—underscores the variability of income gains within individual households over time.

This variability likely reflects diverse economic circumstances or life events that impact household incomes.

Table 4: Loss Variables Summary Statistics

€	Mean	St. Dev.	Min.	Max.	Obs.
Loss compared to last year ($Y_t - Y_{t-1} < 0$)					
General	-265.6023	382.9858	-7959.313	-.0068359	N = 225168
Between Groups		303.2801	-7959.313	-.0588379	n = 54378
Within Group		305.4908	-7151.534	2235.96	T-bar = 4.14079
Loss compared to two years ago ($Y_t - Y_{t-2} < 0$)					
General	-330.3343	437.3853	-9209.993	-.0092773	N = 183368
Between Groups		350.3319	-7079.232	-.0484009	n = 44625
Within Group		336.6933	-6833.3	2865.628	T-bar = 4.10909
Loss compared to three years ago ($Y_t - Y_{t-3} < 0$)					
General	-374.2182	472.3638	-8763.313	-.0113525	N = 155989
Between Groups		382.8692	-6272.396	-.0727539	n = 37303
Within Group		349.898	-6546.724	3374.255	T-bar = 4.18167
Loss compared to four years ago ($Y_t - Y_{t-4} < 0$)					
General	-406.6169	494.401	-8794.634	-.0041504	N = 136145
Between Groups		403.366	-7108.626	-.0217285	n = 32211
Within Group		355.3579	-6631.3	4436.514	T-bar = 4.22666
Loss compared to five years ago ($Y_t - Y_{t-5} < 0$)					
General	-434.2564	515.0289	-9196.808	-.0294189	N = 119026
Between Groups		425.0405	-9196.808	-.1210938	n = 27960
Within Group		360.8096	-6438.02	2984.593	T-bar = 4.25701

Table 4 displays the loss variables, which are also based on the monthly household net income after adjustments for inflation and household size. The average value of these losses ranges approximately from €265 to €434. Individual losses can deviate from the overall average by between €305 and €360. The significant deviation of individual losses from the overall average highlights the diverse impacts of economic downturns on different households. This variation may be influenced by factors such as job loss, health issues, or other personal circumstances affecting household income.

While the descriptive statistics in Table 3 and Table 4 show minimum fluctuations as small as €0.0001, these values are presented primarily to illustrate the full range of the data in real terms. In the econometric analysis, all income-related variables were transformed into logarithmic scales. This transformation ensures that the regression models estimate relative changes rather than absolute Euro amounts, effectively mitigating the influence of negligible nominal fluctuations on the estimated coefficients. Consequently, the potential measurement error from very small nominal changes is structurally addressed by the model's focus on log differences.

Furthermore, to explore the potential categorical sensitivity of individuals to losses, dummy variables for losses and gains were created. Table 5 summarizes these loss dummy variables:

$$loss_{it} = 1\ if\ logy_{it} - \mathrm{logy_{it-s}} < 0,\ \ 1 \leq s \leq 5$$

Table 5: Loss Dummies Summary Statistics

	Frequency	%	Cum. %
Loss compared to last year (loss1 = 1 if $Y_t - Y_{t-1} < 0$)			
0	230504	50.59	50.59
1	225168	49.41	100.00
Total = 455672			
Loss compared to two years ago (loss2 = 1 if $Y_t - Y_{t-2} < 0$)			
0	215863	54.07	54.07
1	183368	45.93	100.00
Total = 399231			
Loss compared to three years ago (loss3 = 1 if $Y_t - Y_{t-3} < 0$)			
0	193833	55.41	55.41
1	155989	44.59	100.00
Total = 349822			
Loss compared to four years ago (loss4 = 1 if $Y_t - Y_{t-4} < 0$)			
0	172052	55.83	55.83
1	136145	44.17	100.00
Total = 308197			
Loss compared to five years ago (loss5 = 1 if $Y_t - Y_{t-5} < 0$)			
0	152910	56.23	56.23
1	119026	43.77	100.00
Total = 271936			

Upon reviewing Table 5, it becomes evident that the rate of loss gradually decreases as the length of the difference period increases. Specifically, for a one-year period, 49% of individuals experience a loss, whereas this rate decreases to 44% when comparing losses experienced five years ago.

As a cumulative total, 60% of the panel participants have remained within the study for a duration of up to 5 years out of the total 29-year period. Consequently, the gain and loss variables have been constructed by examining the preceding 5-year timeframe. The selection of a five-year lag structure is primarily driven by the trade-off between longitudinal depth and statistical power. Extending the lag structure beyond five years would result in a dramatic reduction in the number of observations, compromising the reliability of the estimates and the ability to conduct meaningful subgroup analyses. Thus, the five-year window serves as the optimal balance for observing medium-term income dynamics while maintaining a robust sample size.

3. The Model and the Methodology

The dependent variables in our study categorically ranged from 0 to 10. Models with categorical dependent variables, such as ordered probit or logit models, are therefore suitable for our estimation. In line with recent research, controlling for individual effects is imperative when analyzing the relationship between life satisfaction and various factors (Ferrer-i-Carbonell & Frijters, 2004). Although studies that utilize ordinary least squares (OLS) regression instead of probit or logit models report minimal differences in coefficients, individual effects can significantly alter these relationships.

Given that panel data involves repeated collection of information from the same units over time, accounting for unobserved heterogeneity is essential (Das, 2019). Unobserved heterogeneity, or individual fixed effects, can arise from factors such as genetics, upbringing, and environment (Baltagi, 2008). The choice of an Ordinary Least Squares (OLS) model with a two-way fixed effect estimator is methodologically grounded in the need to control for unobserved heterogeneity. In micro-panel data analysis, individual life satisfaction is often influenced by stable traits such as genetics, upbringing, and personality. Using Fixed Effects (FE) allows the model to control for these time-invariant individual characteristics, which might otherwise bias the relationship between income and well-being. Therefore, our analysis takes into consideration both observable and unobservable effects, as summarized in the following equation:

$$Life\ satisfaction_{it} = \alpha_0 + \alpha_1 logy_{it} + \alpha_2 \Delta y_{it}^{+} + \alpha_3 \Delta y_{it}^{-} + \beta \boldsymbol{X}_{it} + \mu_i + \lambda_t + u_{it}$$

Where:

$\Delta \mathrm{y}_{it}^{-}$: *Losses*

Δy_{it}^{+}: *Gains*

X_{it}: *Independent variables vector*

μ_i: *Individual fixed effects*

λ_t: *Fixed year effects*

u_{it}: *Idiosyncratic error term*

The research hypotheses based on the model are as follows:

$$H_1: \alpha_2 \neq \alpha_3$$

This hypothesis posits that the coefficients for the variables indicating gains (Δy_{it}^{+}) and losses (Δy_{it}^{-}) in individuals' household income over the past years will not be equal, implying differing effects on life satisfaction.

$$H_2: \alpha_3 > \alpha_2$$

Second hypothesis suggests that the negative impact on life satisfaction due to income losses will be greater than the positive impact of income gains, indicating an asymmetry between gains and losses.

Models with dummy variables:

$$Life\ satisfaction_{it} = \alpha_0 + \alpha_1 logy_{it} + \alpha_2 loss_{it} + \beta \boldsymbol{X}_{it} + \mu_i + \lambda_t + u_{it}$$

$$loss_{it}: Loss\ dummies$$

For the analysis of categorical losses, the model is as follows:

$$H_3: \alpha_2 < 0$$

This hypothesis predicts that the coefficient for the loss dummy variable will be negative, indicating the expected adverse effect of being in a loss status on life satisfaction.

3.1. Dependent Variable

The dependent variable "life satisfaction", serving as a proxy for utility, is measured on a scale from 0 to 10. Participants were asked, "How satisfied are you with your life, all things considered?"

3.2. Main Independent Variables

The main variables of interest, loss and gain, are derived from the logarithm of monthly household net income, adjusted by CPI and household size. The formulae for these variables are:

Gains:

$$\Delta y_{it}^{+} = \Delta y_{it} \text{ if } logy_{it} - logy_{it-s} > 0 \text{ otherwise } \Delta y_{it}^{+} = 0, 1 \leq s \leq 5$$

Losses:

$$\Delta y_{it}^{-} = \Delta y_{it} \text{ if } logy_{it} - logy_{it-s} < 0 \text{ otherwise } \Delta y_{it}^{-} = 0, 1 \leq s \leq 5$$

3.3. Control Variables

To address the challenge of endogeneity in happiness economics, this study employs a rigorous econometric design that incorporates time-varying control variables—such as employment status, household composition, and subjective health—to disentangle the direct pecuniary impact of income fluctuations from the non-pecuniary psychological costs of life shocks. By conditioning on these factors, the model isolates the "pure" effect of income changes, ensuring that the reported coefficients for income gains and losses are net of the contextual consequences of events like unemployment or health deterioration. This approach effectively mitigates omitted variable bias and confirms that the observed gain-loss asymmetry is driven by the income change itself relative to the individual's historical reference point, rather than the secondary effects of concurrent life events. These factors include employment status, distinguishing between individuals who are employed full-time, part-time, unemployed, or out of the labor force, as each category significantly affects well-being. Additionally, household composition captures marital and parental status, accounting for varying economic responsibilities and resource allocation within households, along with subjective health status—measured by a dummy variable ranging from poor to very good—and years of education. Despite the potential biases introduced by self-assessed health, the congruent subjective nature of both health and life satisfaction assessments suggests a potential alignment of these biases. This alignment may contribute to preserving the validity of the estimated relationship between health and life satisfaction. Additional controls include age squared and household size squared. These variables are used to capture nonlinearities in variables and are to ensure a more accurate specification with the fixed effect estimation. Year fixed effects are also included to control for macroeconomic conditions and time-specific factors. To maintain focus on the primary research topic, only a subset of results related to key independent variables is presented in the main body of the paper, with comprehensive regression findings, including control variables, available in the appendix.

4. Results

In accordance with the tests conducted in this section, the life satisfaction equations were estimated using the Fixed Effects within-group transformation estimator, with standard errors being clustered. All income-related variables were transformed into logarithmic scale, and the regression results were interpreted accordingly.[2]

2 The Fixed Effects within-group transformation estimator assumes that errors are i.i.d. distributed. This assumption is not valid in the presence of heteroskedasticity and autocorrelation. Since using the default standard errors will produce biased estimates, the analysis should be conducted with clustered standard errors in the presence of heteroskedasticity and autocorrelation (Cameron & Trivedi, 2010). We followed the same pathway, as the Modified Wald test indicated heteroscedasticity, and the Portmanteau test signified autocorrelation.

Table 6: Regression Results of Gains and Losses on Life Satisfaction

Life Satisfaction	(1)	(2)	(3)	(4)	(5)	(6)
logy	.320***	.325***	.311***	.306***	.302***	.299***
	(.01076)	(.01322)	(.01327)	(.01306)	(.01285)	(.01257)
gain_1		-.101***				
		(.015)				
loss_1		-.068***				
		(.017)				
gain_2			-.098***			
			(.014)			
loss_2			-.113***			
			(.016)			
gain_3				-.082***		
				(.014)		
loss_3				-.120***		
				(.016)		
gain_4					-.066***	
					(.014)	
loss_4					-.121***	
					(.017)	
gain_5						-.057***
						(.014)
loss_5						-.125***
						(.017)
constant	5.719***	5.692***	5.775***	5.816***	5.842***	5.857***
	(.108)	(.122)	(.123)	(.122)	(.121)	(.119)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	506779	506779	506779	506779	506779	506779
Number of groups	77,027	77,027	77,027	77,027	77,027	77,027
R-squared (within)	.090	.090	.091	.091	.091	.091

Robust standard errors are in the parenthesis.

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

The results from the linear regression analysis pertaining to life satisfaction are detailed in Table 6. As indicated in the appendix, the F-test results reveal that the coefficients for the gain and loss variables, constructed based on one-year and two-year differences, are not statistically significant from each other. However, for variables based on three-year differences, the coefficients show statistical significance at the 10% level, and even more so at the 1% level for differences spanning four and five years. Beginning with the three-year differences, there is observable statistical variance in the coefficients of gain and loss variables.

