LUISS

Department of Economics and Finance

Chair of Money and Banking

MONETARY POLICY AND ECONOMIC INEQUALITY IN THE EUROZONE: AN EMPIRICAL ANALYSIS IN THE SPIRIT OF PIKETTY

Prof. Paolo Paesani

SUPERVISOR

Francesco Iarossi

CANDIDATE

I would first like to thank Professor Paolo Paesani for giving me the opportunity to work on such a challenging and engaging topic. His guidance and support have been essential throughout this journey.

I am deeply grateful to my parents for always believing in me, even during times when I struggled to believe in myself. To my sisters, thank you for always being by my side and for inspiring me through your achievements to keep pushing forward.

Lastly, I would like to thank my friends for their constant presence over these past three years. Their support, encouragement, and companionship have meant a lot.

TABLE OF CONTENTS

I. INTRODUCTION

The 2008 financial crisis intensified economic inequality in Europe by worsening existing disparities and fostering recovery trends that disproportionately favored high-income groups.[1] As a result, inequality has remained a pressing concern that continues to influence public opinion and shape economic policy debates across the Eurozone.

This thesis wishes to explore the factors that have contributed to this growing inequality in income, particularly in the aftermath of 2008 global crises. The work of French economist and academic Thomas Piketty, which provides a structural and long-term perspective on the causes of this growth, has compellingly argued that inequality naturally occurs when the rate of return on capital surpasses the rate of economic growth.[2] Nonetheless, given recent developments especially in the area of monetary policy since 2008, it has been argued that Piketty's theory may not be enough to explain the current trends in inequality, suggesting that short-term factors like low interest rates and asset purchases may have also had an important role to play.[3]

A. RELEVANCE OF THE STUDY.

In this context, the specific interaction between long-term structural forces and short-term policy interventions like monetary policy is worthy of investigation, as it is a relationship that has been largely underexplored. One possible reason for this may lie in the perception that central bank actions are in essence distributionally neutral and therefore outside the scope of inequality research. However, the expanded role that central banks have played in stabilizing economies post-2008, makes it more likely that their policies can have both deliberate and unintentional impacts on economic equality and public confidence in institutions as well as the general efficacy of policy responses overall.[4] Thus, determining whether monetary policy has exacerbated inequality has the potential to be of crucial interest to both policy development and research understanding.

---

[1] OECD, *Divided We Stand: Why Inequality Keeps Rising* (Paris: OECD Publishing, 2011)
[2] Thomas Piketty (2014). *Capital in the Twenty-First Century*. Cambridge: Harvard University Press.
[3] Piketty. (2014). *Capital in the Twenty-First Century*.
[4] European Central Bank (2021). *Monetary policy and inequality*. Occasional Paper Series

B. RESEARCH AIM, OBJECTIVES AND QUESTIONS:

The aim of this research is therefore to investigate how the return on capital (r) and monetary policy have contributed to income inequality in the Eurozone from 2008 and 2023. Especially the study examines whether the gap between the return on capital and economic growth (r>g), as proposed by Piketty, explains recent trends in inequality.[5] Moreover, this study explores whether monetary policy, especially Quantitative Easing and interest rate reductions, has mitigated the issue of inequality across the member countries.

To achieve the aim of this study, the following objectives are defined.

1- To construct a composite measure of the return on capital (r) across Eurozone countries between 2008 and 2023.

2- To compare the return on capital (r) with the economic growth rate (g) across the same period.

3- To test whether the difference between r and g (i.e., r > g) significantly influences income inequality.

4- To examine the extent to which monetary policy, particularly unconventional measures, has affected inequality in the Eurozone.

To further guide this research and ensure alignment with the research aim and objectives, the following questions have also been defined. These questions are defined to explore both the structural and policy related determinants of inequality in the Eurozone after the 2008 crisis.

1- What was the return on capital in Eurozone countries between 2008 and 2023?

2- How does the return on capital compare to national growth rates?

3- Does the r-g gap help explain changes in income inequality?

4- Has monetary policy widened or reduced income inequality since 2008?

[5] Piketty. (2014). *Capital in the Twenty-First Century*.

II. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

This first chapter will provide a brief overview of the existing literature as it relates to the philosophical, economic and empirical background upon which this dissertation is based.

A. PHILOSOPHICAL PERSPECTIVES ON INEQUALITY

Considerations on inequality benefit from an understanding of their philosophical context, where liberal and libertarian positions provide contrasting perspectives on the role and rationale of inequality in society at large. A significant example of a philosophical perspective on inequality can be found in John Rawls: *A Theory of Justice* where Rawls argues that inequality is only justifiable if it improves the position of the least advantaged in society.[6] His difference principle states that economic disparities must work to the benefit of those with the fewest opportunities.[7] Applied to economic institutions, including monetary systems, this suggests that policy should be evaluated by how well it advances distributive justice, as he claims that, "inequalities are permissible only if they result in compensating benefits for everyone, and in particular for the least advantaged members of society."[8]

As a reflection of the complexity of the debate the variety of opinions on the admissibility of inequality, Robert Nozick, in *Anarchy, State, and Utopia*, offers a libertarian alternative, where he argues that as long as resources are acquired and transferred justly, the resulting inequality is morally acceptable.[9] Nozick sees redistributive policies, including monetary or fiscal interventions, with suspicion, viewing them as infringements on individual freedom and property rights, claiming that: "taxation of earnings from labor is on a par with forced labor."[10] Differently, Amartya Sen critiques income-based metrics and instead focuses on capabilities, that is to say what individuals are actually able to do or be.[11] In *Development as Freedom*, he argues that true inequality

[6] John Rawls, *A Theory of Justice* (Cambridge, MA: Harvard University Press, 1971), 75–83.
[7] Rawls, *A Theory of Justice*
[8] Rawls, *A Theory of Justice*.
[9] Robert Nozick, *Anarchy, State, and Utopia* (New York: Basic Books, 1974), 149–182.
[10] Nozick, *Anarchy, State, and Utopia*
[11] Amartya Sen, *Development as Freedom* (New York: Anchor Books, 1999), 87–110.

lies in the privations of basic means, such as education, health, or employment.[12] In Sen's opinion, even modest changes in monetary policy could significantly affect real freedom for example, if easier access to education or increased employment expands people's ability to participate fully in society improves, this can have a significant impact not only economic inequality but on political and social inequality as "poverty must be seen as the deprivation of basic capabilities rather than merely as low income."[13] In contrast to Sen, Friedrich Hayek's contribution to the debate offers the interesting claim that inequality is a natural result of individual differences in talent, effort, and choice and that attempts to engineer equal outcomes are ineffective and morally wrong. In his work, *The Constitution of Liberty,* Hayek defends the spontaneous order of markets and warns against centralized interventions, including those aimed at redistributing income.[14] In fact, in the context of monetary policy, Hayek is skeptical of central banks aim of redistributive goals, fearing they distort the price system and erode freedom, claiming insightfully that, "there is all the difference in the world between treating people equally and attempting to make them equal."[15]

It is thus observable that perspectives on inequality are profoundly influenced by philosophical thought, whereby inequality can be perceived negatively as a factor that undermines political stability, impedes the possibility for economic mobility thereby wearing down social cohesion; or positively as a factor that can stimulate levels of production and innovation. Arguably structural and policy-driven changes have increased inequality in many well-developed economies in recent decades.[16] Indeed, the role of monetary policy in influencing inequality in areas such as the Euro Zone has come under scrutiny, particularly because of the suggestion that the frameworks underpinning the monetary policies in many contexts are not ethically neutral. This suggests that its impact on both macroeconomic outcomes and on beneficiaries and non must be taken into consideration. In light of the potentially negative effects of inequality, as outlined above, monitoring of inequality is essential, if we are to avoid slower economic growth, and increased political instability.

---

[12] Sen, *Development as Freedom*
[13] Sen, *Development as Freedom*
[14] Friedrich A. Hayek, *The Constitution of Liberty* (Chicago: University of Chicago Press, 1960), 85–98.
[15] Hayek, *The Constitution of Liberty*
[16] Piketty, *Capital in the Twenty-First Century* .

B. THEORIES AND MEASURES OF INEQUALITY

In economic terms, inequality is defined as the unfair difference between groups of people in society, when some have more wealth, status or opportunities than others.[17] More specifically, economic inequality refers to the unequal distribution of income, wealth or access to economic resources among individuals or groups within a society. Income inequality, such as disparities in earnings (from wages, capital income, and transfers), and wealth inequality, which represents disparities in asset ownership, such as real estate, financial securities, or savings, are the most frequent and common forms of inequality.

One of the most widely used indicators of economic inequality is the Gini coefficient. The Gini coefficient measures the extent to which the distribution of income within a country deviates from a perfectly equal distribution.[18]A coefficient of 0 expresses perfect equality, where all individuals receive an equal share of total economic resources, while a coefficient of 1 reflects complete inequality, where a single individual holds all available income or wealth. The Gini is widely used due to its intuitive Lorenz-curve foundation and ease of comparison across time or countries.[19] However, although it is widely used in empirical studies, it has well-known limitations such as the lack of sensitivity to changes in the short-run and a structure that is not easily decomposable which makes it hard to identify subgroup contributions[20]. For example, a policy that only benefits the top 1% may barely numerically affect the Gini coefficient, even though the rich-poor gap grows. Because of such issues, research often complements the Gini with top income/wealth shares.[21] Measures like the top 10% share or top 1% share capture concentration at the upper percentiles. Top-share measures directly illustrate elite accumulation, though they focus only on one end of the distribution and lack the axiomatic foundation of the Gini. Other inequality indices exist as well: for example, the Theil index or Atkinson index which can be decomposed and assign different weights to changes across the distribution.[22] Each measure has a "broader concept" of inequality

[17] Thomas Piketty, *Capital in the Twenty-First Century* (Cambridge: Harvard University Press, 2016), 94
[18] Eurostat. *Gini Coefficient of Equivalence Income – EU-SILC Survey*. Accessed April 22,
[19] Janina Engel, et al. "New Insights into Inequality and Wealth in the Euro Area." *SUERF*. 2022. Web. 25 May 2025.
[20] Rita Neves Costa and Sébastien Pérez-Duarte. "Not All Inequality Measures Were Created Equal."
[21] Costa and Pérez-Duarte. "Not All Inequality Measures Were Created Equal."
[22] Costa and Pérez-Duarte. "Not All Inequality Measures Were Created Equal."

embedded; for example Atkinson's index reflects societal aversion to inequality and thus no single measure is definitive.

In the Eurozone the Gini coefficient for net wealth is about *0.70–0.75* roughly double the 0.30 Gini for disposable incomes.[23] Likewise, the top 10% of wealth holders own about *56%* of total household wealth, with the bottom 50% owning only *5%*, a much higher concentration than observed for income.[24] These gaps highlight the importance of the question of economic inequality around the Euro-Area and in the broader world, raising concerns on the causes that generate such. A secondary concept related to economic inequality is consumption inequality. This is often lower than income inequality since individuals can smooth income shocks via saving and borrowing.[25] Many variables exist to quantify economic inequality, with each variable capturing a different aspect of income and wealth inequality. Because they all differ in sensitivity, scope and interoperability, economists must understand and evaluate which variable best fits the model they are testing.

C. OVERVIEW OF INEQUALITY MODELS

Classic economic theories have proposed different mechanisms to explain how inequality evolves. This section briefly introduces three major perspectives: the Kuznets development hypothesis, the Solow growth model, and institutional theories, assessing their relevance and limitations in today's inequality debate.

Simon Kuznets in 1955 hypothesized that as an economy develops, inequality first rises and then falls following an inverted-U pattern.[26] Following a historical overview of the early stages of the first industrial revolution, Kuznets noted that the initial shift of labor from agriculture to industry led to a rise in inequality as urban incomes rose significantly in comparison to the incomes of the rural population thus widening the gap

[23] "New Insights into Inequality and Wealth in the Euro Area." *SUERF*. n.d. https://www.ecb.europa.eu/..
[24] Ahnert, Henning, et al. "New European Wealth Gauge Helps Policymakers Address Inequality." *IMF*. 19 Nov. 2024 https://www.suerf.org/.
[25] Ija Trapeznikova. "Measuring Income Inequality." *IZA World of Labor*. 17 July 2019. https://wol.iza.org/articles/measuring-income-inequality.
[26] Ivan Lyubimov. "Income Inequality Revisited 60 Years Later: Piketty vs Kuznets ." *Russian Journal of Economics 3* . 2017. Web. https://doi.org/10.1016/j.ruje.2017.10.003.

between the rich and the poor.[27] Kuznets noted that over time, factors such as mass education, political pressure for redistribution, and structural change would reduce inequality in more mature industrial economies.[28] Despite the logic of Kuznets theory, it is based nonetheless on limited empirical evidence, as its main analysis is based primarily on historical data from the U.S., U.K., and Germany in the first half of the late 19th and first half of the 20th century, when inequality had indeed declined alongside growth. Be that as it may, Kuznets' work suggested that inequality might be a temporary effct of growth and that in the long-run it would resolve itself once countries became richer. In fact, subsequently Kuznets stated that his inverted U was only a hypothesis requiring more data, as his study covered just three countries over a few decades.[29] Subsequent historical research, suggested that many pre-industrial societies were in fact not egalitarian to begin with,[30] thus undermining Kuznets key assumption of an initial low-inequality baseline.

Another important and valid model that represents inequality is the Solow Growth Model. The Solow model explains long-run economic growth via capital accumulation, labor force growth, and technological progress.[31] The model, in its basic form, assumes a representative agent and a production function, which for the purposes of simplicity can be assumed to be the Cobb-Douglas, with constant factor shares.[32] A key Solow result, which is in open contrast with the previously stated model by Kuznet, is that the income part of capital against labor remains roughly constant over time and so equilibrium growth is "balanced."[33] This then implies that the conditions above do not generate inequality as everyone's income grows at the rate of overall output, and the distribution between labor and capital incomes is stable.[34] Essentially, in Piketty's words

---

[27] Simon Kuznets, "Economic Growth and Income Inequality," *American Economic Review* 45, no. 1 (1955): 1–28
[28] Kuznets, "Economic Growth and Income Inequality," *American Economic Review*
[29] Piketty, *Capital in the Twenty-First Century*
[30] Lyubimov "Income Inequality Revisited 60 Years Later: Piketty vs Kuznets ."
[31] M.J. Kadigi , and Elizabeth Robinson. "Revisiting the Solow-Swan Model of Income Convergence in the Context of Coffee Producing and Re-Exporting Countries in the World." Sustainable Futures, May 22, 2022. https://www.sciencedirect.com/science/article/pii
[32] Drew Moffitt. "Decoding Solow's Model: Insights Into Economic Development and Growth." Kumospace, May 2024. https://www.kumospace.com/blog/solow-growth-model.
[33] J. Bradford De Long.. 2015. "Wealth and Income Distribution: New Theories Needed for a New Era." *VoxEU.org*, September 7, 2015. https://www.bradford-delong.com/2015/09/highlighted-wealth-and-income-distribution-new-theories-needed-for-a-new-era-vox-ceprs-policy-portal.html.l
[34] DeLong. "Wealth and Income Distribution: New Theories Needed for a New Era."

Solow's framework was "engineered to make it next to impossible for almost anything to materially alter factor shares,"[35] suggesting that it is almost impossible for anything to significantly change how income or resources are divided between workers, businesses, and owners. Thus, as Kanbur and Stiglitz noted, theories built solely on Solow's assumption fail to explain rising inequality in advanced economies.[36] Modern extensions introduce heterogeneity to predictions. The Piketty model is a prime example of this as it can be seen as a consequence of Solow with differential savings and a high elasticity, which allow capital's share to increase. [37]

According to a third perspective that contrasts with the previous two, institutions have a significant role in determining the results of inequality. These institutions include labour market rules, tax and transfer systems, educational systems, financial markets, and larger political considerations. Unlike purely economic models, these theories suggest that differences in policies and institutional choices greatly explains why economies that are similar overall show different inequality levels[38]. An example that illustrates this is the role of union membership; when workers are in strong unions, they can negotiate better wages and benefits for themselves. But as unions have weakened in many countries over the last decades, workers have lost bargaining power, and wages have grown more slowly.[39] In this context legislation that deals with minimum wage is also significant. If the minimum wage doesn't rise with living costs, low-paid workers fall behind as they have less and less purchasing power.[40] Furthermore, taxation systems are also key when discussing this research, as when governments lower taxes on the rich and cut support for lower income groups, more income benefits the top earners. Because of this, countries like France and Germany maintain lower inequality through stronger protections, while more market driven systems like the U.S. and U.K. have seen inequality rise. [41] The weakness of institutional theories lies in the broad nature of the term "institutions" which

---

[35] Piketty. *Capital in the Twenty-First Century*.
[36] Joseph Stiglitz and Ravi Kanbur. *Wealth and income distribution: New theories needed for a new era | CEPR*. 2015.
[37] Ravi Kanbur and Joseph E. Stiglitz. "Dynastic Inequality, Mobility and Equality of Opportunity - The Journal of Economic Inequality." *SpringerLink*. Springer US, 13 July 2016.
[38] Florence Jaumotte and Carolina Osorio Buitron. "Inequality and Labor Market Institutions." https://www.imf.org/external/pubs/ft/sdn/2015/sdn1514. July 2015.
[39] Jaumotte and Buitron. "Inequality and Labor Market Institutions."
[40] Jaumotte and Buitron. "Inequality and Labor Market Institutions."
[41] Acemoglu and Robinson, "Democracy, Redistribution, and Inequality", Handbook of Income Distribution Volume 2, 2015, Pages 1885-1966

includes: labor unions, tax policies, welfare systems and many others. As these components are largely connected and can vary greatly across countries, it becomes challenging to isolate the impact of each single factor. This leads to overlapping effects of institutions which limits the precision of an empirical analysis and as a consequence the predictive ability of these models.[42]

D. PIKETTY'S MODEL

French economist and academic, Thomas Piketty, has emerged as a leading voice in the economics of inequality not only in France, but also globally, over the last two decades, with his work engaging both the expert audience of economists and the general public.[43] Piketty's theoretical model, with its focus on tax data and top incomes,[44] provides a structural explanation of why inequality tends to increase in capitalist economies over time, unless offset by significant policy interventions or consequential economic shocks.[45] While his work is deeply empirical, as it traces wealth and income trends over a century and sometimes two or three, it is rooted in a relatively simple but strong set of macroeconomic relationships that highlight how the unequal distribution of capital drives inequality.

Piketty's most influential claim is that capitalism, if left unmonitored, naturally tends towards the concentration of wealth among top income earners.[46] He highlights that this outcome is not driven by moral failure or political corruption alone, but by actual structural forces that derive from the dynamics of growth, savings, and returns on capital.[47] His model, which "consists of one definitional relationship, two fundamental economic laws of capitalism (as they are called by Piketty), and one inequality

[42] Acemoglu and Robinson, "Democracy, Redistribution, and Inequality", 6
[43] Milanovic Branko. "The Return of 'Patrimonial Capitalism': A Review of Thomas Piketty's 'Capital in the Twenty-First Century.'" *Journal of Economic Literature* 52, no. 2 (2014): 519–34. http://www.jstor.org/stable/24433816.
[44] Branko. "The Return of 'Patrimonial Capitalism': A Review of Thomas Piketty's 'Capital in the Twenty-First Century.'"
[45] Piketty, *Capital in the Twenty-First Century*
[46] Piketty, *Capital in the Twenty-First Century*
[47] Piketty, *Capital in the Twenty-First Century*

relationship",[48] aims to explain why inequality may not only persist but intensify even in democratic societies with functioning markets and institutions.[49]

1. The First Fundamental Law of Capitalism: Capital's Share of Income

The first law of capitalism can be expressed in the simple equation:

Formula 1.0

$\alpha = r \cdot \beta$

Where:

α is the share of national income derived from capital,

r is the average rate of return on capital (such as dividends, interest, rents, profits),

β is the capital-to-income ratio (total capital stock divided by annual national income).

This equation explains how much of a society's total income goes to capital owners rather than to wage earners.[50] When the capital to income ratio β increases the share of capital connected to national income increases, with r the return on that capital, remains stable, then the share of income going to capital α, will also rise. This will result in a shift in income away from labor toward capital which overall benefits wealthier households who own the majority of assets.[51]\\

In this dissertation, a composite measure of the return on capital (r) will be constructed , allowing this research to empirically test its (r) evolution and role in driving income and wealth inequality across the Eurozone. Thus, hypothesis 1 (H1): Construct a composite measure of the return on capital (r).

2. The Second Fundamental Law of Capitalism: Long-Run Capital Accumulation

The second law complements the first by explaining how β evolves over time:

Formula 2.0

$\beta = s/g$

[48] Branko. "The Return of 'Patrimonial Capitalism': A Review of Thomas Piketty's 'Capital in the Twenty-First Century.'"