Table 7: Regression Results of Categorical Losses on Life Satisfaction

Life Satisfaction	(1)	(2)	(3)	(4)	(5)	(6)
logy	.320***	.328***	.304***	.312***	.305***	.293***
	(.011)	(.013)	(.014)	(.015)	(.016)	(.017)
loss_1		0				
		(.004)				
loss2			-.009*			
			(.005)			
loss3				-.008		
				(.005)		
loss4					-.007	
					(.006)	
loss5						-.018***
						(.007)
constant	5.719***	5.635***	5.763***	5.684***	5.734***	5.847***
	(.108)	(.126)	(.139)	(.148)	(.161)	(.177)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	506779	428634	377477	341243	301688	266842
Number of groups	77,027	60,145	51,770	44,206	39,080	35,444
R-squared(within)	.090	.093	.094	.097	.097	.097

Robust standard errors are in the parenthesis.

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

The parameters for both loss and gain variables are generally significant. Increases in income, even when income is controlled for, do not positively impact life satisfaction, corroborating the findings of Di Tella et al. (2010) and Fang & Niimi (2017). The negative gain coefficients can also be observed in the study by Di Tella et al. As anticipated, the loss variables exhibit a negative sign. Starting from the three-year differences, the coefficients for losses are found to be larger than those for gains where they are statistically significant. This supports the second research hypothesis regarding the gain and loss variables. Table 6 shows that a 10% decrease in income, compared to three years earlier, leads to a 0.012-point reduction in life satisfaction.

Significantly, a four-year difference produces a similar effect in this study's context. When analyzing the regression results in relation to five-year differences, it is noted that a 10% decrease in an individual's income, compared to five years earlier, results in a 0.013-point decrease in life satisfaction. Conversely, a 10% increase in income over the same period leads to a 0.006-point decrease in life satisfaction. In summary, the regression analysis indicates that while the impact of gain variables on individuals' subjective well-being is small, ranging from 0.006 to 0.008 points, it is nonetheless negative. On the other hand, the impact of losses on life satisfaction is more pronounced, varying between 0.012 and 0.013 points. Although these effects are minimal, they are consistent with the results of similar studies. Table 7 presents the effects of loss dummy variables on life satisfaction, incorporating dummy variables to assess whether losses exert a categorical influence on an individual's well-being, regardless of their magnitude. The regression analysis reveals that losses incurred two (loss2) and five (loss5) years prior significantly reduce life satisfaction by 0.009 and 0.018 points, respectively. Interestingly, the impact of these categorical losses on life satisfaction appears more substantial than that of incremental income losses, confirming the research hypothesis that categorical losses significantly affect well-being over two- and five-year periods.

4.1. Income Groups

Table 8 details the regression analysis results for various income groups, showing that individuals with lower incomes are more sensitive to income fluctuations. Notably, those earning a monthly income of €3,501 to €5,000 are most affected by losses. Over a two-year period, individuals in the €3,501-€5,000 bracket experience the most pronounced decline in life satisfaction, with a decrease of 0.023 points for a 10% reduction in income compared to two years earlier. For the three-year interval, the lowest income group does not exhibit significant changes in response to income gains, but a 10% income drop leads to a 0.009-point decrease in life satisfaction. In the €1,251-€2,500 income bracket, a 10% increase in income results in a 0.007-point decrease in life satisfaction, while a 10% reduction causes a 0.013-point decrease.

During a four-year period, the two lowest income groups experience statistically significant declines in satisfaction by 0.006 points. Over five years, income gains do not statistically impact the two lowest-income groups, but income losses have a notable effect. For example, in the group earning below €1,250, a 10% decrease in income corresponds to a 0.006-point reduction in life satisfaction. In the €1,251-€2,500 bracket, a similar income drop results in a 0.008-point decrease, whereas the €2,501-€3,500 group remains unaffected by income changes. Conversely, in the €3,501-€5,000 bracket, a 10% income reduction leads to a 0.018-point decrease in life satisfaction.

Table 8: Regression Results of Gains and Losses on Life Satisfaction by Income Groups

Life Satisfaction	Under 1250€	1251-2500 €	2501-3500 €	3501-5000 €	5000€ and more
logy	.534***	.424***	.21***	.172***	.24***
	(.054)	(.03)	(.056)	(.06)	(.069)
gain_1	-.205***	-.086***	-.024	.035	-.074
	(.072)	(.026)	(.034)	(.036)	(.046)
loss_1	-.055	-.058**	.004	.025	-.07
	(.037)	(.028)	(.045)	(.058)	(.102)
Observations	67063	215836	111926	76840	35114
Number of groups	21,695	47873	33199	23714	11108
R-squared (within)	.089	.087	.085	.086	.074
logy	.493***	.415***	.17***	.149**	.247***
	(.053)	(.03)	(.055)	(.06)	(.068)
gain_2	-.151**	-.085***	-.003	-.078**	-.055
	(.071)	(.025)	(.03)	(.032)	(.042)
loss_2	-.109***	-.09***	-.107**	-.226***	-.015
	(.035)	(.028)	(.044)	(.061)	(.107)
Observations	67063	215836	111926	76840	35114
Number of groups	21695	47873	33199	23714	11108
R-squared (within)	.089	.087	.085	.086	.074
logy	.482***	.398***	.202***	.184***	.268***
	(.052)	(.03)	(.056)	(.06)	(.068)
gain_3	-.056	-.071***	-.034	-.028	-.08*
	(.071)	(.025)	(.029)	(.032)	(.043)
loss_3	-.082**	-.127***	-.039	-.017	.029
	(.036)	(.027)	(.045)	(.061)	(.108)
Observations	67063	215836	111926	76840	35114
Number of groups	21695	47873	33199	23714	11108
R-squared (within)	.089	.087	.085	.086	.074

logy	.488***	.4***	.207***	.167***	.254***
	(.051)	(.03)	(.056)	(.06)	(.066)
gain_4	-.036	-.008	-.027	-.063*	-.113***
	(.072)	(.026)	(.029)	(.032)	(.039)
loss_4	-.063*	-.066**	-.014	-.148**	-.119
	(.037)	(.027)	(.047)	(.062)	(.106)
Observations	67063	215836	111926	76840	35114
Number of groups	21695	47873	33199	23714	11108
R-squared (within)	.088	.087	.085	.086	.074
logy	.481***	.396***	.206***	.164***	.264***
	(.05)	(.03)	(.055)	(.06)	(.064)
gain_5	.009	-.006	-.038	-.033	-.098***
	(.079)	(.027)	(.029)	(.031)	(.037)
loss_5	-.064*	-.08***	-.036	-.118*	-.02
	(.037)	(.028)	(.047)	(.063)	(.114)
Observations	67063	215836	111926	76840	35114
Number of groups	21695	47873	33199	23714	11108
R-squared (within)	.088	.087	.085	.086	.074

Robust standard errors are in the parenthesis.

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

Note: The control variables and individual and year dummies are included in all regressions.

Table 9: Regression Results of Categorical Losses on Life Satisfaction by Income Groups

Life Satisfaction	Under 1250€	1251-2500 €	2501-3500 €	3501-5000 €	5000€ and more
logy	.496***	.424***	.157***	.148**	.214***
	(.055)	(.032)	(.06)	(.063)	(.073)
loss1	.014	0	-.01	-.019*	-.001
	(.016)	(.007)	(.009)	(.01)	(.014)
Observations	53380	183793	96550	65861	29050
Number of groups	16062	38,231	27,625	19,450	8,754
R-squared (within)	.094	.089	.085	.083	.071

logy	.445***	.402***	.169***	.113*	.266***
	(.06)	(.034)	(.063)	(.068)	(.076)
loss2	-.02	-.01	-.013	-.024**	.006
	(.018)	(.008)	(.01)	(.012)	(.017)
Observations	45420	160415	86053	59124	26465
Number of groups	12992	32451	24119	17,268	7,960
R-squared (within)	.096	.091	.087	.083	.076
logy	.492***	.428***	.192***	.114	.214***
	(.063)	(.036)	(.066)	(.07)	(.079)
loss3	-.032	0	-.019*	-.006	.017
	(.02)	(.009)	(.011)	(.013)	(.018)
Observations	40968	145207	77793	53376	23899
Number of groups	11339	27956	21203	15266	7043
R-squared (within)	.098	.093	.089	.087	.079
logy	.443***	.409***	.212***	.192***	.243***
	(.069)	(.039)	(.07)	(.073)	(.085)
loss4	-.012	-.003	-.006	.001	.002
	(.022)	(.01)	(.012)	(.015)	(.021)
Observations	35519	127633	69145	47872	21519
Number of groups	9663	24283	18827	13762	6392
R-squared (within)	.096	.092	.089	.088	.079
logy	.439***	.381***	.158**	.148*	.283***
	(.072)	(.042)	(.074)	(.077)	(.088)
loss5	-.021	-.022**	-.004	-.034**	.019
	(.025)	(.011)	(.013)	(.016)	(.023)
Observations	31152	112453	61196	42701	19340
Number of groups	8386	21656	16769	12400	5831
R-squared (within)	.095	.092	.09	.093	.084

Robust standard errors are in the parenthesis.

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

Note: The control variables and individual and year dummies are included in all regressions.

Table 9 illustrates the impact of loss dummies on life satisfaction, categorized by income groups. Within one-year differences, only individuals in the €3,501 to €5,000 income range are affected by categorical losses, experiencing a 0.02-point reduction in life satisfaction from a year-over-year income decrease. Interestingly, this same income group does not show a significant response to actual losses, as outlined in Table 8.

For two-year differences, the pattern continues solely within the €3,501-€5,000 income bracket, where categorical losses are significant. For the three-year interval, the impact shifts to those earning between €2,501 and €3,500, with an income reduction correlating with a 0.02-point decrease in life satisfaction.

For five-year differences, categorical losses significantly affect life satisfaction in groups earning €1,251-€2,500 and €3,501-€5,000. Specifically, in the €1,251-€2,500 group, an income decrease over this period is associated with a 0.022-point reduction in life satisfaction. Similarly, individuals in the €3,501-€5,000 bracket experience a 0.034-point decrease in life satisfaction due to a comparable income reduction.

4.2. Robustness Check

The primary aim of this study is to examine the asymmetric effects of income changes over the past five years, with a particular focus on variations across different income groups. To enhance the robustness of our findings, we conducted a series of additional tests. In the regression analysis presented in the Results section, both gain and loss variables were included simultaneously. For robustness checks, we also conducted separate regressions for gains and losses, calculated both as annual differences and as cumulative differences in current income over the past five years. Key findings from these tests are shown in the tables below, with the full regression results available in the appendix.

Table 10: Regression Results of Gain Variables

Variable	Coeff.	p	Variable	Coeff.	p
First difference gain ($Y_t - Y_{t-1} > 0$)	-0.091	0.000	Gain compared to last year ($Y_t - Y_{t-1} > 0$)	-0.091	0.000
Second difference gain ($Y_{t-1} - Y_{t-2} > 0$)	-0.050	0.000	Gain compared to two years ago ($Y_t - Y_{t-2} > 0$)	-0.085	0.000
Third difference gain ($Y_{t-2} - Y_{t-3} > 0$)	-0.023	0.000	Gain compared to three years ago ($Y_t - Y_{t-3} > 0$)	-0.070	0.000
Fourth difference gain ($Y_{t-3} - Y_{t-4} > 0$)	-0.012	0.000	Gain compared to four years ago ($Y_t - Y_{t-4} > 0$)	-0.054	0.000
Fifth difference gain ($Y_{t-4} - Y_{t-5} > 0$)	-0.006	0.000	Gain compared to five years ago ($Y_t - Y_{t-5} > 0$)	-0.045	0.001

Table 11: Regression Results of Loss Variables

Variable	Coeff.	p	Variable	Coeff.	p
First difference loss ($Y_t - Y_{t-1} < 0$)	-0.052	0.002	Loss compared to last year ($Y_t - Y_{t-1} < 0$)	-0.052	0.002
Second difference loss ($Y_{t-1} - Y_{t-2} < 0$)	-0.047	0.000	Loss compared to two years ago ($Y_t - Y_{t-2} < 0$)	-0.100	0.000
Third difference loss ($Y_{t-2} - Y_{t-3} < 0$)	-0.025	0.000	Loss compared to three years ago ($Y_t - Y_{t-3} < 0$)	-0.110	0.000
Fourth difference loss ($Y_{t-3} - Y_{t-4} < 0$)	-0.012	0.000	Loss compared to four years ago ($Y_t - Y_{t-4} < 0$)	-0.113	0.000
Fifth difference loss ($Y_{t-4} - Y_{t-5} < 0$)	-0.007	0.000	Loss compared to five years ago ($Y_t - Y_{t-5} < 0$)	-0.118	0.000

In reviewing the gain and loss variables presented in Tables 10 and 11, it becomes apparent that the gain variables have negative coefficients. This finding is consistent with previous studies cited earlier, reinforcing the view that gains, when income is controlled for, do not have a significant positive effect on life satisfaction. Examining the annual differences, we observe that the coefficients gradually decrease, suggesting a diminishing effect over time. However, this trend is not apparent in variables based on comparisons between current income and income from previous years, particularly in the case of loss variables.

In the subsequent phase of the robustness check, we assessed the effects of experiencing consecutive years of gains or losses. Specifically, we analyzed the impact of having losses or gains over periods of 5, 4, 3, and 2 consecutive years on life satisfaction, comparing these effects with the primary findings.

Table 12: The Effect of Consecutive Gains and Losses

Variable	Coeff.	p	Variable	Coeff.	p
Yearly differences					
Mean of losses over the past five years $(Y_t - Y_{t-1} < 0$ & $Y_{t-1} - Y_{t-2} < 0$ & $Y_{t-2} - Y_{t-3} < 0$ & $Y_{t-3} - Y_{t-4} < 0$ & $Y_{t-4} - Y_{t-5} < 0)$	-0.019	0.096	Mean of gains over the past five years $(Y_t - Y_{t-1} > 0$ & $Y_{t-1} - Y_{t-2} > 0$ & $Y_{t-2} - Y_{t-3} > 0$ & $Y_{t-3} - Y_{t-4} > 0$ & $Y_{t-4} - Y_{t-5} > 0)$	-0.014	0.204
Mean of losses over the past four years $(Y_t - Y_{t-1} < 0$ & $Y_{t-1} - Y_{t-2} < 0$ & $Y_{t-2} - Y_{t-3} < 0$ & $Y_{t-3} - Y_{t-4} < 0)$	-0.040	0.005	Mean of gains over the past four years $(Y_t - Y_{t-1} > 0$ & $Y_{t-1} - Y_{t-2} > 0$ & $Y_{t-2} - Y_{t-3} > 0$ & $Y_{t-3} - Y_{t-4} > 0)$	-0.022	0.097
Mean of losses over the past three years $(Y_t - Y_{t-1} < 0$ & $Y_{t-1} - Y_{t-2} < 0$ & $Y_{t-2} - Y_{t-3} < 0)$	-0.053	0.003	Mean of gains over the past three years $(Y_t - Y_{t-1} > 0$ & $Y_{t-1} - Y_{t-2} > 0$ & $Y_{t-2} - Y_{t-3} > 0)$	-0.039	0.013
Mean of losses over the past two years $(Y_t - Y_{t-1} < 0$ & $Y_{t-1} - Y_{t-2} < 0)$	-0.037	0.077	Mean of gains over the past two years $(Y_t - Y_{t-1} > 0$ & $Y_{t-1} - Y_{t-2} > 0)$	-0.055	0.003

Differences taken from the current income					
Mean of losses over the past five years $(Y_t - Y_{t-1} < 0\ \&$ $Y_t - Y_{t-2} < 0\ \&$ $Y_t - Y_{t-3} < 0\ \&$ $Y_t - Y_{t-4} < 0\ \&$ $Y_t - Y_{t-5} < 0)$	-0.027	0.752	Mean of gains over the past five years $(Y_t - Y_{t-1} > 0\ \&$ $Y_t - Y_{t-2} > 0\ \&$ $Y_t - Y_{t-3} > 0\ \&$ $Y_t - Y_{t-4} > 0\ \&$ $Y_t - Y_{t-5} > 0)$	0.023	0.730
Mean of losses over the past four years $(Y_t - Y_{t-1} < 0\ \&$ $Y_t - Y_{t-2} < 0\ \&$ $Y_t - Y_{t-3} < 0\ \&$ $Y_t - Y_{t-4} < 0)$	-0.087	0.177	Mean of gains over the past four years $(Y_t - Y_{t-1} > 0\ \&$ $Y_t - Y_{t-2} > 0\ \&$ $Y_t - Y_{t-3} > 0\ \&$ $Y_t - Y_{t-4} > 0)$	-0.045	0.388
Mean of losses over the past three years $(Y_t - Y_{t-1} < 0\ \&$ $Y_t - Y_{t-2} < 0\ \&$ $Y_t - Y_{t-3} < 0)$	-0.080	0.098	Mean of gains over the past three years $(Y_t - Y_{t-1} > 0\ \&$ $Y_t - Y_{t-2} > 0\ \&$ $Y_t - Y_{t-3} > 0)$	-0.045	0.266
Mean of losses over the past two years $(Y_t - Y_{t-1} < 0\ \&$ $Y_t - Y_{t-2} < 0)$	-0.044	0.204	Mean of gains over the past two years $(Y_t - Y_{t-1} > 0\ \&$ $Y_t - Y_{t-2} > 0)$	-0.083	0.008

The first section of Table 12 presents models created by averaging the gain and loss variables based on annual differences, while the second section includes models using differences calculated from current income. Comparing the results in Table 12 with those in Table 6 indicates that the coefficients for the averages of consecutive years of gains and losses are smaller, and that some results in the second section of Table 12 are statistically insignificant. The findings reveal that both cumulative income losses and gains have a negative effect on life satisfaction, with losses demonstrating a consistently stronger impact over multiple years. Notably, the three- and four-year averages of losses show a significant effect on life satisfaction, underscoring an intensified impact of loss over time.

Table 13: The Effect of Being in a Loss or Gain State Over Consecutive Years with Dummy Variables

Variable	Coefficient	p	Variable	Coefficient	p
Yearly differences			**Differences taken from the current income**		
Loss dummy =1 if $(Y_t - Y_{t-1} < 0$ & $Y_{t-1} - Y_{t-2} < 0$ & $Y_{t-2} - Y_{t-3} < 0$ & $Y_{t-3} - Y_{t-4} < 0$ & $Y_{t-4} - Y_{t-5} < 0)$	-0.005	0.419	Loss dummy = 1 if $(Y_t - Y_{t-1} < 0$ & $Y_t - Y_{t-2} < 0$ & $Y_t - Y_{t-3} < 0$ & $Y_t - Y_{t-4} < 0$ & $Y_t - Y_{t-5} < 0)$	-0.014	0.095
Loss dummy = 1 if $(Y_t - Y_{t-1} < 0$ & $Y_{t-1} - Y_{t-2} < 0$ & $Y_{t-2} - Y_{t-3} < 0$ & $Y_{t-3} - Y_{t-4} < 0)$	-0.001	0.812	Loss dummy = 1 if $(Y_t - Y_{t-1} < 0$ & $Y_t - Y_{t-2} < 0$ & $Y_t - Y_{t-3} < 0$ & $Y_t - Y_{t-4} < 0)$	-0.013	0.068
Loss dummy = 1 if $(Y_t - Y_{t-1} < 0$ & $Y_{t-1} - Y_{t-2} < 0$ & $Y_{t-2} - Y_{t-3} < 0)$	-0.002	0.619	Loss dummy = 1 if $(Y_t - Y_{t-1} < 0$ & $Y_t - Y_{t-2} < 0$ & $Y_t - Y_{t-3} < 0)$	-0.014	0.025
Loss dummy = 1 if $(Y_t - Y_{t-1} < 0$ & $Y_{t-1} - Y_{t-2} < 0)$	-0.004	0.346	Loss dummy = 1 if $(Y_t - Y_{t-1} < 0$ & $Y_t - Y_{t-2} < 0)$	-0.006	0.227

Table 13 analyzes the impact of consecutive years of income loss on life satisfaction using dummy variables. The findings indicate that as individuals experience prolonged periods of income loss, the negative effect on life satisfaction becomes more pronounced, especially from the third year onward. While a two-year loss period shows a negative but relatively minor and less significant effect on life satisfaction—suggesting that short-term income reductions may not immediately affect well-being—by the third consecutive year, life satisfaction begins to decline significantly. This trend highlights that extended income reduction takes a noticeable psychological toll. The four- and five-year loss periods demonstrate the strongest negative impacts on life satisfaction, underscoring that prolonged income loss imposes a cumulative psychological burden that meaningfully reduces well-being. These results confirm that sustained income loss, particularly over three or more consecutive years, has a significant effect on life satisfaction.

In this section, the findings reinforce the stability and reliability of the primary conclusions regarding the asymmetric effects of income changes on life satisfaction. By analyzing gains and losses separately across various models and testing cumulative impacts, the robustness check strengthens the evidence that income losses have a substantially greater negative effect on well-being than income gains, especially when experienced over extended periods. The diminishing effects observed in annual gain coefficients, alongside the consistent, pronounced effects of cumulative losses, validate the study's focus on the psychological toll of prolonged income reduction. Additionally, the robustness tests reveal that the experience of consecutive losses has meaningful implications for subjective well-being. The models further suggest that comparisons based on current income relative to past income have a more substantial impact on life satisfaction than annual income changes. This finding implies that individuals are more influenced by how their current income compares to previous levels than by fluctuations in income over a single year. Overall, this section reinforces the main conclusions of the study—particularly the intensified impact of prolonged income loss and the limited influence of income gains—demonstrating consistency across diverse analytical models and specifications.

5. Discussion and Conclusion

This study reveals the nuanced effects of income changes on life satisfaction, demonstrating that income gains generally have an insignificant or slightly negative effect on well-being, consistent with the concept of diminishing marginal utility of income. In contrast, income losses, initially perceived as minor or less impactful than gains, show a growing influence over time, becoming statistically more significant than gains starting from the third year. This pattern suggests that the immediate impact of income losses may be buffered by factors such as consumption habits, accumulated wealth, or the perception of these losses as temporary setbacks.

Notably, categorical losses exert a more pronounced effect than the actual magnitude of losses, possibly because individuals place greater emphasis on the state of experiencing a loss rather than its size. This distinction is particularly relevant for lower-income groups, who are most affected by realized losses, highlighting the potential effectiveness of policies aimed at increasing disposable income for these segments. For instance, policy measures such as unemployment benefits, training programs, and job placement services could be crucial in mitigating the impacts of income losses, particularly for those impacted by job losses or economic downturns. From a policy perspective, the importance of adopting time-sensitive approaches is underscored. Immediate recovery measures may be more effective in offsetting the negative impact of income losses. The persistence of consumption levels despite income declines risks savings depletion and household indebtedness, necessitating prompt and effective policy interventions.

Loss aversion has garnered significant attention and acceptance since its introduction to literature by Tversky and Kahneman as a critical component of Prospect Theory. However, recent studies suggest that loss aversion may not be as prevalent in both risky and risk-free choices as previously thought. For instance, various studies have not observed loss aversion in bets conducted in recent years (Erev et al., 2008; Ert & Erev, 2013; Mukherjee et al., 2017; Rakow et al., 2020; Spektor et al., 2023; Walasek & Stewart, 2015; Yechiam & Hochman, 2013; Zeif & Yechiam, 2022). In studies where individuals were asked to evaluate the impact of losing and winning certain objects, evidence for loss aversion is weak when stakes are low, while the effect is observed when stakes are relatively high (Harinck et al., 2007; McGraw et al., 2010; Mukherjee et al., 2017; Rozin & Royzman, 2001). Gal and Rucker, (2018), did not find a loss aversion effect in individual evaluations conducted on everyday items.

Gal and Rucker (2018) argue that choices attributed to loss aversion are confounded with inaction, and that no endowment effect is found when controlling for inaction and decomposing the decision whether to act and the loss/gain decisions. According to Gal (2006), individuals may choose not to change their status quo in riskless choices because taking action requires more motivation, information processing, and transaction costs, or because the cost of mistakes in changing the status quo is higher than the cost of mistakes in inaction (regret). The endowment effect, often seen as a manifestation of loss aversion in risk-averse choices, can similarly be explained by the inaction factor (Gal & Rucker, 2018). If individuals are not motivated to exchange, they may prefer to stick with their current option. Another explanation for the endowment effect involves different reference points for the parties involved. For sellers, the market value is the most salient reference point, while for buyers, the most salient reference point is the benefit they will receive (Isoni, 2011; Weaver & Frederick, 2012). Considering these discussions, some researchers have concluded that loss aversion is context-dependent rather than a generalizable principle (Ert & Erev, 2013; Gal & Rucker, 2018). Our study does not directly test loss aversion through active choices. However, the fact that negative changes in income over the years are only effective at certain lags may be related to the context-dependency of loss aversion.

However, this study faces limitations, including its inability to establish causality due to the dataset's unbalanced nature. It remains unclear whether decreases in income cause reductions in life satisfaction or vice versa. Although the stability of life satisfaction assessments within the group somewhat mitigates this issue, future research should more definitively aim to establish causality.