[49] Piketty, *Capital in the Twenty-First Century*

[50] Piketty, *Capital in the Twenty-First Century*

[51] Piketty. *Capital in the Twenty-First Century*.

Where:

s is the savings rate,

g is the rate of economic growth.

This equation describes a long-run equilibrium condition, that states that in a stable economic environment, the capital-to-income ratio β is equal to the ratio of savings to growth.[52] This implies that if growth slows, and if savings remain steady or increase, β tends to rise. As a consequence of this, it feeds back into the first law and subsequently increases capital's share of income. By empirically estimating both the return on capital (r) and the growth rate (g), the aim of the study is to assess whether the inequality amplifying condition r > g holds in the Eurozone context. Thus, hypothesis 2 (H2): Compare the return on capital (r) to the growth rate (g).

3. The Piketty Equation: Linking Capital and Inequality

The Piketty Equation derives by combining the two laws :

Formula 3.0

$$\alpha = r \cdot s / g$$

This expression demonstrates that capital's share of income will tend to rise when r is stable or rising, and g is falling.[53] This dynamic creates a mechanism through which economic inequality in the long run increases, when the real rate of return on capital r is higher than the broader growth rate of the economy g. [54] Building on this framework, the study tests whether the difference between r and g (i.e. r – g) significantly affects measures of economic inequality, such as the Gini coefficient or top income shares, within Eurozone countries. Thus, hypothesis 3 (H3): Test whether the difference between r and g affects inequality.

[52] Piketty. *Capital in the Twenty-First Century*.

[53] Tim Jackson, and Peter A. Victor. "Does Slow Growth Increase Inequality? Some Reflections on Piketty's Fundamental Laws of Capitalism." University of Surrey, 2014.

[54]Robert P. Murphy and Phillip W. Magness, *Contra Piketty: The Flaws and Fallacies in Capital in the Twenty-First Century* (Washington, DC: Cato Institute, 2015).

4. The Model's Relevance and Limitations

Much of the praise heaped on Piketty's model is due to the contribution his writing has made in changing the focus of conversations around inequality from a debate based on theory and philosophical perspective to one driven by data and empirical formulations. Despite the strengths of his work, several limitations regarding the theoretical stance and the underlying assumptions of his research have been acknowledged. For instance, Murphy and Magness argue that Piketty's empirical foundation, which has often been referred to as one of the book's greatest contributions, is in fact compromised by a series of methodological inconsistencies, selective data usage, and factual inaccuracies.[55] In their research, they highlight that his historical reconstructions, in particular for the United States, frequently rely on interpolated and constructed data rather than verifiable historical records, this, if true, casts doubts on the robustness of his long-term inequality trends.[56] Furthermore, they demonstrate that key frameworks, such as those showing the U-shaped trajectory of wealth inequality, are often based on cherry picked sources and datasets that ultimately obscure important divergences in the underlying evidence.[57]

In a complementary critique from Rallo, another theoretical underpinning of Piketty's model is called into question, especially the formulation of Piketty's "fundamental laws of capitalism."[58] In his paper, Rallo points out that the identity $\beta = s/g$, while being mathematically coherent, relies on a series of unrealistic behavioral assumptions such as: the net saving rate remaining constant in time and unaffected by broader macroeconomic conditions.[59] In reality, Rallo states that savings behavior is more likely to be endogenous, and so responding to variables such as growth, risk, and capital depreciation more than constant.[60] Moreover, the "Some Fundamental Problems with Thomas Piketty's Capital in the Twenty-First Century" paper argues that Piketty's assumption of a stable or constant rate of return on capital is highly questionable, especially given that increasing capital accumulation typically leads to diminishing

[55] Ivan Lyubimov. "Income Inequality Revisited 60 Years Later: Piketty vs Kuznets ." *science direct*. 2017. Print.
[56] Lyubimov. "Income Inequality Revisited 60 Years Later: Piketty vs Kuznets."
[57] Lyubimov. "Income Inequality Revisited 60 Years Later: Piketty vs Kuznets ."
[58] Juan Ramon Rall. *Some fundamental problems with Thomas Piketty's ...* 2018. Web. 26 May 2025.
[59] Rallo. *Some fundamental problems with Thomas Piketty's ...* 2018.
[60] Rallo. *Some fundamental problems with Thomas Piketty's ...* 2018.

marginal returns.[61] As a result, the statement that $r > g$ will inevitably lead to rising inequality is significantly weakened, as it neglects important balancing forces such as : declining returns on capital, different saving behaviors, and potential shifts in income distribution between labor and capital, that may limit the inequality dynamics predicted by Piketty. Additionally, as highlighted by Bruegel, Piketty's research and the numerous critiques that have been made to his theories, has led economists to question whether inequality is generate by long term concepts and theories, like the r-g gap, or whether short- term trends are more influential.[62] In conclusion, while Piketty's model has been fundamental in drawing attention to the issue of inequality, the critiques discussed here show that his approach could potentially benefit from other theoretical perspectives and a more robust data analysis.

E. EMPIRICAL EVIDENCE ON R > G AND INEQUALITY

When considering the results of empirical research on the relationship between the return on capital (r) and economic growth (g) mixed results are reported. Micro-level studies such as those conducted in Norway, indicate that wealthy households often earn higher returns on capital compared to the average person which could result in a larger effective $r - g$ gap.[63] This disparity suggests that inequality can escalate even when the aggregate $r - g$ gap appears modest. Analysis conducted by Strauss and Ventosa-Santaularia in 2023, employing data generated between 1928 and 2012 , employed an instrumental variable approach that not only found a positive relationship between: r-g and inequality, but also a statistically significant one.[64] In particular, their findings suggest that the r – g gap accounts for over 50% of the increase in the top 1% wealth share since the late 1970s.[65] This study offers solid empirical support for the idea that long-term

[61] Rallo. *Some fundamental problems with Thomas Piketty's ...* 2018.
[62] Jérémie Cohen-Setton. "The Piketty Theory Controversy." Bruegel, April 29, 2015. https://www.bruegel.org/blog-post/piketty-theory-controversy.
[63] Stefan Collignon, "The Paradox of Prosperity and Poverty: Confronting Inequality in Norway," *The Lancet Regional Health – Europe* 37 (2025): 100799. https://doi.org/10.1016/j.lanepe.2024.100799.
[64] David Strauss, and Daniel Ventosa-Santaularia. "Does R-g Cause Wealth Inequality? The Case of the United State." *https://www.researchgate.net/publication/372552452_Does_r-g_cause_wealth_inequality_The_case_of_the_United_States*. 2023.
[65] David Strauss, and Daniel Ventosa-Santaularia. "Does R-g Cause Wealth Inequality? The Case of the United State.".

wealth concentration, especially among high-income households, can be significantly influenced by a consistently higher real return on capital relative to economic growth.

However, more thorough macroeconomic research challenges the completeness and accuracy of this relationship. An IMF study by Carlos Góes in 2016 examined 18 advanced economies and found that in approximately 75% of the cases an increase in the Piketty gap was associated with slight decreases in inequality, which is actually the opposite to what Piketty suggests.[66] Moreover, this research highlighted that nations with higher social spending and lower mobility tend to experience more significant inequality responses to r – g shocks, further emphasizing the role of national institutions and redistributive systems in interfering with the effects of capital returns.[67]

Furthermore, these controversial results highlight the complexity of the r – g mechanism and how easily results can differ. Conclusions can be greatly impacted by variations in measurement techniques, such as the proxy used to calculate the real return on capital. Furthermore, social structures, policy circumstances, and institutional factors all have a significant influence on how capital returns affect inequality. As a result it can be said that although the r-g mechanism might work in some situations it is not a general rule and needs to be part of a broader picture.

F. OVERVIEW OF THE EFFECTS OF MONETARY POLICY ON INEQUALITY

Although traditionally viewed as a neutral tool aimed at stabilizing inflation and output, according to McKay and Wolf, the last decade has seen an 'explosion of empirical and theoretical research on the links between monetary policy and inequality.'[68] Monetary policy refers to the actions (such as credit conditions, interest rates and inflation rates) taken by a central bank to influence a nation's money supply with the aim of achieving macroeconomic stability. Prior to the 2008 financial crisis, traditional methods which included interest rate adjustments and open market operations were key to

[66] Carlos Goes. *Testing Piketty's Hypothesis on the Drivers of Income Inequality: Evidence from Panel VARs with Heterogeneous Dynamics*. May 2025.
[67] Goes. *Testing Piketty's Hypothesis on the Drivers of Income Inequality: Evidence from Panel VARs with Heterogeneous Dynamics*.
[68] Alisdair McKay, and Christian K. Wolf. 2023. "Monetary Policy and Inequality." *Journal of Economic Perspectives* 37 (3): 3–28.. https://www.jstor.org/stable/27192412.

achieving this stability as monetary policy is one of the primary tools available to governments for managing business cycles and sustaining economic growth.[69] In fact, the European Central Bank (ECB) together with other central banks are currently the most influential institutions in shaping monetary policy. In 2024, the University of Siena published a working paper that analyzed Italian administrative records from 1999 to 2018 to highlight the positive effect of monetary policy on inequality by showing that expansionary monetary policy reduced wage inequality by enhancing employment numbers in small firms and lower-wage sectors which face high sensitivity to credit and demand disturbances.[70] Furthermore *The Journal of Economic Perspectives* published by McKay and Wolf explained that monetary policy affected diverse households differently through their income levels and savings and asset ownership but the average economic impact on inequality remained constant.[71] In fact, HANK models which simulate household equality demonstrate that most indirect redistribution occurs through employment and wage adjustments rather than permanent changes in consumption inequality. Additionally, a paper from Asger Lau Andersen et al., that analysed the effects of monetary policy on inequality in denmark confirms what McKay and Wolf found in their research, so that monetary policy affects households in different ways.[72] But Andersen et al. observed that expansionary monetary policy increased both income and wealth inequality by benefiting high-income households. These households gained more due to larger financial asset holdings, greater capital gains, and higher levels of debt that respond more favorably to interest rate cuts.[73] Which could be said to be in line with what Piketty found from his research and so the fact that inequality raises when returns on holdings and capital is higher than the growth of the economy.

However, during the global financial crisis of 2008 central banks implemented innovative unconventional policies including quantitative easing (QE) forward guidance and negative interest rates because traditional tools became ineffective due to zero interest

[69] Team, T. I. (n.d.). *Monetary policy meaning, types, and Tools*. Investopedia. https://www.investopedia.com/terms/m/monetarypolicy.asp#:~:text
[70] University of Siena. 2024. *Monetary Policy and Wage Inequality: Evidence from Italian Administrative Data*. Dipartimento di Economia Politica e Statistica, Working Paper No. 912. https://www.deps.unisi.it/sites/st02/files/allegatiparagrafo/05-08-2024/912.pdf
[71] McKay and Wolf. 2023. "Monetary Policy and Inequality." *Journal of Economic Perspectives*.
[72] Asger Lau Andersen, Niels Johannesen, Mia Jorgensen and Jose-Luis Peydro. "Monetary Policy and Inequality." The Journal of Finance, October 2023.
[73] Andersen, Johannesen, Jorgensen and Peydro. "Monetary Policy and Inequality."

rates.[74] In a European Central Bank working paper authored by Lenza and Slacalek, it was demonstrated that unconventional monetary policy, specifically QE, decreased income inequality across the euro area through employment growth and labor income protection during economic downturns.[75] These indispensable economic moves introduced unwanted secondary effects into the system as the implementation of monetary policy began influencing asset prices and lending terms, which motivated researchers to investigate its potential impact on income distribution and wealth distribution. Silvo et al. examined how ECB monetary easing affected Finland and revealed substantial economic benefits and job growth but only minimal effects on social inequality.[76] The authors established that national structural elements such as social benefits together with tax policy and labour institution design played a more significant role than central bank actions in determining long-term inequality patterns.[77] The findings indicate that monetary policy alone is insufficient to resolve fundamental inequality issues but its side effects must be carefully evaluated.

G. INEQUALITY ACROSS NATIONS

While monetary policy plays a role in shaping inequality within individual countries, differences in inequality across Europe often result from deeper structural and institutional factors. Inequality growth is different in each country, and it is also caused by various factors.

Germany and Sweden maintain low inequality levels because they have implemented strong labour protections and fair tax systems that, according to this theory ,prevent economic inequality from rising further .[78] The establishment of these systems

[74] European Central Bank, "Monetary Policy Strategy," accessed April 20, 2025, https://www.ecb.europa.eu/mopo/strategy/html/index.en.html.
[75] Michele Lenza, and Jiri Slacalek. "How does monetary policy affect income and wealth inequality", October 2018. https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2190.en.pdf.
[76] Aaro Silvo Mikael Paloviita, and Juha Kilponen. 2021. "The Impact of Monetary Policy on Income and Wealth Inequality in Finland." *VoxEU.org*, October 5, 2021. https://cepr.org/voxeu/columns/impact-monetary-policy-income-and-wealth-inequality
[77] Thomas Blanchet et al. "Why is Europe more equal than the United States?" *American Economic Journal: Applied Economics*, vol. 14, no. 4, 1 Oct. 2022, pp. 480–518, https://doi.org/10.1257/app.20200703.
[78] Blanchet et al. "Why is Europe more equal than the United States?" *American Economic Journal: Applied Economics*.

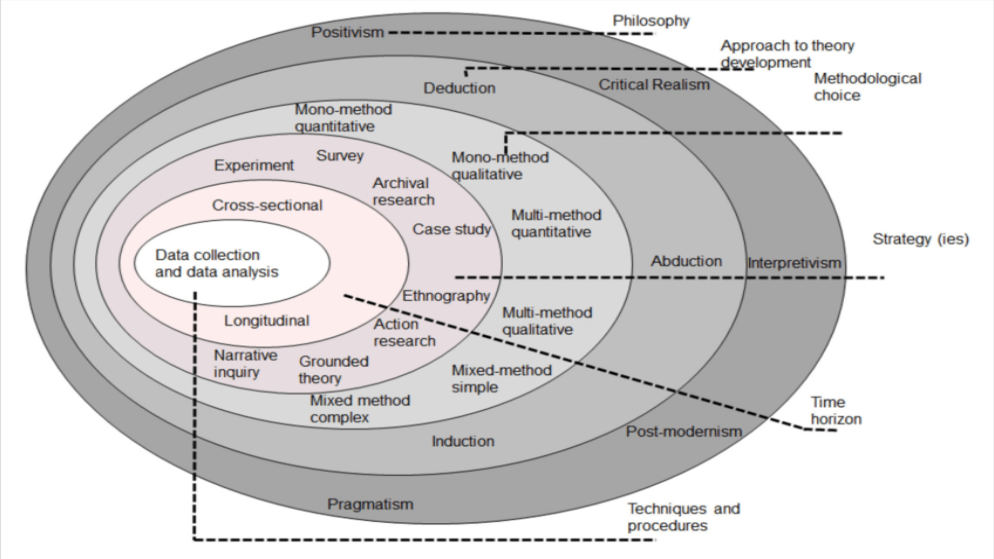
produces active social structures which prevent the rich from becoming excessively richer with respect to the rest of the population. On the other hand, the UK along with Italy and Spain have experienced a rapid increase in social inequality, this can largely be attributed to the combination of weak tax enforcement with flexible labour markets that benefit high earners and insufficient public services for lower income households. [79]Further research has shown that nations which implement progressive taxation alongside effective wealth and capital monitoring achieve superior results in preventing top earners from dominating the economic landscape.[80] This suggests that policy decisions may prove to be more important than economic growth or global trends, as each nation has its unique historical development and institutional framework which prevents the existence of a single solution.

[79] Carlos Gradín. "Why Is Income Inequality So High in Spain?" Working Paper, University of Vigo, 2015. https://cgradin.webs.uvigo.esf.
[80] Blanchet et al. "Why is Europe more equal than the United States?" *American Economic Journal: Applied Economics*.

III. METHODOLOGY

The purpose of this chapter is to provide the methodological foundation upon which the empirical framework of this dissertation is built. The structure of the methodology follows that presented by Saunders' in his"research onion" model.[81] This model ensures transparency and consistency while providing a more theoretical foundation for this research. The following chapter will then progress through each layer of Saunders' "research onion"[82] model starting from philosophical foundations up to data analysis techniques where it will present the various regression models. The research question and data characteristics determine the methodological choices made for this study. The chapter dedicates special attention to selecting and building essential variables and obtaining secondary data and establishing panel regression models to test the hypothesis. Finally this structured approach ensures both logical coherence and data robustness exist in the methods which enables the study to validate theoretical claims in this empirical work.

Figure 1.0: Research onion model by Saunders



Source: research gate

[81] David Phair and Kerryn Warren. 2021. "Saunders' Research Onion – Explained Simply (With Examples)." *Grad Coach*. January 2021. https://gradcoach.com/saunders-research-onion/.
[82]Phair and Warren. 2021. "Saunders' Research Onion – Explained Simply (With Examples)." *Grad Coach*.

A. RESEARCH PHILOSOPHY

As figure 1.0 shows, the outermost layer of Saunders' research onion is the research philosophy. The research philosophy reflects the fundamental beliefs that researchers hold about what makes up knowledge and how it can be discovered.[83] The three main philosophical approaches to research include positivism together with interpretivism and pragmatism which provide separate perspectives for understanding research. The key theory of positivism states that reality exists independently from human perception.[84] The theory establishes that knowledge derives from observable facts that can be measured by scientists through quantitative research methods.[85] Research following this paradigm focuses on hypothesis testing to identify general laws and patterns which can be copied.[86] According to interpretivism reality exists simply as a social construct that is created by humans through their personal experiences.[87] This approach focuses on studying personal interpretations and real life experiences, through qualitative research methods that include things such as interviews and ethnographic studies. Meanwhile, pragmatism provides researchers with an adaptable research method.[88] In this method the research question plays a central role in guiding both the methodological and philosophical choices made. In particular, the pragmatist perspective focuses on finding practical solutions, using either quantitative or qualitative methods depending on which is most effective for answering the research question. [89]

In this study it can be said that a positivist philosophical approach has been adopted. This is because this study aims to test Piketty's $r > g$ hypothesis and the role it has combined to monetary policy on inequality, through empirical methods. The research focuses on three economic indicators which include income shares, economic growth rates and returns on capital. A positivist approach works best here because it allows us to use structured data, statistical tools, and hypothesis driven analysis to find possible connections between theory and data research.

---

[83] Phair and Warren. "Saunders' Research Onion – Explained Simply (With Examples)." *Grad Coach*.
[84] Phair and Warren. "Saunders' Research Onion – Explained Simply (With Examples)." *Grad Coach*.
[85] Phair and Warren. "Saunders' Research Onion – Explained Simply (With Examples)." *Grad Coach*.
[86] The PhD Club. 2025. "Saunders' Research Onion." *The PhD Club*. Accessed June 3, 2025. https://thephdclub.com/f/saunders'-research-onion.
[87] The PhD Club. "Saunders' Research Onion." *The PhD Club*. 2024.
[88] The PhD Club. "Saunders' Research Onion." *The PhD Club*. 2024.
[89] The PhD Club. "Saunders' Research Onion." *The PhD Club*. 2024.

B. RESEARCH APPROACH

The second part of Saunders' research onion deals with the research approach which describes the connection between theory and data. This approach determines whether research starts with theoretical propositions or develops new theory through empirical observations. [90] The two main approaches, observable in the figure above, are deductive and inductive reasoning. A deductive research approach starts with proven theory to create particular hypotheses which researchers verify through data examination.[91] Generally quantitative research methods use this approach to verify whether or not the theoretical statements have an empirical base. On the other hand, the inductive research method begins with data collection to discover patterns and themes that could lead to the development of new theories. [92]

This study therefore adopts a deductive approach mainly because it is grounded in existing economic theory such as Piketty's proposition that inequality tends to rise when the rate of return on capital exceeds the rate of economic growth. In addition to this, the study develops hypotheses based on this theoretical framework and empirically tests them with panel data from nations in the Euro Area. Because it enables an organised and unbiased assessment of theoretical claims through statistical analysis, the deductive method is ideally suited to this research setting.

C. RESEARCH STRATEGY

Moving on to the third layer of Figure 1 above, the onion methodology focuses on the research strategies. The research strategies can include case studies, experiments, ethnography, surveys and archival research, which are all different methods that can be used in research strategy.[93] This study does not address all of the above, focussing only on the strategy that is applied in our one study: quantitative archival research. Archival research is a form of methodology in which the researcher uses data that is pre-existing and that has been gathered for other studies, this type of data is commonly referred to as

[90] The PhD Club. "Saunders' Research Onion." *The PhD Club*. 2024.
[91] Phair and Warren. "Saunders' Research Onion – Explained Simply (With Examples)." *Grad Coach*.
[92] Phair and Warren. "Saunders' Research Onion – Explained Simply (With Examples)." *Grad Coach*
[93] Phair Warren. "Saunders' Research Onion – Explained Simply (With Examples)." *Grad Coach*

secondary data. In fact the study follows an archival research strategy because it relies entirely on pre-existing, publicly available economic data such as economic inequality, capital returns, and GDP growth collected solely from official and accredited institutions like the ECB, Eurostat, and the World Inequality Database.