Another limitation is the dataset's unsuitability for dynamic analysis. Future studies might delve into the origins and perceptions of income changes to better understand the short-term resilience to losses and investigate factors like optimism and compensability for deeper insights into individuals' reactions to income fluctuations.

In summary, our findings highlight asymmetric effects of income changes, particularly over the medium term and more significantly for lower-income groups. The larger impact of categorical losses compared to actual losses provides critical insights for policy formulation. Policymakers could improve individual and household welfare by focusing on increasing income for low earners, supporting those experiencing income losses, reducing income inequality, and devising policies that leverage loss framing to enhance financial decision-making.

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STATEMENTS AND DECLARATIONS

Authorship.

Ozge Selvi Yavuz: Conceptualization, data collection, data curation, methodology, formal analysis, software, writing – original draft.

Devrim Dumludag: Conceptualization, methodology, formal analysis, writing – review and editing.

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Replication Materials. Replication Materials. The data used in this study are from the German Socio-Economic Panel (SOEP), which is publicly available for scientific research through the DIW Berlin. Information on data access can be found at: https://www.diw.de/en/diw_01.c.615551.en/research_infrastructure__socio-economic_panel__soep.html

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Research Article

Institutional Quality as a Structural Determinant of Investment

Alper Duman, *Corresponding author*. Department of Economics, Izmir University of Economics, alper.duman@ieu.edu.tr, ORC-ID: 0000-0001-9928-6501.

Ece Tahminci, Department of Economics, Izmir University of Economics, ece.tahminci@ieu.edu.tr, ORC-ID: 0009-0002-9758-9626.

Abstract

This study examines the effect of institutional quality on gross capital formation independently of income, using a balanced panel of 118 countries over the period 2002–2022. A composite governance index is constructed from the six Worldwide Governance Indicators via principal component analysis and residualized on GDP per capita, yielding a measure of institutional performance that is orthogonal to income by construction and captures whether each country governs better or worse than its level of development would predict. Fixed-effects panel regressions with Driscoll–Kraay standard errors show that this income-adjusted institutional quality index exerts a positive and statistically significant effect on investment whether measured in absolute terms or as a share of GDP, with near-identical coefficient magnitudes across both specifications. A panel threshold regression does not separate rich from poor countries but distinguishes countries whose institutional performance falls short of income-level expectations from those that meet or exceed them, implying that marginal governance improvements yield the strongest investment response precisely where institutional capacity is weakest relative to development level. The findings carry direct implications for the targeting of institutional reform support: income-adjusted governance benchmarks, rather than absolute rankings, should guide the prioritisation of reform assistance.

Keywords: *Institutional Quality, Gross Capital Formation, Panel Data, Threshold Regression, Governance, Income-Adjusted Institutions*

JEL Codes*: O43, E22, C33, P48*

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Araştırma Makalesi

Yatırımın Yapısal Belirleyicisi Olarak Kurumsal Kalite

Alper Duman, *Sorumlu yazar*. Department of Economics, Izmir University of Economics, alper.duman@ieu.edu.tr ORCID: 0000-0001-9928-6501.

Ece Tahminci, Department of Economics, Izmir University of Economics, ece.tahminci@ieu.edu.tr, ORCID: 0009-0002-9758-9626.

Öz

Bu çalışma, kurumsal kalitenin brüt sermaye oluşumu üzerindeki etkisini gelir düzeyinden bağımsız olarak incelemekte; 2002–2022 dönemini kapsayan 118 ülkeli dengeli bir panel veri seti kullanmaktadır. Dünya Bankası'nın altı Dünya Çapında Yönetişim Göstergesinden temel bileşenler analizi aracılığıyla oluşturulan bileşik bir yönetişim endeksi, kişi başına GSYİH'ya göre artık değer alınarak, yapısal olarak gelirden bağımsız hale getirilmektedir. Bu sayede elde edilen ölçüt, her ülkenin kendi gelişmişlik düzeyinin öngördüğünden daha iyi ya da daha kötü yönetilip yönetilmediğini ortaya koymaktadır. Driscoll–Kraay standart hataları ile tahmin edilen sabit etkiler panel regresyonları, gelir ayarlamalı kurumsal kalite endeksinin yatırım üzerinde ister mutlak düzeyde ister GSYİH'ya oran olarak ölçülsün istatistiksel açıdan anlamlı ve pozitif bir etkiye sahip olduğunu; üstelik her iki tanımlama biçiminde de katsayı büyüklüklerinin birbirine çok yakın kaldığını göstermektedir. Panel eşik regresyonu, zengin ve yoksul ülkeleri birbirinden ayırmamakta; bunun yerine kurumsal performansı gelir düzeyi beklentisinin altında kalan ülkeleri, bu beklentiyi karşılayan ya da aşan ülkelerden ayırt etmektedir. Bu bulgu, kurumsal kapasitenin gelişmişlik düzeyine kıyasla en zayıf kaldığı yerlerde marjinal yönetişim iyileştirmelerinin en güçlü yatırım tepkisini ortaya çıkardığını göstermektedir. Elde edilen bulgular, kurumsal reform desteğinin hedeflenmesi açısından doğrudan sonuçlar doğurmaktadır: reform desteğinin önceliklendirilmesinde mutlak sıralamalar değil, gelire göre ayarlanmış yönetişim kıyaslamaları esas alınmalıdır.

Anahtar Kelimeler: *Kurumsal Kalite, Brüt Sermaye Oluşumu, Panel Veri, Eşik Regresyonu, Yönetişim, Gelir Ayarlamalı Kurumsal Kalite*

JEL Kodları: *O43, E22, C33, P48*

1. Introduction

Investment is widely recognized as a fundamental driver of economic growth. Conventional analyses focus on financial and macroeconomic determinants: interest rates, government spending, and volatility, yet this framing omits a structural layer that shapes how investors behave before financial signals even register: institutions. When property rights are weak or contracts are unenforceable, investors respond not to price signals but to the underlying credibility of the institutional environment.

North (1990) and Acemoglu et al. (2005) define institutions not as legal rules but as the incentive structures that shape how economic actors behave. Property rights protection, administrative capacity, the enforceability of law, and corruption control are among the institutional dimensions that directly affect the investment climate.

A central identification challenge is that governance tracks income. Glaeser et al. (2004) demonstrated that standard governance indices are largely explained by GDP per capita and education levels, raising the question of whether observed associations between governance and investment reflect institutional quality or simply the broader advantages of wealth. Standard governance indices largely track income and including them alongside income controls risks conflating two distinct sources of variation. Addressing this requires a measurement strategy that isolates the income-independent component of institutional quality.

This study does so by constructing a composite institutional index via principal component analysis and purging it of its income component by regressing the index on GDP per capita. The resulting residualized measure captures each country's institutional performance relative to what its income level would predict. Rather than testing a simplistic 'better governance equals more investment' relationship, the study asks whether countries that govern better than expected, given their income, also invest more than expected. The analysis covers 118 countries over the period 2002-2022 and employs fixed effects panel regression with Driscoll-Kraay standard errors.

2. Literature Review and Theoretical Framework

2.1. Gross Capital Formation in Economic Theory

Gross capital formation (GCF) refers to the total value of fixed asset acquisition and inventory accumulation within an economy over a given period. As a broad indicator, GCF captures the overall volume of capital deployed toward productive capacity, regardless of funding source or sectoral origin.

In classical growth theory, investment is understood as a mechanism of capital deepening and accumulation. Neoclassical models treat it as a function of expected returns and intertemporal optimization (Solow, 1956), while Keynesian frameworks emphasize expectations, uncertainty, and macroeconomic coordination (Keynes, 1936). More recent institutional approaches also consider the structural and political foundations of investment decisions (Aron, 2000; Rodrik et al., 2004).

While many empirical studies rely on disaggregated indicators such as FDI or private fixed capital formation, this study adopts GCF as a more comprehensive measure. GCF encompasses total capital formation across the entire economy, allowing for a unified analysis of aggregate investment behavior and its structural determinants.

2.2. The Role of Institutions in Shaping Investment

Institutions are a set of formal and informal rules that govern economic interaction. North (1990) defines institutions as the rules of the game, emphasizing their role in reducing uncertainty and stabilizing expectations. Williamson (1989) conceptualizes them as mechanisms that reduce transaction costs, particularly under incomplete information and weak enforcement. The transmission from institutional quality to investment operates through several distinct channels. First, secure property rights reduce the risk of expropriation, lowering the effective cost of long-term capital commitments and enabling investors to plan beyond short-term horizons (Knack & Keefer, 1995). Second, effective contract enforcement reduces counterparty risk in investment relationships; without it, firms substitute away from relationship-specific assets toward more liquid, reversible forms of capital (Williamson, 1989). Third, regulatory quality and government effectiveness reduce administrative uncertainty: when firms cannot predict how rules will be applied, the option value of waiting dominates the value of investing, depressing capital formation even in the presence of profitable opportunities (Aron, 2000). Fourth, control of corruption reduces the implicit tax on returns, where public officials extract rents from investment projects and the risk-adjusted return falls below the threshold required to trigger commitment (Mauro, 1995). Taken together, these channels suggest that institutional quality does not merely accompany investment; it constitutes a precondition for it, particularly for long-term, irreversible capital formation of the kind captured by gross capital formation data. Within this framework, institutions shape not only the quantity of investment but also its direction, quality, and time horizon.

Acemoglu et al. (2005) identify institutions as the fundamental cause of long-run economic growth and capital formation. Inclusive institutions protect property rights and enable long-term planning for investors; extractive institutions generate uncertainty and divert capital toward unproductive uses. The historical origins of these institutional differences are documented through colonial settlement patterns (Acemoglu et al., 2001) and pre-colonial economic structures (Nunn, 2009). They confirm that institutions are not merely contemporary constructs but historically embedded structures with persistent effects.

2.3. Empirical Evidence on Institutional Quality and Investment

Early empirical work established the foundational relationships in this literature. Mauro (1995) demonstrated that corruption significantly reduces investment; Knack and Keefer (1995) showed that property rights protections have a measurable positive effect on capital formation; and Chakrabarti (2001) confirmed that FDI flows are sensitive to institutional quality. These cross-sectional studies established the basic associations but could not resolve questions of causality or account for country-specific heterogeneity. Panel methods addressed these limitations.

Panel data studies have addressed these limitations through fixed effects (FE), system GMM, and quantile regression methods. Panel data improved things. Chen et al. (2022) used fixed effects to study governance and private investment in 100 countries. Barra & Ruggiero (2023) tried quantile regression on governance and public spending in Europe. Akobeng (2017) was closer to our question: he looked at governance and GCF specifically in Africa. Emara and Chiu (2016) used a GMM approach to measure governance effects on growth in MENA countries, constructing a composite WGI index via PCA. Bhujabal et al. (2024) similarly applied PCA to WGI dimensions to study the FDI–institutional quality nexus in South and Southeast Asian economies. Saha et al. (2022) investigated institutional quality and FDI in lower-middle income countries, applying sample stratification by income group to address the income-institution collinearity.

More recent work has examined nonlinear and threshold dynamics in the institutions-growth relationship. Ochi et al. (2023, 2024) find, using panel smooth transition regression, that governance quality affects economic growth and poverty reduction only above a critical institutional threshold in African and South Asian samples. Chuku et al. (2017) document that institutional quality is a robust determinant of the absolute level of investment in Africa but loses significance when investment is expressed as a share of GDP, attributing this to the dominance of macroeconomic scale effects.

2.4. Critical Perspectives and Heterogeneity

A recurring challenge in the institutional quality literature is the direction of causality. Glaeser et al. (2004) argue that most governance indicators are largely explained by income and education levels, raising the possibility that institutions are an outcome of development rather than a cause. Przeworski and Limongi (1993) similarly suggest that economic growth can shape political regimes. These critiques do not invalidate the institutional perspective, but they do underscore the need for measurement and identification strategies that go beyond simple correlations.

A related concern is the endogeneity of institutional quality in investment regressions. Even if reverse causality from investment to institutions is not the primary worry, omitted variables such as geography, colonial history, or deep cultural factors may simultaneously drive both institutional quality and investment. Instrumental variable approaches, such as those based on settler mortality rates (Acemoglu et al., 2001) or legal origins (Rodrik et al., 2004), have been used to address this problem, but require instruments that are often difficult to justify in large cross-country panels.