D. METHODOLOGICAL CHOICE AND TIME HORIZON

Though not shown in Figure 1, another important research layer is the methodological choice that refers to whether the study uses qualitative, quantitative, or mixed methods. This thesis applies a mono method quantitative design that relies entirely on secondary data. Thanks to this choice the research maintains consistency with the rest of the research onion layers and supports the use of statistical analysis to evaluate the theoretical relationships under investigation .[94] Regarding the time horizon, which is the fourth layer in Saunders researcher opinion,[95] the study follows a longitudinal approach covering data from 2008 to 2023. A longitudinal approach to collecting data, implies collecting data from the same units (in this case countries over an extended period) allowing the study to capture long-term trends and policy effects.[96]

E. DATA SOURCES AND SAMPLE

As previously mentioned, this research is only based on the re-elaboration of secondary data obtained from accredited public sources. The data set is made up of annual observations from 2008 to 2023 for three countries (France, Germany, and Italy) and the Eurozone aggregate. The choice of these countries stems from both their economic relevance, as they are the three leading economies in Europe, and from the interesting contrast that emerges from the data analysis. On the other hand, the Euro-area aggregate is included to capture broader region level data that may not appear in country specific macro-data. The data are annual and consist of macroeconomic and inequality indicators such as GDP growth, returns on capital, income shares, monetary policy rates and all the

[94] Phair and Warren. "Saunders' Research Onion – Explained Simply (With Examples)." *Grad Coach*
[95] Research onion (Saunders et al., 2019, p. 108) https://www.researchgate.net/figure/Research-onion-Saunders-et-al-2019-
[96] The PhD Club. "Saunders' Research Onion." *The PhD Club*. 2024..

necessary information to construct an appropriate and coherent model. The selected years, from 2008 to 2023, provide the most suitable context to study how capital returns relate to economic growth and inequality. All the variables received inflation adjustment and country-level harmonization using dummy variables to achieve uniform measurement. The data structure suits panel regression analysis, which will be presented in the following sections. The key sources that were used to gather the information are: Eurostat, the European Central Bank database and the World Inequality Database. In table 1.0 (at the end of the chapter) a summary of the variables and a description of how they were computed can be found, as an anticipation of what will be presented in the next paragraph.

Table 1.0: Summary of Variables and Construction Methodology

Variable	Description	Primary Source
Top 10% Income Share (inequality)	Share of national income earned by the top 10% (%)	World Inequality Database (WID)
GDP Growth (g)	Annual real GDP growth (%)	Eurostat and National banks
Final Return on Capital (r)	Weighted average of returns on housing, equity, and bonds (%)	Author's construction (based on ECB portfolio weights)
Return on Equity	Equity return adjusted for inflation (%)	MSCI country indices, Eurostat (inflation adj.)
Return on Housing	Sum of rental yield + real house price appreciation (%)	Constructed from Eurostat & rental yield data
Rental Yields	Estimated gross rental yield on residential property (%)	Eurostat
Annual Real House Price Change	Annual change in deflated residential property prices (%)	Eurostat (Housing Price Index, deflated)
Return on Bonds	Annual nominal yield of 10-year government bonds, adjusted for inflation	ECB (Statistical Data Warehouse), National Central Banks, Eurostat

		(HICP)
MRO Rate	Main Refinancing Operations interest rate (ECB policy rate)	European Central Bank (Statistical Data Warehouse)
Deposit Facility Rate	ECB deposit facility interest rate (annual average)	European Central Bank
APP & LTRO Amounts	ECB's Asset Purchase Programme and Long-Term Refinancing Operation (EUR bn)	European Central Bank reports & press releases
Unemployment Rate	National annual unemployment rates (%)	Eurostat (Labour Market Statistics)

F. VARIABLE CONSTRUCTION:

This section outlines the methods and the formulas that were used to calculate the variables employed in the regression model that will be presented later on in this chapter. The variables taken in consideration are: return on capital, economic growth, income inequality, and monetary policy stance.

1. Construction of the real return on capital variable

Due to the complex and at times controversial nature of the real return on capital described by Piketty, many empirical studies have often relied on proxies (such as the 10 year government bond yield). However, it can be argued that these proxy variables are over simplistic because they do not fully describe what the broader return on capital variable depicted by Piketty states.[97] In the long run, analysing triple A bonds can be valid, but in the short run, as stated by Carlos Góes in his paper on Testing Piketty's Hypothesis on the Drivers of Income Inequality: "The choice of sovereign

[97] Carlos Goes. "Testing Piketty's Hypothesis on the Drivers of Income Inequality: Evidence from Panel VARs with Heterogeneous Dynamics." *https://www.imf.org/external/pubs/ft/wp/2016/wp16160.pdf*. IMF Working Paper, Feb. 2016. Print

bond yields as a proxy for returns on capital is not self-evident".[98] Carlos Goes in his paper went further and suggested a solution for future studies in fact he stated that: "in reality,the aggregate return on capital is a weighted average of returns across a plethora of investments."[99]

The idea of a composite r comes from the fact that households typically hold diversified portfolios and not just government bonds. According to the European Central Bank,[100] the return on wealth should reflect both risky assets (like housing and equities) and safe assets (such as bonds and deposits), with each weighted by its share in the total portfolio. Jordà et al. similarly argue that long-run asset returns must include housing, given that it often constitutes more than half of household wealth and historically yields returns comparable to equities.[101] Using only the 10-year bond yield fails to account for capital gains and higher-yielding asset classes, which are instead factored into the Piketty variable.

This research adopt the ECB's stylized household portfolio composition for the euro area, which allocates household wealth approximately as follows:

W housing : 0,55

W equity: 0,30

W bonds: 0,15

These weights are supported by ECB survey data and reflect the dominant forms of wealth held by euro area households.[102] While actual portfolio shares may vary by country and over time, it can be said that these weights offer a benchmark for cross country comparisons. In addition to this, housing returns are calculated as the sum of rental yields and real house price appreciation. Rental yields were manually estimated

[98] Goes. "Testing Piketty's Hypothesis on the Drivers of Income Inequality: Evidence from Panel VARs with Heterogeneous Dynamics.".

[99] Goes. "Testing Piketty's Hypothesis on the Drivers of Income Inequality: Evidence from Panel VARs with Heterogeneous Dynamics.",

[100] European Central Bank, "The Household Wealth Distribution in the Euro Area: The Role of Housing, Portfolio Composition and the Impact of Monetary Policy on Households," *ECB Economic Bulletin*, Issue 1 (2020).

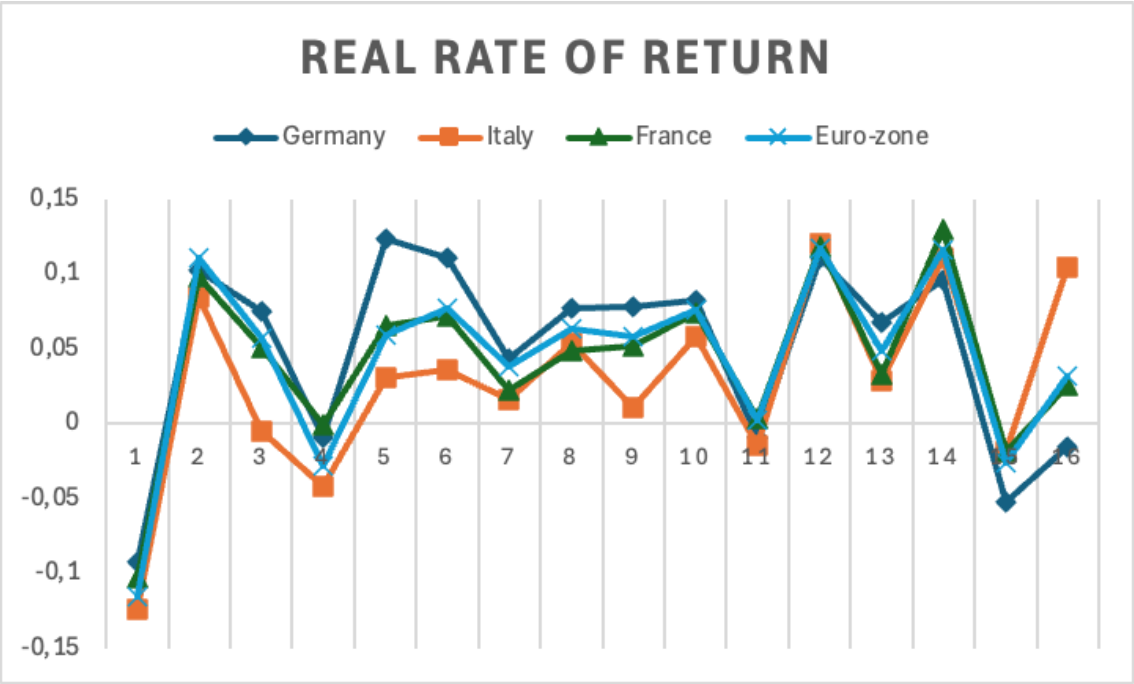
[101] European Central Bank, "The Household Wealth Distribution in the Euro Area: The Role of Housing, Portfolio Composition and the Impact of Monetary Policy on Households,"

[102] European Central Bank, "The Household Wealth Distribution in the Euro Area: The Role of Housing, Portfolio Composition and the Impact of Monetary Policy on Households,"

from sources such as The Luxury Playbook,[103] which reports gross rental yields in major European cities; while real house price growth data were sourced from Eurostat, using annual deflated housing price indices.[104] This methodology aims to replicate Piketty's inclusion of housing as a core component of capital, and all the while captures annual variations more precisely which is key for a short run research. Furthermore, equity returns are derived from MSCI country indices, which capture total returns including dividends. These again have been deflated by the respective national consumer price index (CPI) to obtain real returns.[105] Further, bond returns are estimated using 10-year government bond yields from the ECB and national central banks. These yields were averaged monthly and adjusted for inflation to compute the real return on bonds.[106] All returns are expressed in real terms manually adjusted to consider inflation. Manual processing, although time consuming, has ensured consistency and alignment across asset classes and countries. In Figure 2.0 we can see how across all countries r maintained more or less the same pattern by decreasing in the years of crises and increasing again in the years of positive economic performance reflecting the cyclical nature of capital returns and the stabilizing effect of portfolio diversification.

[103] The Luxury Playbook, "Rental Yield in European Cities and How to Calculate It – 2024 Guide," accessed April 2025, https://theluxuryplaybook.com/rental-yield-in-european-cities-and-how-to-calculate-it-2024/.
[104] Eurostat. *"Statistics Explained." Housing Price Statistics - House Price Index - Statistics Explained*. Accessed May 4, 2025. https://ec.europa.eu/eurostat/statistics-explained/..
[105]MSCI. *"MSCI Indexes."* Accessed May 4, 2025. https://www.msci.com/indexes.
[106] European Central Bank (ECB). *"Yield Curve Spot Rate, 10-Year Maturity - Government Bond, Nominal, All Issuers Whose Rating Is Triple A - Euro Area (Changing Composition), Daily - Businessweek."* ECB Data Portal. Accessed May 4, 2025. https://data.ecb.europa.eu/.

Figure 2.0: Visual representation of the real return of return from 2008-2023.



2. The choice of G

As stated in table 1.0 to estimate the economic growth rate (g) envisioned in Piketty's conceptual framework, this thesis takes a straightforward and transparent approach by using the official annual real GDP growth rates published by Eurostat for each individual country. These figures represent the year to year percentage change in the amount of gross domestic product, adjusted for inflation, and it aligns with standard macroeconomic definitions of real economic growth.[107]

[107] Caroline Banton n.d. *"Real Economic Growth Rate: Definition, Calculation, and Uses."* Investopedia. Accessed May 13, 2025. https://www.investopedia.com/.

Figure 3.0: Visual representation of Gdp in Euro-area from 2008-2023.

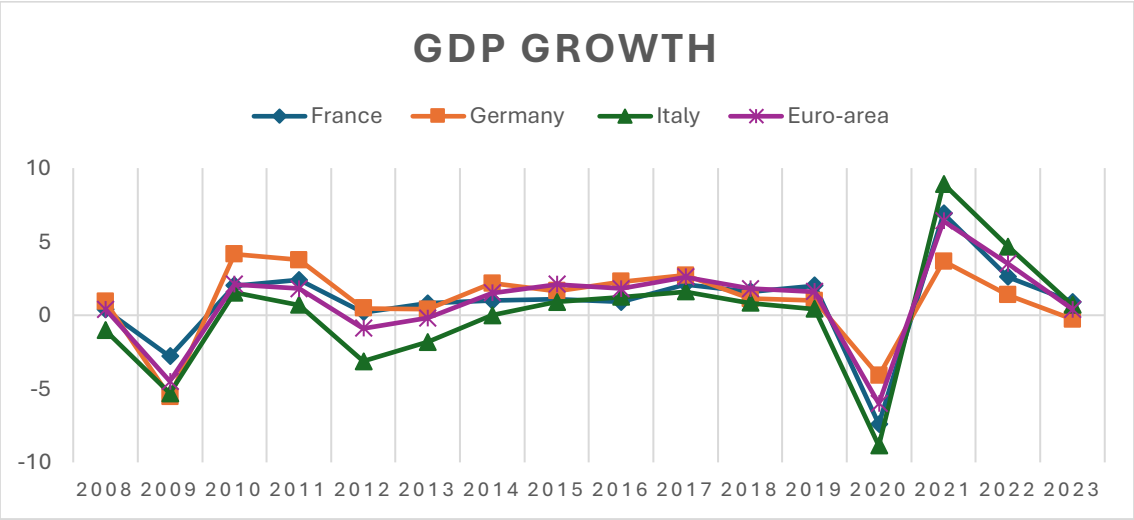
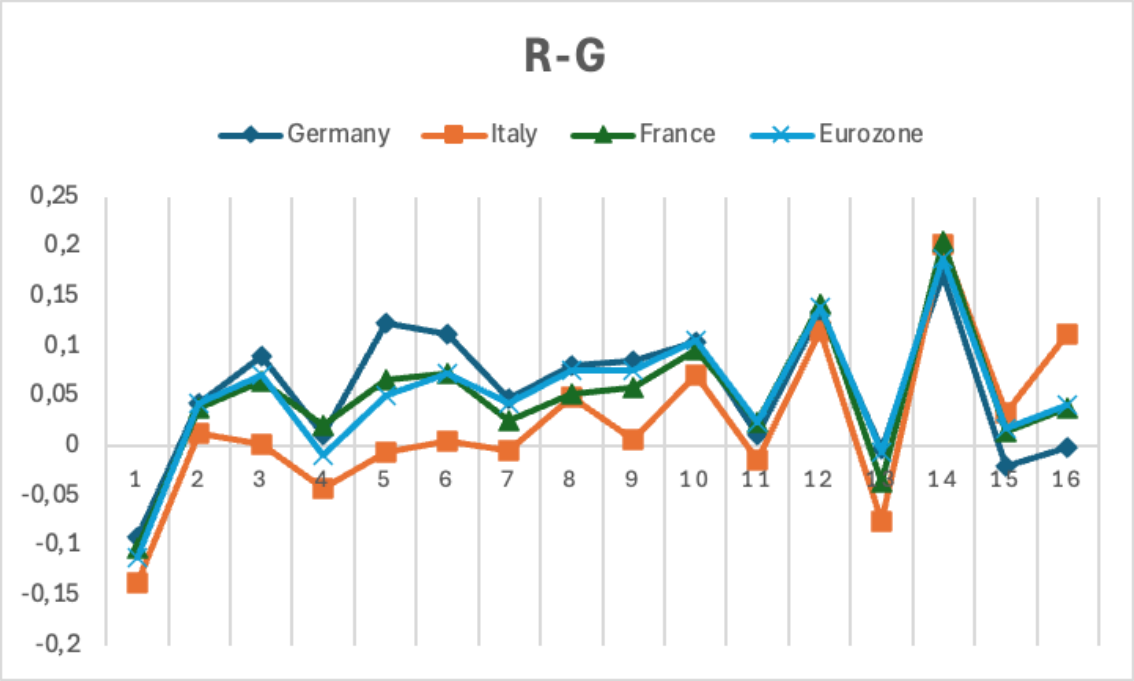


Figure 4.0: Evolution of the r − g Gap from 2008 to 2023



3. Best Inequality variable

With regards to the next variable: Inequality. This thesis adopts the top 10% income share as the principal measure of inequality, in line with the methodology employed by Thomas Piketty in *Capital in the Twenty-First Century* and subsequently endorsed by other empirical researches. This indicator reflects the proportion of total national income that ends up to the wealthiest 10% of the population and has gained prominence in inequality research due to its ability to reflect shifts in the concentration of income at the top.[108] The top 10% share is especially useful for assessing inequality in short to medium term models because it is highly sensitive to variations in capital returns, policy shifts, and financial market fluctuations, factors which are not considered in broader indicators such as the Gini coefficient.

4. Monetary policy variables

Moving on to the monetary policy variables, as previously explained following the global financial crisis of 2008 the Ecb implemented numerous new policies and variables known as unconventional forms of monetary policy to try and maintain control during the period of emergency. The use of unconventional monetary policy was necessary because of the ineffectiveness of the already used conventional policy variables such as the main refinancing operation rate, and deposit facility rate.

The Main Refinancing Operations (MRO) rate serves as the ECB's main instrument to control short-term interest rates within the Euro Area.[109] This rate serves as the basis for banks to obtain central bank loans. The economy's borrowing costs adjust based on MRO rate modifications which affect how much households and businesses pay for credit access. The central bank employs a lower MRO rate to establish an expansionary monetary policy while it implements a tighter policy by increasing the rates. The ECB also operates via the Deposit Facility Rate that is the interest paid to commercial banks when they keep their funds overnight at the central bank.[110] Low or negative Deposit Facility Rate aims to discourage bank reserve holding while pushing banks to

[108] Julia Kagan. "How Much Income Puts You in the Top 1%, 5%, 10%?" Investopedia, July 2024. https://www.investopedia.com/personal-finance/how-much-income-puts-you-top-1-5-10/.
[109] European Central Bank. "What is the main refinancing operations rate?" Last updated September 13, 2024. https://www.ecb.europa.eu/ecb-and-you/explainers/tell-me/html/mro.en.html.
[110] European Central Bank. "What is the deposit facility rate?" https://www.ecb.europa.eu/ecb-and-you/explainers/tell-me/html/what-is-the-deposit-facility-rate.en.html.

provide loans to real economic activities. These rates work fine under positive economic conditions but in times of crises and so when monetary policy becomes ineffective as the rates drop below the zero bound level, unconventional tool must be implemented. The ECB implemented unconventional policies in the years following the crises by creating the Asset Purchase Programme (APP) and Long-Term Refinancing Operations (LTRO) alongside its standard tools. The APP functions through massive public and private bond acquisitions (quantitative easing) which boosts market liquidity and reduces interest rates over extended periods.[111] All of these data were found on the official ECB website press releases. The Euro Area monetary policy which the ECB sets from its central location does not differ between countries, yet individual countries experience varying impacts due to their distinct labor market frameworks, financial systems and social protection systems. This study applies common monetary policy variables to all countries due to the central role of the European Central bank.

G. MODEL SPECIFICATION.

The statistical model of reference used in this empirical research is the regression model. The study is divided into two distinct models. Using dummy variables to account for country-specific effects, the first model examines the impact of the $(r - g)$ gap on the inequality variable (EQ). The fixed effects across the various Eurozone economies are taken into consideration by these country dummies. These country dummies help to account for fixed effects across different Eurozone economies. In the second regression model, the initial framework was expanded to account for our other research question, whether monetary policy affects income inequality in the Eurozone. To do this, the model incorporates the previously discussed monetary policy variables, this allows for a more comprehensive analysis of macroeconomic influences on inequality

[111] European Central Bank. "Asset purchase programmes." Accessed May 30, 2025. https://www.ecb.europa.eu/mopo/implement/app/html/index.en.html.

Model 1.

Equation:

Formula 4.0

$$EQit=\beta0+\beta1(r-g)it+\beta3DummyGer+\beta4DummyItaly+\beta5DummyEuro+\varepsilon it$$

Where:

-*EQit*: Income inequality

-*β0:* is the intercept of the regression line

-*β1* being the coefficient of the (r−g) gap

-*β3-4-5:* are the coefficients that account for the country dummy variables

-*εit*: Stochastic error term capturing all unobserved influences on income inequality in country *i* and year *t*, assumed to be independently and identically distributed with zero mean and constant variance

Model 2:

Model 2 builds on Model 1, using the same variables but introducing monetary policy instruments as additional regressors.