The literature also suggests that the effect of institutions on investment is not uniform across countries. In developing economies, basic institutional deficiencies tend to have a direct impact on investment decisions, whereas in advanced economies investment conditions are more often shaped by market expectations and macroeconomic signals (Aron, 2000; Gwartney et al., 2006). Hayat (2019) finds that while institutions enhance FDI-led growth in low and middle-income countries, the relationship differs in high-income settings. Chuku et al. (2017) further document that the institutional effect is strongest when investment is measured in levels, and attenuates when expressed as a share of GDP, a finding that motivates the dual-specification approach adopted in this study. This heterogeneity across income groups is examined directly in Section 4.

2.5. The WGI Framework and the Income-Adjustment Problem

This study uses the Worldwide Governance Indicators (WGI) to measure institutional quality. Developed by Kaufmann et al. (1999, 2002, 2010) and updated in Kaufmann and Kraay (2024), the WGI framework comprises six dimensions: Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. These indicators capture both state institutional capacity and governance quality and are constructed from a synthesis of expert evaluations and cross-country survey data.

A well-documented concern with WGI-based indices is their strong correlation with income levels (Langbein & Knack, 2010). Countries with higher GDP per capita consistently score better on governance dimensions, raising the question of whether governance indices capture something independent of income or simply reflect it. Gallego-Álvarez et al. (2021) further document that WGI scores exhibit high persistence over time and cluster by income group, reinforcing concerns about their interpretation in causal analyses.

To address this, the composite index constructed in this study is residualized on GDP per capita, following the governance surplus approach of Han et al. (2014). This yields a measure of institutional quality that is orthogonal to income by construction, capturing whether a country's governance exceeds or falls short of what its income level would predict. This approach is more appropriate than using aggregate GDP, which conflates development with country size, and more transparent than alternative strategies such as income group stratification (Saha et al., 2022) or IV approaches that require instruments difficult to apply at the global level. The construction of this measure is described in detail in Section 3.

3. Research Methodology

3.1. Data and Variables

The analysis is based on a balanced panel of 118 countries over the period 2002-2022. The sample period begins in 2002, reflecting the first year for which annual WGI estimates are available across all six governance dimensions (Kaufmann et al., 2002). The balanced panel requirement retains only countries with complete observations across all variables for the full 21-year period, reducing the initial country pool to 118 countries; the full country list, organized by income group, is provided in Appendix A. Data are drawn from the World Bank's World Development Indicators (WDI) and Worldwide Governance Indicators (WGI; Kaufmann et al., 1999, 2002, 2010; Kaufmann & Kraay, 2024).

The dependent variable is gross capital formation as a share of GDP (GCF/GDP, %), sourced from WDI. Level-based specifications are susceptible to scale effects in cross-country panels because larger economies invest more in absolute terms regardless of institutional quality, which motivates the ratio-based approach adopted here (Mauro, 1995; Akobeng, 2017; Chuku et al., 2017). The original level-based specification is also retained for comparison. The main explanatory variable is a residualized composite index of institutional quality, described in Section 3.2. Control variables are GDP per capita (constant 2015 USD, log-transformed), population (log-transformed), and government consumption expenditure as a share of GDP (%). All VIF values fall below 1.26. The real interest rate enters the extended model in levels due to negative values in some observations.

Model 1 covers the full 118-country panel. Model 2 adds the real interest rate, reducing the sample to 51 countries; Model 1 is also estimated on this subsample to separate sample composition effects from the contribution of the interest rate. Variable definitions and data sources are listed in Table 1.

Table 1. Variable Definitions and Data Sources

Variable	Definition	Source
	Dependent variable	
GCF / GDP	Gross capital formation as a percentage of GDP	WDI
GCF (levels)	Gross capital formation, constant 2015 USD (log-transformed)	WDI
	Control variables	
GDP per capita	GDP per capita, constant 2015 USD (log-transformed)	WDI
Population	Total population (log-transformed)	WDI
Government expenditure / GDP	General government final consumption expenditure as a share of GDP (%)	WDI
Real interest rate	Lending interest rate adjusted for inflation, levels (Model 2 only)	WDI
Crisis dummies	Binary indicators for 2009 (Global Financial Crisis) and 2020 (COVID-19 pandemic)	-
	WGI components (composite institutional index)	
Voice and Accountability (VA)	Citizens' capacity to participate in government selection; freedom of expression and media	WGI
Political Stability (PV)	Likelihood of political instability or politically motivated violence	WGI
Government Effectiveness (GE)	Quality of public services and policy implementation capacity	WGI
Regulatory Quality (RQ)	Capacity to formulate and implement sound policies and regulations	WGI
Rule of Law (RL)	Extent to which agents abide by and have confidence in societal rules	WGI
Control of Corruption (CC)	Extent to which public power is exercised for private gain	WGI

Note: *Model 1 includes 118 countries (118 × 21 = 2,478 observations). Model 2 and the Model 1 subsample each include 51 countries (51 × 21 = 1,071 observations). A balanced panel structure is imposed throughout.*

Descriptive statistics and pairwise correlations for the key variables are presented in Tables 2 and 3.

Table 2. Descriptive Statistics

Variable	N	Mean	SD	Min	Max	Skew
log(GCF/GDP)	2,478	3.15	0.31	0.20	4.34	-0.31
log(GCF levels)	2,478	23.52	2.03	18.35	29.55	0.23
log(GDP per capita)	2,478	8.84	1.42	5.77	11.63	-0.11
log(Population)	2,478	16.16	1.71	11.32	21.08	0.05
Gov. expenditure / GDP	2,478	16.27	5.47	2.36	46.26	0.58
IQres	2,478	0.00	0.52	-1.55	1.41	-0.23

Note: *Statistics based on the 118-country balanced panel (2,478 observations). IQres is the residualized PCA-based composite index, orthogonal to log(GDP per capita) by construction.*

Table 3. Pairwise Correlation Matrix

Variable	(1)	(2)	(3)	(4)	(5)	(6)
(1) log(GCF/GDP)	1.000					
(2) log(GCF levels)	0.164	1.000				
(3) log(GDP per capita)	-0.009	0.529	1.000			
(4) log(Population)	0.028	0.706	-0.203	1.000		
(5) Gov. exp. / GDP	-0.038	0.089	0.407	-0.219	1.000	
(6) IQres	0.021	-0.111	0.000	-0.122	0.151	1.000

Note: *All VIF values fall below 1.26. IQres is orthogonal to log(GDP per capita) by construction (correlation = 0.000).*

3.2. Composite Institutional Index and Income Adjustment

The six WGI dimensions display strong pairwise correlations (0.66–0.96) and capture overlapping aspects of governance quality (Langbein & Knack, 2010; Gallego-Álvarez et al., 2021). Principal component analysis reduces them to a single composite index; the first principal component accounts for 85.4% of total variance, with all loadings exceeding 0.83 (Appendix B). This approach is consistent with related studies (Barra & Ruggiero, 2023; Bhujabal et al., 2024; Chen et al., 2022; Emara & Chiu, 2016). The composite score is defined as:

$$PC1_{it} = \lambda_1 \cdot VA_{it} + \lambda_2 \cdot PV_{it} + \lambda_3 \cdot GE_{it} + \lambda_4 \cdot RQ_{it} + \lambda_5 \cdot RL_{it} + \lambda_6 \cdot CC_{it} \quad (1)$$

WGI-based indices are strongly correlated with income levels (Langbein & Knack, 2010; Glaeser et al., 2004), which risks conflating institutional quality with development level when both enter the same regression. PC1 is therefore residualized on log(GDP per capita). Han et al. (2014) and Zhuang et al. (2010) apply the same procedure to construct income-independent governance measures for growth analysis in developing Asia and the MENA region; Hayat (2019) applies a similar approach in the FDI-growth context. The present study extends this residualization strategy to a broad 118-country cross-country investment panel. Chuku et al. (2017) provide additional motivation: using a comparable sample, they find that institutional quality is a robust determinant of investment levels but loses significance when investment is expressed as a share of GDP, a pattern this study directly investigates. The residualized index is:

$$IQres_{it} = PC1_{it} - \beta \cdot \log(GDPpc_{it}) \tag{2}$$

Income accounts for 69.6% of cross-country variation in PC1 (Appendix C). The resulting index has a mean of zero and standard deviation of 0.52; positive values indicate stronger-than-expected institutions given a country's income level, negative values the opposite. Alternative approaches such as income-group stratification (Saha et al., 2022) or instrumental variables (Acemoglu et al., 2001; Rodrik et al., 2004), either restrict comparability or require instruments difficult to justify at this scale. The analysis does not claim causal identification; the focus is on isolating robust structural associations between income-adjusted institutional quality and investment.

3.3. Estimation Strategy

All specifications are estimated using country fixed effects. Countries differ in ways that are unobserved but persistent, such as legal traditions, colonial history, geographic endowments, and these correlate with both governance quality and investment. Absorbing them at the country level is the natural choice, and a Hausman test confirms it ($\chi^2 = 107.62$, $p < 0.001$). Driscoll and Kraay (1998) standard errors are used throughout, robust to heteroskedasticity, serial correlation, and cross-sectional dependence.

Year fixed effects are not included. Governance evolves slowly and is strongly collinear with the country means absorbed by fixed effects; in practice, adding year dummies eliminates the institutional signal entirely, a pattern well-documented in within-estimator applications to slowly changing governance variables (Gallego-Álvarez et al., 2021; Acemoglu et al., 2005). Instead, binary indicators for 2009 and 2020 capture the two major common shocks in the sample period without absorbing within-country institutional variation. The 2009 indicator captures the sharp contraction in gross capital formation associated with the Global Financial Crisis; the 2020 indicator captures the COVID-19 pandemic shock, which produced the largest single-year decline in capital formation in the sample period. The main model equations are:

$$\ln(GCF_{it}) = \alpha_i + \beta_1 \ln(GDPpc_{it}) + \beta_2 \ln(Pop_{it}) + \beta_3 GovExp_{it} + \beta_4 IQres_{it} + \beta_5 D2009_{it} + \beta_6 D2020_{it} + \varepsilon_{it} \tag{3.0}$$

$$\ln(GCF/GDP_{it}) = \alpha_i + \beta_1 \ln(GDPpc_{it}) + \beta_2 \ln(Pop_{it}) + \beta_3 GovExp_{it} + \beta_4 IQres_{it} + \beta_5 D2009_{it} + \beta_6 D2020_{it} + \varepsilon_{it} \tag{3.1}$$

$$\ln(GCF/GDP_{it}) = \alpha_i + \beta_1 \ln(GDPpc_{it}) + \beta_2 \ln(Pop_{it}) + \beta_3 GovExp_{it} + \beta_4 IQres_{it} + \beta_5 RealIR_{it} + \beta_6 D2009_{it} + \beta_7 D2020_{it} + \varepsilon_{it} \tag{3.2}$$

3.4. Threshold Analysis

To examine whether the effect of institutional quality on investment varies across levels of governance capacity, a panel threshold regression is estimated following Hansen (1999). The motivation is that the relationship between governance and investment may not be linear: in environments where core institutional functions are absent or deeply compromised, marginal improvements may be insufficient to shift investor behavior, while the same improvement could have a discernible effect once a baseline level of credibility is established. This interpretation is supported by recent empirical evidence: Ochi et al. (2023, 2024) find nonlinear threshold effects of governance quality on economic growth and poverty outcomes in African and South Asian countries, with significant effects only above a critical governance threshold. Aron (2000) and Fraga and da Cunha Resende (2022) similarly argue that governance quality shapes long-run investment primarily where enforcement capacity and administrative coherence are sufficiently developed. The threshold model takes the form:

$$\ln(GCF/GDP_{it}) = \alpha_i + \beta_1 X_{it} + \delta_1 IQres_{it} \cdot \mathfrak{T}(IQres_{it} \leq \gamma) + \delta_2 IQres_{it} \cdot \mathfrak{T}(IQres_{it} > \gamma) + \varepsilon_{it} \tag{3.3}$$

where γ is the threshold parameter to be estimated, $\mathfrak{T}(\cdot)$ is an indicator function, and X_{it} is the vector of control variables. The threshold is identified by minimizing the concentrated sum of squared residuals over a grid of candidate values, following Hansen (1999). The search is conducted over the central 90% of the IQres distribution, with a minimum of 40 observations and 10 countries required in each regime to ensure reliable fixed effects estimation within each sub-sample. The sensitivity of the threshold estimate to these parameter choices is examined in Section 4 through a systematic grid search across alternative trimming values and minimum observation thresholds. The model is applied to the residualized institutional index rather than raw WGI scores, ensuring that the estimated regime boundary reflects structural differences in governance capacity rather than income-driven variation. Results are reported in Section 4.