Formula 5.0

Equation:

$$EQit=\beta0+\beta1(r-g)it+\beta3DummyGer+\beta4DummyItaly+\beta5DummyEuro+\beta6MROit+\beta7DRFit+\beta8LTROit+\beta9APPit+\mu it$$

Where:

β6: expresses the coefficient related to the Main Refinancing Operations rate

β7: being the coefficient of the Deposit Facility Rate

β8: coefficient of the Long-Term Refinancing Operations

β9: the numerical factor derived from Asset Purchase Programme

μit: Stochastic error term capturing all unobserved factors affecting income inequality in country *i* at time *t*, assumed to be normally distributed with zero mean and constant variance

1. Robustness checks

To ensure the robustness of this research both of these regression models have then be re-computed by using fixed regression. This method controls for unobserved, time-invariant characteristics that may differ between countries but that may remain constant over time. Which allows for a more accurate identification of the effects of the main explanatory variables with respect to economic inequality.

Furthermore, a diagnostic tests for the final models residuals was conducted. The test is useful to further check for the presence of heteroskedasticity, autocorrelation, multicollinearity, and normality of residuals, helping to evaluate the validity and statistical reliability of the regression outputs.

IV. DATA ANALYSIS

A. INTRODUCTION TO CHAPTER.

This chapter presents the empirical findings from the two regression models developed in the previous section. The aim here is to clearly report the outcomes of the analysis. The results of each model are examined and particular emphasis is placed on the direction, magnitude, and statistical significance of the coefficients. Key variables are interpreted in practical terms, and the explanatory power of each model is evaluated using R^2, Adjusted R^2etc. After the initial ols regressions, further studies are presented to discuss both the robustness and the statistical relevance of the results. The structure of this chapter therefore first presents the results from the baseline regression with the respective robustness check, followed by those from the extended model including monetary policy variables. Finally, a brief comparison is made between the two models with the intent to summarize the key differences in performance and results across the two specifications.

B. REGRESSION MODEL ONE:

The first regression estimates reveal that the (r – g) variable has a positive but statistically insignificant effect on top income shares. B0 is equal to 0.0274, implying that a one-unit increase in (r - g) is associated with a 2.74 percentage point increase in the top 10% income share. These results suggest that there is a “directional” consistency with what Piketty had predicted. However, this estimate is accompanied by a standard error of 0.0145 and it also yield a p-value of 0.063, which is above the conventional 5% significance threshold. This, implies that we cannot reject the null hypothesis that there is no relationship between (r - g) and the economic inequality share at a 95% confidence level. In more practical terms, the data do not show a statistically confident relationship between the real return on capital to growth and inequality outcomes.

Table 2.0: Metric values of Regression 1

Metric	Value
Multiple R	0.8405
R Square	0.7065
Adjusted R Square	0.6866

Table 2.1: Regression Results for r − g and Country Fixed Effects regression 1

Variable	Coef.	Std. Err.	t-Stat	P-value	Lower 95%	Upper 95%
Intercept	0.3354	0.0021	157.3862	4.02E-79	0.3312	0.3397
r_g	0.0274	0.0145	1.8898	0.0637	-0.0016	0.0564
Dummy_Germany	0.0295	0.0028	10.3779	6.29E-15	0.0238	0.0352
Dummy_Italy	0.0253	0.0028	8.8049	2.42E-12	0.0195	0.0310
Dummy_Eurozone	0.0267	0.0028	9.3848	2.62E-13	0.0210	0.0323

In contrast, the country dummy variables coefficients indicate substantial fixed differences in top ten percent income shares between the countries and are highly significant, as they all have a $p < 0.001$. For example, the dummy for Germany is 0.0295, implying Germany's inequality is about 2.95 percentage points higher than France's. These country specific effects capture structural and institutional differences that vary by country.

1. Robustness check.

After having run this initial regression to further evaluate the accuracy and the robustness of the data, a second regression that included country specific fixed effects, was run. These fixed effects absorb all stable heterogeneity across countries, ensuring that the observed relationships are not influenced by national differences. Furthermore, standard errors were clustered at the country level. This change allows the model to account for both autocorrelation, which is the correlation of residuals within the same country, and heteroskedasticity, which instead refers to unequal error variance across observations.

As a result of these methodological changes, the model imposes stricter conditions to identify statistically significant relationships. From the results (expressed in table 4.3) we get that the coefficient on the (r − g) variable B0 remains positive at 0.0122, suggesting a directionally consistent association with inequality. However, the p-value

increases reaching 0.6545 , which means that the result further deviates from statistical significance. Another important variable that has changed in this new model is the R squared which drops significantly to just 0.0105. This very low value reinforces the conclusion that (r − g) explains virtually none of the variation in inequality over time within countries. It also indicates that the previously high R-squared of 0.7065 was likely inflated by unobserved, time-invariant differences between countries that were not accounted for. By introducing country fixed effects, the model now isolates within-country variation, removing the biased influence of national characteristics. This outcome is consistent with expectations, under a more conservative and statistically rigorous specification.

Table 2.2: Robustness regression results model 1

Category	Statistic	Value	Interpretation
(r-g)	B0	0.0122	Positive relationship, directionally in line with previous study.
(r-g)	Standard Error	0.0270	Indicates large relative uncertainty.
(r-g)	T-statistic	0.4500	Low, weak evidence for effect.
(r-g)	P-value	0.6545	Not statistically significant
Intercept	Coefficient	0.3490	Represents baseline average inequality across countries.
	T-statistic	290.71	Inflated, driven by small standard error, not meaningful.
R-squared		0.0105	Model explains ~1% of variation within countries over time.
F-test for Poolability	F-statistic	27.367	Confirms variation exists across countries.

Covariance Estimator		Clustered	Robust to autocorrelation & heteroskedasticity.

B. REGRESSION MODEL TWO: EXTENDED WITH MONETARY POLICY.

In the second regression model, four monetary policy variables are added to the baseline framework from regression 1 to explore whether these instruments are associated with effects on economic inequality. The variables included are: the Main Refinancing Operations (MRO) rate, the Deposit Facility Rate, Long-Term Refinancing Operations (LTRO), and the Asset Purchase Programme (APP).

The coefficient for (r − g) is 0.0258, indicating a positive relationship with inequality which suggests that as the return on capital exceeds economic growth, the top 10% income share tends to increase by 2,58% . However, as in the previous regression, the result is not statistically significant (p = 0.133), thus meaning that while the association exists in the data we cannot assert it with high confidence.

Table 3.0: Metric values of Regression 2

Multiple R	0.862
R Square	0.744
Adjusted R Square	0.701
Standard Error	0.00784
Observations	64

Table 3.1: Regression results for model 2

Variable	Coefficient	Std. Error	t-Stat	P-value	Lower 95%	Upper 95%
Intercept	0.336	0.00562	59.41	6.9441E-51	0.325	0.347
r-g	0.0257	0.0169	1.525	0.133	-0.00809	0.0596
Dummy_Germany	0.0294	0.00277	10.60	8.0876E-1	0.0238	0.0350
Dummy_Italy	0.0251	0.00281	8.942	3.06E-12	0.0195	0.0308
Dummy_Eurozone	0.0265	0.00278	9.517	3.8166E-13	0.0209	0.0321

Inflation	0.000532	0.000923	0.576	0.566	-0.00131	0.00238
MRO	-0.00659	0.00601	-1.096	0.277	-0.0186	0.00546
Deposit Facility	0.00690	0.00689	1.0008	0.3213	-0.00692	0.0207
LTRO	3.1221E-06	3.7296E-06	0.837	0.406	-4.355E-06	1.06E-05
APP	4.6288E-06	5.3286E-06	0.868	0.388	-6.054E-06	1.5312E-05

Moving on to the monetary policy variables: MRO has a coefficient of −0.0066, suggesting a negative relationship which means that when the rate increases, inequality slightly decreases. However, the result is statistically insignificant ($p = 0.278$), and the confidence interval includes zero, which prevents firm conclusions. Furthermore, Deposit Facility Rate has a positive coefficient of 0.0069, indicating a mild positive relationship with inequality. This may reflect increased returns to financial assets. Yet again, the result is not statistically significant ($p = 0.321$).

Nonetheless in regards to the unconventional monetary policy variables the LTRO is positively associated with inequality, with a very small coefficient of 0.00000312. This implies that increases in long-term refinancing operations are correlated with a slight increase in the top income share, but the effect is extremely small and statistically insignificant ($p = 0.406$). Asset purchase programs, also show a positive relationship with inequality coefficient = 0.00000463. This aligns with the view that large scale asset purchases may boost asset prices, benefitting capital holders. Nonetheless, the effect is again small and statistically insignificant ($p = 0.389$).

None of these monetary policy variables meet conventional thresholds for statistical significance. Still, the direction of the relationships is meaningful: three of the four coefficients are positively correlated with inequality, which supports the idea that expansive monetary policy may benefit households that are in the top 10%.

A crucial finding is that the model's overall explanatory power improves which is represented in R^2 and adjusted R^2. In this model the models are respectively 0.744, and the Adjusted R^2 is 0.726, meaning the model explains approximately 72.6% of the variation in income inequality. This suggests that there is a strong level of fit which means that, while the individual coefficients are not statistically significant, the additional

monetary policy variables contribute to a more complete understanding of the factors driving inequality.

1. Robustness check

As in the case of regression 1, a second regression with the objective to check the robustness was calculated for this model as well. The results of this stricter model are shown in table 3.2 and 3.3. What can be observed is that contrary to the previous robustness check, where the p value drastically increased, in this model the p value for most variables actually decreased. These results suggest that the research actually benefited from this stricter regression. Furthermore, the p values for the Mro, LTRO and Dfr decreased respectively to 0.2, 0.121 and 0.09 with the latter being statistically relevant for a 10% assumption. This improvement is likely due to the use of country fixed effects, which control for stable differences between countries. By doing so, the model can better isolate and measure the effects of policy variables that change over time, like interest rates.

On the contrary, the p-value for Asset purchase programs increased, demonstrating no statistical relevance. One possible explanation for this may be that asset purchases operate with prolonged effects, so their impact on inequality may be shown indirectly and over an extended period of time.