4. Discussion of Results

4.1. Main Estimation Results

Table 4 reports fixed effects estimation results with Driscoll-Kraay standard errors. Both specifications use the same 118-country sample over 2002-2022. Institutions predict investment. The coefficient is 0.119 in absolute dollars ($p < 0.001$) and 0.109 as a share of GDP ($p < 0.001$). Same size either way. This matters because it solves a puzzle in the literature: Chuku et al. (2017) found governance predicts investment levels but vanishes in ratios. We don't replicate that divergence. This is discussed further in Section 4.2.

Table 4. Fixed Effects Estimation Results (Driscoll-Kraay Standard Errors)

Variable	Model 1A Levels	Model 1B Ratio	Model 2A Levels + IR	Model 2B Ratio + IR
log(GDP per capita)	1.314***	0.213***	1.204***	0.045
	(0.044)	(0.051)	(0.046)	(0.054)
log(Population)	1.499***	0.257*	1.391***	0.210
	(0.141)	(0.124)	(0.212)	(0.153)
Government expenditure / GDP	0.001	0.001	0.005*	-0.002
	(0.006)	(0.006)	(0.002)	(0.004)
IQres	0.119**	0.109***	0.118***	0.083.
	(0.038)	(0.030)	(0.035)	(0.047)
Real interest rate	-	-	0.001	-0.001
			(0.002)	(0.001)
Countries	118	118	51	51
Observations	2,478	2,478	1,071	1,071
Fixed effects	Country	Country	Country	Country

Note: *. $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Driscoll–Kraay standard errors in parentheses. Models 1A and 1B use log(GCF in constant USD) and log(GCF/GDP) as the dependent variable, respectively, estimated on an identical 118-country sample. Models 2A and 2B add the real interest rate, reducing the sample to 51 countries.*

Log(GDP per capita) and log(Population) enter positively in the levels specification, consistent with larger and wealthier economies sustaining higher absolute capital formation. These scale effects are partially absorbed by the dependent variable in the ratio specification, which accounts for the smaller coefficients. Government expenditure is not significant in either specification, likely reflecting its overlap with GDP per capita when both are expressed as ratios. Interest rates don't predict investment ($p > 0.10$). Makes sense:

when property rights are shaky, whether the rate is 5% or 6% barely matters. Governance uncertainty dominates financial cost (Aron, 2000). Within-country R-squared values are modest, as is typical for fixed effects models applied to slowly evolving outcomes.

4.2. Level-Based versus Ratio-Based Specifications

A notable feature of Table 4 is the consistency of the institutional quality coefficient across the level-based (Model 1A) and ratio-based (Model 1B) specifications. This is worth emphasizing because the two specifications address different empirical concerns. The ratio-based model removes scale effects that are present when investment is measured in absolute USD levels, since larger economies invest more in absolute terms regardless of governance quality. The level-based model captures the total volume of capital formation and is more directly comparable to the existing literature (Mauro, 1995; Akobeng, 2017).

The finding that both specifications yield significant and similarly sized institutional quality coefficients suggests that the association between governance and investment is robust to this measurement choice. This is not always the case. Chuku et al. (2017) find that institutional quality is a robust determinant of investment levels but loses significance when investment is expressed as a share of GDP, attributing this to the dominance of macroeconomic scale effects. The present results do not replicate this divergence. A likely explanation lies in the residualization of the institutional index. Raw WGI-based governance scores are strongly correlated with income, and income in turn is strongly correlated with the scale of investment. When an unresidualised governance index enters a levels regression alongside GDP, part of its coefficient reflects this income-investment channel rather than the independent effect of governance. When investment is then expressed as a share of GDP, this channel is partially removed, causing the governance coefficient to lose significance. By constructing IQres as the component of governance that is orthogonal to income, the present study removes this confound at the measurement stage rather than at the specification stage. The result is a governance measure whose explanatory power does not depend on whether investment is scaled by GDP, which accounts for the consistency observed across Models 1A and 1B.

4.3. Robustness and Reliability

The results are supported by diagnostic tests. The Hausman test rejects the null hypothesis of consistency of the random effects estimator ($\chi^2 = 107.62$, df = 4, $p < 0.001$), confirming that fixed effects estimation is appropriate. Three violations of standard regression assumptions are detected: the Breusch-Pagan test rejects homoskedasticity (BP = 117.11, $p < 0.001$); the Breusch-Godfrey/Wooldridge test identifies serial correlation ($\chi^2 = 1{,}148.3$, df = 21, $p < 0.001$); and the Pesaran (2004) CD test confirms cross-sectional dependence ($z = 33.49$, $p < 0.001$). Driscoll–Kraay (1998) standard errors address all three issues simultaneously and are used throughout.

All variance inflation factors fall below 1.26, a marked improvement over the level-based specification in which VIF values between log(GDP) and log(government expenditure) exceeded 27. Expressing both government expenditure and the dependent variable as shares of GDP eliminates this structural overlap. The institutional quality coefficient retains its sign and significance across all tested specifications, with its VIF remaining below 1.04 in all models.

The stability of the institutional quality coefficient across the four specifications in Table 4 is also reassuring. The coefficient ranges from 0.083 to 0.119 with a consistent positive sign. The reduction in Models 2A and 2B is attributable to sample composition rather than the inclusion of the interest rate: Model 1A estimated on the same 51-country subsample yields a coefficient of 0.118, nearly identical to the full-sample estimate.

4.4. Threshold Analysis

The threshold regression follows Hansen (1999) and uses the residualized institutional quality index (IQres) as the threshold variable. The threshold is identified by minimizing the concentrated sum of squared residuals over the central 90% of the IQres distribution, with a minimum of 40 observations and 10 countries per regime. Results for both the ratio-based (1B) and level-based (1A) specifications are reported in Table 5.

The threshold estimate is IQres = -0.076. Below this value (74 countries, 1,042 observations), the institutional quality coefficient is 0.196 ($p = 0.002$), indicating a strong and significant positive effect. Above it (88 countries, 1,436 observations), the coefficient falls to 0.048 and is not significant ($p = 0.215$). The threshold marks the boundary between countries that underperform institutionally relative to their income level and those that meet or exceed income-adjusted expectations. Where governance falls below this benchmark, institutional improvements are associated with substantially higher investment; above it, other determinants dominate. The regime boundary, therefore, does not simply separate rich from poor countries; it distinguishes countries that underperform institutionally relative to their income from those that meet or exceed the institutional expectation for their development level. This pattern is consistent with the nonlinear governance effects documented by Ochi et al. (2023, 2024) and Houngbedji and Bassongui (2021): institutional quality appears to have a stronger marginal effect on investment where governance capacity is relatively weak, while in better-governed environments other determinants dominate.

For the levels specification (Model 1A), the estimated threshold is IQres = 0.609. Below the threshold, the coefficient is 0.228 ($p = 0.010$); above it, the coefficient is -0.282 ($p = 0.003$). The reversal in sign in the high regime is consistent with Chuku et al. (2017), who note that institutional effects on investment levels are driven by countries at lower governance levels, and may reflect compositional differences between the two regimes. The above-threshold group comprises only 30 countries.

Table 5. Threshold Regression Results

	Threshold	Regime	Obs.	Countries	Coef.	p-value
GCF/GDP (1B)	−0.076	Below	1,042	74	0.196	0.002
		Above	1,436	88	0.048	0.215
GCF levels (1A)	0.609	Below	2,166	115	0.228	0.010
		Above	312	30	-0.282	0.003

Note: *Estimated following Hansen (1999). Threshold variable is IQres. Country fixed effects with Driscoll–Kraay standard errors (HC3). Crisis dummies (D2009, D2020) included in all specifications. Obs. = number of country-year observations.*

The sensitivity of the threshold estimate to the choice of trimming parameter and minimum observation requirement is reported in Table 6. Across all nine combinations of trim (0.05, 0.10, 0.15) and min_obs (30, 40, 50), the threshold value, regime coefficients, and p-values are identical. The result is therefore not an artifact of parameter selection but reflects the structure of the data.

Table 6. Threshold Sensitivity Analysis (Model 1B, GCF/GDP)

trim	min_obs	Threshold	Low coef.	Low p	High coef.	High p
0.05	30	-0.076	0.195	0.002	0.050	0.193
0.05	40	-0.076	0.195	0.002	0.050	0.193
0.05	50	-0.076	0.195	0.002	0.050	0.193
0.10	30	-0.076	0.195	0.002	0.050	0.193
0.10	40	-0.076	0.195	0.002	0.050	0.193
0.10	50	-0.076	0.195	0.002	0.050	0.193
0.15	30	-0.076	0.195	0.002	0.050	0.193
0.15	40	-0.076	0.195	0.002	0.050	0.193
0.15	50	-0.076	0.195	0.002	0.050	0.193

Note: *Each row reports results for a different combination of trimming parameter (trim) and minimum observations per regime (min_obs). Threshold value, regime coefficients, and significance are invariant across all combinations.*

4.5. Heterogeneity by Income Group

Model 1B is estimated separately by income group to test whether the institutional effect holds across development levels. Results are in Table 7.

Only the upper middle-income group shows a significant coefficient (0.094, p = 0.011). The other three groups do not. This is not surprising: the low-income group has only 10 countries, and the high-income group sits mostly above the governance threshold where the effect fades. The within-group governance variation is similar across all groups (SD: 0.45–0.48, vs. 0.52 in the full sample), so the absence of significance is not because governance does not vary; it is a sample size problem.

The upper middle-income result connects to the threshold finding: 67% of countries in this group fall below IQres = -0.076, the regime where institutional improvements predict stronger investment. The low-income coefficient is negative (-0.090) but insignificant and unreliable with only 10 countries.

The full-sample estimate remains the main finding. Within income tiers, there are too few countries to detect a relationship that requires 118 to emerge clearly. Chuku et al. (2017) and Hayat (2019) similarly find the institutional effect varies across income levels.

Table 7. Institutional Quality and Investment by Income Group (Model 1B, Individual FE)

Income group	N	Coef.	SE	t-stat	p-value
High income	50	0.123	0.084	1.472	0.141
Upper middle income	31	0.094	0.037	2.560	0.011*
Lower middle income	27	0.111	0.141	0.790	0.430
Low income	10	−0.090	0.095	−0.945	0.346

Note: *Dependent variable: log(GCF/GDP). Individual fixed effects with crisis dummies D2009 and D2020. Driscoll–Kraay standard errors (HC3). Income group classification follows World Bank (2022). Coef. = coefficient on IQres. * $p < 0.05$.*

5. Conclusion and Policy Implications

This study examined the effect of institutional quality on gross capital formation across a balanced panel of 118 countries over 2002–2022. The central methodological contribution is the application of an income-residualized PCA-based governance index to a broad cross-country investment panel. Han et al. (2014) and Zhuang et al. (2010) applied similar residualization procedures in growth analyses across developing Asia and the MENA region; Hayat (2019) extended the approach to the FDI-growth nexus. The present study applies this strategy to aggregate investment across a wider and more diverse country sample, and tests whether the residualization approach resolves a specific empirical puzzle in the institutions-investment literature.

The main findings are threefold. First, institutional quality exerts a positive and statistically significant effect on gross capital formation in both level-based and ratio-based specifications, with near-identical coefficient magnitudes. Chuku et al. (2017) documented that institutional quality loses significance when investment is expressed as a share of GDP in an African sample using raw WGI scores, attributing this to the dominance of macroeconomic scale effects. The present results do not replicate this divergence. The explanation lies in the residualization: by purging the governance index of its income component at the measurement stage, the specification removes the channel through which an unresidualised index proxies for country size. The divergence documented by Chuku et al. appears to reflect a measurement problem rather than a structural feature of the institutions-investment relationship. This finding has methodological implications beyond this study: reported inconsistencies between level-based and ratio-based specifications in the governance-investment literature may partly reflect the failure to account for the income-governance correlation in the construction of the institutional index. The real interest rate is insignificant across all specifications, consistent with the argument that in environments where institutional uncertainty is high, governance conditions dominate over formal cost-of-capital signals in shaping investment decisions (Aron, 2000; Gwartney et al., 2006).

Second, the effect is nonlinear. The threshold regression identifies a regime boundary at IQres = -0.076, corresponding to countries whose institutional quality falls slightly below what their income level would predict. Below this threshold, the institutional quality coefficient is 0.196 and significant at the 1% level; above it, the coefficient falls to 0.048 and is not significant. This finding stands in contrast to the argument in Aron (2000) and Fraga and da Cunha Resende (2022), who suggest that governance shapes investment primarily where institutional capacity is sufficiently developed. The present results point in the opposite direction: institutional improvements have their strongest marginal impact where governance capacity is weakest relative to income expectations. This divergence likely reflects two differences. First, prior studies focus on sectoral or infrastructure investment, whereas the present study uses aggregate GCF. Second, the income-adjusted threshold variable produces a regime boundary that is conceptually distinct from those estimated using raw governance scores: the split does not separate rich from poor countries but separates countries that underperform institutionally relative to their development level from those that meet or exceed it. The threshold estimate is robust across all nine combinations of trimming parameter and minimum observation requirement tested in the sensitivity analysis. In the level-based specification, the institutional quality coefficient turns negative above the threshold (−0.282, p = 0.003), with the above-threshold group comprising only 30 countries. This reversal likely reflects compositional rather than structural factors: the group is too small to support reliable inference, and the result should not be interpreted as evidence that stronger institutions suppress investment levels.

Third, the income group analysis yields limited evidence of heterogeneous effects. The institutional quality coefficient is statistically significant only in the upper middle-income group (coef. = 0.094, p = 0.011); the remaining three groups yield insignificant estimates. The upper-middle-income finding is broadly consistent with the threshold result: 67% of countries in this group fall below the estimated regime boundary, though this overlap should be interpreted cautiously rather than as a structural explanation. For the other groups, statistical power remains the most likely constraint: the low-income group covers only 10 countries, and the high-income group, while larger, is concentrated above the threshold where the institutional effect attenuates. The low-income coefficient is negative (-0.090) but not significant and should not be over-interpreted given the sample size. Taken together, the income group results do not provide strong evidence of systematic heterogeneity across development tiers, and the full-sample estimate remains the more reliable characterization of the institutions-investment relationship. Chuku et al. (2017) and Hayat (2019) similarly find that the institutional effect on investment is heterogeneous across income levels.

The policy implications follow from the threshold finding. The regime boundary does not separate rich from poor countries. Korea, Croatia, and Romania sit just below the threshold (mean IQres: -0.069, -0.062, -0.081 respectively; authors' calculations based on estimation sample), despite being high-income economies; Viet Nam and the Philippines have crossed it from lower income levels (mean IQres: 0.009 and 0.011 respectively), meaning that despite their relatively modest development, their institutional performance meets income-adjusted expectations and other determinants of investment now dominate. The relevant policy question is therefore not how strong institutions are in absolute terms but how they compare to the governance level that a country's income would predict. Countries with a negative IQres value, where governance falls short of income-level expectations, are precisely where marginal institutional improvements are most likely to translate into measurable investment responses. For development institutions and policymakers, this reframes the targeting of institutional reform support. Using absolute governance rankings to prioritize reform assistance may misidentify the countries where such support would have the greatest effect. A country like Bangladesh, which sits below the threshold (mean IQres: -0.043), may respond more strongly to improvements in contract enforcement or regulatory predictability than a country already above it, where other determinants of investment dominate. The implication is that reform programs should be calibrated against income-adjusted governance benchmarks rather than absolute scores.

The study has several limitations. The residualization strategy removes the linear correlation between governance and income but does not resolve reverse causality. Investment may itself shape institutional quality over time, and factors such as natural resource endowments or geography could drive both simultaneously. Country fixed effects absorb time-invariant differences but not time-varying confounders. WGI scores are perception-based and slow to change, which means they capture long-run institutional patterns better than short-run reforms (Langbein & Knack, 2010; Gallego-Álvarez et al., 2021). The composite index is not decomposed; separating the contributions of rule of law, regulatory quality, and corruption control could yield sharper policy guidance. Finally, the income group results are consistent with a power constraint, but true heterogeneity across development tiers remains possible; the sample is simply too small within each group to rule it out. These are productive directions for future research.

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Appendix

Appendix A. Country Sample

Model 1 includes 118 countries over 2002-2022. Countries also included in Model 2 are marked with an asterisk (*).

High income (50)
Austria, Bahamas The*, Bahrain, Belgium, Brunei Darussalam*, Bulgaria*, Canada, Chile*, Croatia, Cyprus, Czechia*, Denmark, Estonia, Finland, France, Germany, Greece, Hungary*, Iceland*, Ireland, Israel, Italy*, Japan, Korea Rep.*, Latvia, Lithuania, Luxembourg, Macao SAR China*, Malta, Netherlands, New Zealand, Norway, Oman, Panama*, Poland, Portugal, Romania*, Russian Federation*, Saudi Arabia, Seychelles*, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Arab Emirates, United Kingdom, United States, Uruguay*
Upper middle income (31)
Albania*, Algeria*, Argentina, Armenia*, Belarus*, Belize*, Bosnia and Herzegovina*, Botswana*, Brazil*, China*, Colombia*, Costa Rica*, Cuba, Dominican Republic*, Ecuador, El Salvador, Gabon, Guatemala*, Iran Islamic Rep., Kazakhstan, Malaysia*, Mauritius*, Mexico*, Moldova*, Namibia*, North Macedonia, Paraguay, Peru*, Serbia, South Africa*, Ukraine*
Lower middle income (27)
Angola*, Bangladesh*, Benin, Bhutan*, Bolivia*, Cambodia, Cameroon, Comoros*, Congo Rep., Egypt Arab Rep.*, Haiti*, Honduras*, India*, Kenya*, Lebanon, Mauritania, Morocco, Nepal, Nicaragua*, Pakistan, Philippines, Senegal, Tajikistan, Tanzania, Tunisia, Viet Nam*, West Bank and Gaza
Low income (10)
Burkina Faso, Congo Dem. Rep., Guinea-Bissau, Madagascar*, Mali, Mozambique*, Rwanda*, Sierra Leone*, Togo, Uganda

Appendix B. PCA Factor Loadings for the Composite Institutional Index

WGI Dimension	Loading on PC1	Variance explained
Voice and Accountability (VA)	0.848	
Political Stability (PV)	0.823	
Government Effectiveness (GE)	0.962	
Regulatory Quality (RQ)	0.949	
Rule of Law (RL)	0.979	
Control of Corruption (CC)	0.954	85.4%

Note: *First principal component (PC1) extracted from six WGI dimensions using psych::principal. Variance explained refers to the proportion of total variance across the six indicators accounted for by PC1. All loadings exceed 0.82.*

Appendix C. Residualization Regression: PC1 on log(GDP per capita)

	Estimate	**Std. Error**	**t-value**	**p-value**
(Intercept)	−5.295	0.066	−79.65	< 0.001
log(GDP per capita)	0.599	0.007	80.67	< 0.001

$R^2 = 0.724$, Adjusted $R^2 = 0.724$, $F(1, 2476) = 6508$, $p < 0.001$

Note: *Dependent variable: first principal component of the six WGI dimensions (PC1). Estimated by OLS on the full 118-country balanced panel (2,478 observations). The residuals from this regression constitute the income-adjusted institutional quality index (IQres) used throughout the analysis.*

STATEMENTS AND DECLARATIONS

Authorship.

Alper Duman: Conceptualization, mathematical modeling, coding, analysis. *Ece Tahminci*: Data collection, data preparation, mathematical modeling, analysis, coding, writing.

Competing Interests. There are no competing interests associated with this research.

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Ethics Approval. This research did not involve human participants or animals.

Replication Materials. The data used in this research are drawn from the World Bank's World Development Indicators (WDI) and Worldwide Governance Indicators (WGI), both of which are publicly available at https://databank.worldbank.org The R codes used in the analysis are available upon request.

EFİLJOURNAL YAZIM KURALLARI/

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Gönderilen makalede daha önce başka bir yerde yayımlanmış ve telif hakkına tabi olan şekil veya tablolar bulunuyorsa, yazarların basılı ve çevrimiçi sürümler için telif hakkı sahiplerinden gerekli yasal izinleri gönderimden önce almaları gerekmektedir. Bu tür bir belge olmaksızın gönderilen makalelerde, Editörler çalışmanın telif hakkına tabi materyal içermediğini varsayacaktır.

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Makale dosyası ve aşağıda tarif edilen diğer dosyalar, info[at]efiljournal.com adresine, kısa bir konu başlığı ve e-posta metni içindeki bir üst yazı ile gönderilmelidir. Üst yazı gönderilen makalenin türünü (özgün araştırma makalesi, derleme makale, kitap incelemesi veya yorum yazısı) açıkça belirtmelidir.

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Bir makalenin gönderilmesi şu hususları ima eder: (i) gönderimi yapan yazar makalenin sorumlu yazarıdır, (ii) makale başka bir dergiye gönderilmemiş ya da başka bir dergide yayımlanmamıştır ve (iii) varsa tüm ortak yazarlar çalışmanın *Efil Ekonomi Araştırmaları Dergisi*'ne gönderilmesini onaylamıştır.

Yeni gönderimlerde üç ayrı belge eklenmelidir: (i) Kapak Sayfası, (ii) Anonim Makale ve (iii) Beyan ve Açıklamalar (aşağıya bakınız).

Bir makale, Editörler tarafından, hakemlere gönderilmeksizin reddedilebilir. Hakemlere gönderilen makalelerde nihai kabul veya ret kararı Editörler tarafından verilir. Reddedilen makaleler yeniden gönderilmemelidir. Hakemlik sürecine ilişkin daha ayrıntılı açıklama aşağıda yer almaktadır.

Kapak Sayfası

Kapak Sayfası tek sayfalık *.docx dosyası olarak gönderilmeli ve aşağıdaki unsurları içermelidir:

Başlık. Sayfanın en üstünde kısa ve bilgilendirici bir başlık yer almalıdır. Alt başlık isteğe bağlıdır.

Yazar Bilgileri

- Yazar(lar)ın tam adı
- Kurum bilgileri (örneğin üniversite, bölüm)
- E-posta adres(ler)i
- 16 haneli ORCID kimlik(ler)i

Tarih. Makalenin gönderildiği tarih yazılmalıdır (örneğin, 1 Nisan 2026).

Özet. Makalenin özgün dilinde 150–250 kelimelik bir özet sunulmalıdır. Özet kısaltma veya kaynakça içermemelidir.

JEL Kodları. Özetin altında en az bir, en fazla üç JEL kodu yer almalıdır.

Anahtar Sözcükler. JEL kodlarının altında en az üç, en fazla beş anahtar sözcük yer almalıdır.

Kapak Sayfası taslağı için websitesini ziyaret ediniz.

Anonim Makale

Anonim Makale bir *.docx dosyası olarak gönderilmelidir.

Anonim Makale metnindeki bilgiler, Kapak Sayfası'ndaki başlık, özet, JEL kodları ve anahtar sözcükler ile birebir aynı olmalıdır.

Yazarlar, makalelerini çift-taraflı anonim hakemlik sürecine uygun şekilde hazırlamakla sorumludur. Makale metninde (i) yazar(lar)ın bilgileri ve (ii) yazar(lar)ın kimliğini ortaya çıkarabilecek herhangi bir bilgi yer almamalıdır. Yazar(lar)ın kendi çalışmalarına yapılan atıflar üçüncü şahıs anlatımıyla yapılmalıdır.

Derginin katı bir sözcük sınırı bulunmamaktadır. Bununla birlikte, özgün araştırma ve derleme makalelerinin; özet, şekil ve tablo başlıkları, kaynakça, dipnotlar ve varsa ekler dâhil olmak üzere 10.000 kelimeyi geçmemesi önerilir. Kitap incelemeleri ve yorum yazıları 5.000 kelimeyi aşmamalıdır.

Anonim Makale taslağı için websitesini ziyaret ediniz.. Biçim kuralları aşağıda ayrıntılı biçimde açıklanmıştır.

Beyan ve Açıklamalar

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Yapay Zekâ. Efil Ekonomi Araştırmaları Dergisi, Yapay Zekâ (YZ) araçlarının kullanımına ilişkin güncel Committee on Publication Ethics (COPE) politikasını benimsemektedir. Buna göre, büyük dil modelleri olan ChatGPT, Gemini, Claude vb. dâhil olmak üzere Yapay Zekâ (YZ) araçları tarafından kısmen veya tamamen yazılmış makaleler gönderilemez.

Yazarlar, dil düzenlemesi ve optik karakter tanıma (OCR) ile veri düzenleme gibi diğer görevler için YZ araçlarının kullanımını açıklamakla yükümlüdür. Ayrıca yazarlar, YZ kullanımına ilişkin kayıtları saklamalıdır (örneğin, (i) kullanılan YZ aracının adı ve sürümü ile (ii) her bir kullanımın amacı ve tarihi).

Rutin düzeltme (proofreading) ile yazım/dilbilgisi denetimleri için açıklama yapılması gerekmez.

Yazarlık. İki veya daha fazla yazarlı makalelerde, her bir yazarın katkısını açıklayan bir beyan zorunludur. Bu beyan; kavramsallaştırma, veri toplama, veri hazırlama, matematiksel modelleme, analiz, kodlama, yazım ve revizyon gibi görevlerdeki katkıları netleştirmelidir.

Makale bir lisansüstü tezden üretilmişse, beyan metni öğrencinin ve tez danışmanının rollerini açıkça belirtmelidir.

Çıkar Çatışması. Yazarlar, makaleyle doğrudan veya dolaylı olarak ilişkili her türlü çıkar çatışmasını açıklamak zorundadır. Bu kapsam, fon sağlayan kurumları içermez. Herhangi bir çıkar çatışması yoksa aşağıdaki metin kullanılabilir:

- *Bu araştırmayla ilişkili herhangi bir çıkar çatışması bulunmamaktadır.*

Finansman. Yazarlar, araştırmanın herhangi bir kurum, kuruluş veya ajans tarafından finanse edilip edilmediğini açıklamak zorundadır. Finansman alınmadıysa aşağıdaki metin kullanılabilir:

- *Bu araştırma herhangi bir kurum, kuruluş veya ajans tarafından finanse edilmemiştir.*

Etik Onay. Bilgilendirilmiş onam veya etik inceleme gerektiren, insan katılımcılar ve/veya hayvanlar üzerinde yürütülen araştırmalar için yazarlar, çalışmanın yetkili bir etik kurul tarafından onaylandığını beyan etmeli ve buna ilişkin kanıt sunmalıdır. Beyan; onay veren kurumun adını, onay tarihini ve ilgili diğer ayrıntıları içermelidir.

Araştırmada insan katılımcılar veya hayvanlar ile çalışılmadıysa, aşağıdaki metin kullanılabilir:

- *Bu araştırma bilgilendirilmiş onam veya etik inceleme gerektirmemektedir.*

Tekrarlanabilirlik Materyalleri. Veri ve kodların erişilebilirliğine ilişkin kısa bir beyan zorunludur. Tekrarlanabilirlik materyalleri (yani veri setleri ve kodlar) kamuya açık ise doğrudan bir internet bağlantısı verilmelidir. Kamuya açık değilse, bu durum açıkça belirtilmelidir.

Teşekkür. Yazarlar, teşekkür edilen kişilerin tam adlarını ve finansman kaynaklarını ayrı bir başlık altında belirtebilir.

Beyan ve Açıklamalar taslak dosyasını indirmek için websitesini ziyaret ediniz.

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Sayfa Düzeni ve Metin. Tüm kenarlarda 1 inç (2,54 cm) boşluk bırakacak şekilde tek sütunlu bir sayfa düzeni kullanılmalıdır. Metin 12 punto Times New Roman yazı tipinde olmalı ve kalın (bold) veya altı çizili stiller kullanılmamalıdır. Vurgu için italik yazım tercih edilmelidir. Sayfa numaraları sayfanın alt kısmında yer almalı ve otomatik olarak eklenmelidir.

Bölümler. Makalenin bölümleri ardışık biçimde numaralandırılmalıdır (örneğin, "1. Giriş"). Alt bölümler de numaralandırılmalıdır (örneğin, "3.1. Veri"). Daha alt düzey başlıklar ile Kaynakça bölümü ise numaralandırılmamalıdır. Makalenizde ekler varsa, bunlar büyük Latin harfleri kullanılarak numaralandırılmalıdır (örneğin, "Ek A: Veri Kaynakları").

Denklemler ve Matematiksel İfadeler. Denklemler makale dosyası içinde ortalanmış gösterim öğeleri olarak yer almalı ve sayfanın sağ tarafında görünecek şekilde ardışık olarak numaralandırılmalıdır. Denklemler, denklem düzenleyici kullanılarak eklenmelidir. Satır içi matematiksel ifadeler için de denklem düzenleyici kullanılmalıdır.

Şekiller. Şekiller makale dosyası içinde yer almalı, tercihen sayfanın üst kısmında ortalanmış bir gösterim öğesi olarak sunulmalıdır. Şekiller ardışık biçimde numaralandırılmalı ve şeklin altında kısa bir başlık (açıklama) bulunmalıdır. Her şekle ana metin içinde atıf yapılmalıdır.

Yazarlar görsel dosyaları için uygun herhangi bir formatı kullanabilir (örneğin pdf, png, jpg, emf vb.). Ancak çözünürlüğü yetersiz görseller kabul edilmez; bu nedenle yazarlar, gönderimden önce makale dosyalarını *.pdf formatına dönüştürerek şekillerin çözünürlüğünü kontrol etmelidir.

Tablolar. Tablolar makale dosyası içinde yer almalı, tercihen sayfanın üst kısmında ortalanmış bir gösterim öğesi olarak sunulmalıdır. Tablolar ardışık biçimde numaralandırılmalı ve tablonun üstünde kısa bir başlık bulunmalıdır. Her tabloya ana metin içinde atıf yapılmalıdır.

Kaynakça ve Atıflar. Efil Ekonomi Araştırmaları Dergisi kaynakça ve atıf sistemi için American Psychological Association APA'nın en güncel yazım kurallarını benimsemektedir.

Metin içi atıflar yazar-tarih formatında yapılmalıdır.

Parentez içinde atıf örnekleri:

- (Akyüz & Boratav, 2003, p. 1459), (Acemoglu et al., 2006), (Yeldan, 2009)

Anlatım içinde atıf örnekleri:

- Akyüz & Boratav (2003, p. 1459), Acemoglu et al. (2006), Yeldan (2009)

Kaynakça listesi, atıf yapılan her bir kaynak türü için APA yazım kurallarına uygun olarak hazırlanmalıdır.

Kitaplar:

- Svendsen, S., & Løber, L. (2020). *The big picture/Academic writing: The one-hour guide* (3rd digital ed.). Hans Reitzel Forlag.

- Hygum, E., & Pedersen, P. M. (Eds.). (2010). *Early childhood education: Values and practices in Denmark.* Hans Reitzels Forlag.

Kitap bölümleri:

- Dillard, J. P. (2020). Currents in the study of persuasion. In M. B. Oliver, A. A. Raney, & J. Bryant (Eds.), *Media effects: Advances in theory and research* (4th ed., pp. 115–129). Routledge.

Dergi makaleleri:

- Rybaczewska, M., & Sparks, L. (2022). Ageing consumers and e-commerce activities. *Ageing and Society,* 42(8), 1879–1898.

Yayımlanmamış çalışma tebliğleri, gazete makaleleri, veri arşivleri, çevrim içi kaynaklar ve lisansüstü tezler gibi diğer materyal türleri için American Psychological Association (APA) yazım kurallarına bakınız.

Dipnotlar. Dipnotlar, ek bilgi ve açıklamalar vermek amacıyla kullanılabilir; buna yazar-tarih formatında metin içi atıf da dahildir. Ancak dipnotlarda atıf yapılan kaynağın tam bibliyografik künyesi verilmemelidir.

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Başvurular öncelikle eksik bilgi ve teknik uygunluk açısından kontrol edilir. Ardından Editörler, makalenin hakem değerlendirmesine gönderilip gönderilmeyeceğine karar verir. Bu aşamada, masa başı ret (desk rejection) kararı verilebilir.

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Her aşamada sorumlu yazara e-posta yoluyla bildirim yapılır.

Masa başı ret kararı genellikle gönderimden itibaren 30 gün içinde verilir. Hakem değerlendirmesine gönderilen makaleler için nihai karar normalde gönderim tarihinden itibaren 90 gün içinde alınır.

Nihai karar tamamen Editörlere aittir. Reddedilen makaleler yeniden gönderilmemelidir.

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Koşullu kabul sonrasında, sorumlu yazarın bir telif hakkı devir sözleşmesi imzalaması gerekir. Ardından üretim ekibi dizgi işlemlerini tamamlar ve makalenin dizgisi tamamlanmış nihai kopyasını onay için sorumlu yazara gönderir.

Nihai kopya onaylandıktan sonra, makale, derginin internet sitesinde erken görünüm (forthcoming article) olarak yayımlanır. Erken görünüm makaleler, derginin sonraki sayılarından birinde yayımlanır.

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- The full name(s) of the author(s)
- The affiliation(s) of the author(s) [e.g., institution, department, etc.]
- The email address(es) of the author(s)
- The 16-digit ORCID(s) of the author(s)

Date. The date of submission should be included (e.g., April 1, 2026).

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JEL Codes. At least one and at most three JEL Codes should appear below the abstract.

Keywords. At least three and at most five keywords should appear below the JEL Codes.

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Authorship. For manuscripts with two or more authors, a statement describing each author's contribution is required. This should clarify contributions to tasks such as conceptualization, data collection, data preparation, mathematical modeling, analysis, coding, writing, and revision.

If the manuscript originates from a graduate dissertation, the statement must clarify the roles of the student and the principal supervisor.

Competing Interests. Authors must disclose any conflicts of interest directly or indirectly related to the manuscript. This does not include funding institutions. If there are no competing interests, the following text may be used:

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Funding. Authors must disclose whether the research received funding from any institution, organization, or agency. If no funding was received, the following text may be used:

- *This research did not receive funding from any institution, organization, or agency.*

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If the research did not involve human participants or animals, the following text may be used:

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Replication Materials. A brief statement on data and code availability is required. If the replication materials (i.e., the datasets and codes) are publicly available, provide a direct web link. If they are not publicly available, this must be stated.

Acknowledgements. Authors may include the full names of acknowledged individuals and funding sources under a separate heading.

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Please use the sample files shared on website while preparing your submission files.

Layout and Text. Authors should use a single-column page layout with one-inch page margins on all sides. The text should be in 12pt Times New Roman font without boldface or underlined styles. Italics should be used for emphasis. The page numbers should appear on the bottom of the page, inserted automatically.

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Figures. Figures should appear within the manuscript file, ideally as a centered display item at the top of a page. Figures should be numbered consecutively using Arabic numerals, and a brief caption should appear below the figure. Each figure should be cited in the main text.

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References and Citation. The Efil Journal of Economic Research follows the most recent style guidelines of the American Psychological Association (APA) for references and citation.

The citations within the text must be in the author-year format.

Parenthetical examples:

- *(Akyüz & Boratav, 2003, p. 1459), (Acemoglu et al., 2006), (Yeldan, 2009)*

Narrative examples:

- *Akyüz & Boratav (2003, p. 1459), Acemoglu et al. (2006), Yeldan (2009)*

The references list should be prepared in accordance with the APA style guidelines for each type of cited materials.

Books:

- Svendsen, S., & Løber, L. (2020). *The big picture/Academic writing: The one-hour guide* (3rd digital ed.). Hans Reitzel Forlag.

- Hygum, E., & Pedersen, P. M. (Eds.). (2010). *Early childhood education: Values and practices in Denmark*. Hans Reitzels Forlag.

Chapter in an edited book:

- Dillard, J. P. (2020). Currents in the study of persuasion. In M. B. Oliver, A. A. Raney, & J. Bryant (Eds.), *Media effects: Advances in theory and research* (4th ed., pp. 115–129). Routledge.

Journal article:

- Rybaczewska, M., & Sparks, L. (2022). Ageing consumers and e-commerce activities. *Ageing and Society*, 42(8), 1879–1898.

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At each stage, the corresponding author is notified by email.

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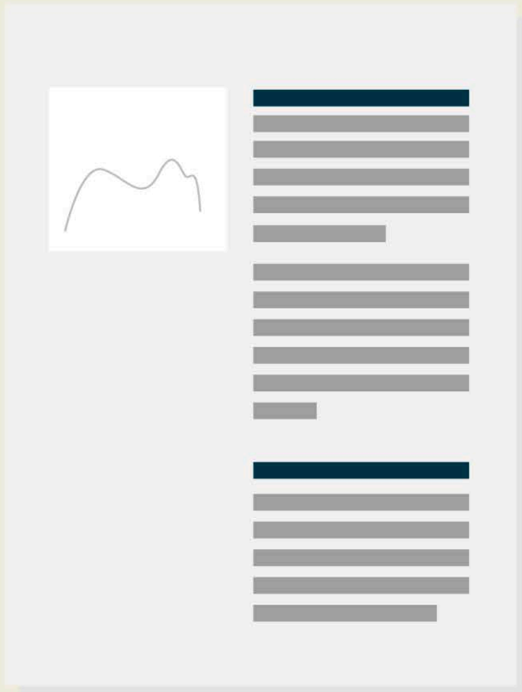

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