Table 3.2: Robustness regression metric model 2

Variable	Value
R-squared	0,1140
Cov. Estimator	Clustered

Table 3.3: Robustness regression results model 2

Variable	Coef.	Std. Err.	t-Stat	P-value	95% CI	Interpretation
Intercept	0.3519	0.0033	106.59	0.0000	[0.3453, 0.3585]	Baseline inequality across countries is very stable.
r_g	0.0214	0.0194	1.1055	0.2741	[−0.0175, 0.0603]	Positive sign (in line with theory), but not significant.
MRO	−0.0084	0.0066	−1.2781	0.2069	[−0.0217, 0.0048]	Negative (tighter policy may reduce inequality), but not significant.
Deposit Facility	0.0101	0.0060	1.6823	0.0985	[−0.0020, 0.0222]	Positive, and marginally significant (close to 10% level).
LTRO	3.79e−06	2.41e−06	1.5766	0.1210	[−1.04e−06, 8.62e−06]	Positive but very small; not statistically significant.
APP	1.19e−06	3.01e−06	0.3961	0.6936	[−4.85e−06, 7.23e−06]	Essentially zero effect, with very high uncertainty.

C. DIAGNOSTIC TESTS FOR MODEL ASSUMPTIONS

Table 4.0: Residual Diagnostics and Multicollinearity Tests

Test	Statistic / Value	Interpretation
Breusch-Pagan (Heteroskedasticity)	LM stat = 7.13, p = 0.21	No heteroskedasticity (p > 0.05)
Durbin-Watson (Autocorrelation)	DW = 0.233	Strong autocorrelation (DW << 2)
Anderson-Darling (Normality)	A^2 = 2.10, p = 0.00002	Residuals not normal (p < 0.05)
Variance Inflation Factor (r_g)	1.33	No multicollinearity
Variance Inflation Factor (const)	11.24	High VIF (but for intercept only)
Variance Inflation Factor (Mro)	17.60	Multicollinearity present
Variance Inflation Factor (Deposit facility rate)	16.08	Multicollinearity present
Variance Inflation Factor (Ltro)	1.16	No multicollinearity
Variance Inflation Factor (App)	1.53	No multicollinearity

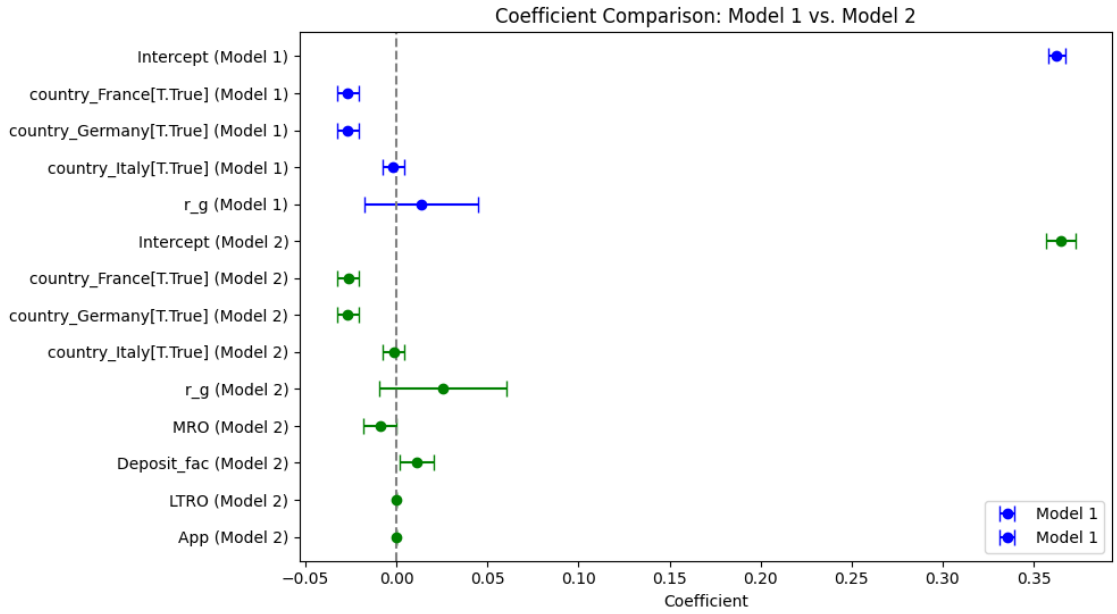
To further assess the robustness of the regression results, a residual diagnostic analysis was conducted. This included specific tests for heteroskedasticity, autocorrelation, normality of residuals, and multicollinearity that are key assumptions underlying the Ordinary Least Squares framework. The results of these diagnostic tests are summarized in table 4.0. When testing for heteroskedasticity, the Breusch-Pagan test is commonly used. From our table since the p-value is greater than the 0.05 threshold, we conclude that the spread of the errors is even across the data. This indicates no evidence of heteroskedasticity.

In contrast the Durbin-Watson statistic does not show positive results as it sits at 0.233 far smaller than the 2 thresholds. This result suggests a strong autocorrelation, which in simple terms means that the errors are not independent. This undermines the results we have found and suggest that the standard errors may be too small and that the p values aren't correct. To check whether the errors follow a normal distribution, the Anderson test is conducted. According to the Anderson-Darling test, the errors do not take a regular bell-shaped curve. This suggests a high degree of a-normality, as it makes it harder to be confident about the p-values and confidence intervals.

The VIF (Variance Inflation Factor) allows us to evaluate the presence of multicollinearity. Multicollinearity is the overlap between variables. The result for the main variable, r − g, is low being at 1.33, so we know that there is no overlap between variables in the model. The same applies to the Ltro and app variable. On the contrary the same cannot be said for the Mro and the Dfr which have a VIF of respectively 17.6 and 16.08. These results are most likely linked to their overlap as conventional monetary policy tools, especially in the years from 2016 to 2020 where they were both either 0 or negative. Overall, while heteroskedasticity isn't a concern, the presence of autocorrelation, multicollinearity and non-normality suggests caution should be applied when interpreting standard errors and significance tests.

D. COMPARISON OF MODELS AND SUMMARY

Figure 5.0 : Comparative Plot of Coefficients and Confidence Intervals for Model 1 and Model 2



When looking at the two models side by side, we can notice several trends, in both models the coefficient related to the r-g gap is positive which suggests that there is a directional relationship between this variable and economic inequality. However, the p value does increase from one model to another, possibly as a result of the newly introduced variables having an overlapping variance or because the model is too complex for this statistic to be maintained. With regards to the country's dummy variables, they remain both statistically significant and positively related to changes in the top 10 share of income. The consistency underscores the importance of country specific factors, such as tax regimes, welfare systems and labour institutions.

The most notable change between the models lies in the introduction of monetary policy instruments in Model 2. Despite their importance in the aftermath of the global financial crisis, from our model, none of the main variables reaches statistical significance. The coefficients of the relative variables are both small and accompanied by p values, demonstrating a low detectable effect on inequality. Yet the model's overall ability to explain things improves notably. The adjusted R goes from 0.68 in the first regression to 0.73 in the second, thus indicating that the latter model does a better job at capturing the variation in inequality across countries and years. So, it can be argued that the inclusion of monetary policy variables helps the model explain inequality more

comprehensively, even if the effects are not sharp enough to be picked up through standard significance tests.

In conclusion, these findings allow us to comprehend the truly complex nature of inequality, which is not only shaped by economic growth and capital returns but also by national factors and broader macroeconomic policies. Although the results of this research do not offer definitive causal links, they provide valuable insight into the multifaceted nature of income inequality in Europe.

V. CONCLUSION

In this final chapter the main objective is to tentatively combine the empirical findings from our regression models with the findings coming from the literary review. The aim is thus to evaluate the extent to which the data substantiate the fundamental hypothesis and consider what they disclose regarding the factors influencing inequality.

A. LINKING RESULTS TO LITERATURE

The empirical findings follow the line of a growing body of literature that emphasize the multidimensional nature of inequality. While Piketty, in his book *Capital in the Twenty-First Century*, gives a central role in the relationship between higher return on capital and economic growth, the final data from our regression seems to suggest a weak correlation, at least in the short run, of this gap with inequality for the Eurozone between 2008 and 2023.[112] Nonetheless these results are similar to those achieved by Carlos Góes' in his study from 2016, that challenges and disputes the universality of the r > g inequality description, emphasizing national institutions and redistributive systems as key variables to account for. [113] In his study Goes found that 75 % of the changes in inequality could be directly related back to institutional differences between countries. Furthermore, a recent paper by Rory O'Farrell et al. achieves our same empirical results, that although there is relevance and a relationship between both income and wealth inequality and monetary policy the relationship is both weak and highly related to country specific factors.[114] These findings are all reasonable and could be assumed to be reflected in this study's model as well, as the country dummy variables were among the most statistically significant, possibly suggesting that persistent, country-specific factors (likely institutional in nature) play a major role in shaping inequality levels in the Eurozone.

---

[112] Piketty, *Capital in the Twenty-First Century* .
[113] Carlos Goes. "Testing Piketty's Hypothesis on the Drivers of Income Inequality: Evidence from Panel VARs with Heterogeneous Dynamics." IMF Working Paper, Feb. 2016..
[114] Rory O'Farrell, Łukasz Rawdanowicz, and Kei-Ichiro Inaba. "Monetary Policy and Inequality." OECD Economics Department Working Papers No. 1281, February 2016. https://dx.doi.org/10.1787/5jm2hz2x9hxr-en.

B. REVISITING HYPOTHESES

Hypothesis 1: r > g and Inequality

The data presented in Model 1 and 2 confirms a directionally consistent but statistically insignificant link between the r – g gap and the top 10% income share. The robustness check, which accounted for country-level fixed effects, further weakened the statistical significance, reinforcing the idea that the Piketty's gap doesn't properly explain the changes in inequality. The lack of statistical relevance demonstrates that numerous critiques to the empirical evidence of Piketty's theory are grounded, suggesting that claims such as that of Murphy and Magness regarding the cherry picking of data done in the *Capital in the Twenty-First Century* might be true[115]. Even Carlos goes so far as to argue the relevance of the universality of the r-g gap, by saying that Piketty's study might be relevant but only in extremely specific circumstances. [116] Hypothesis 2: Monetary Policy and Inequality

The introduction of monetary policy variables in Model 2 improved the explanatory power of the model (Adjusted R^2 rose from 0.686 to 0.726), but individual coefficients for APP, LTRO, MRO, and Deposit Facility rate were all again not statistically significant. Nevertheless, the positive, even if very low, coefficients for APP and LTRO could potentially suggest that expansive monetary policy does widen inequality by inflating asset prices. The previous lack of results are connected to the concerns presented in studies like McKay and Wolf , where they say that monetary policy doesn't really have an effect on inequality.[117] According to their findings, most redistribution occurs indirectly through employment channels, and any impact on long-term inequality tends to be limited.

In contrast with this, the fact that R squared rose, might instead suggest that monetary policy does indeed help to explain the broader picture of changes in income inequality, which is what Silvo et al. argued in 2024.[118] Silvio et al. suggested that expansionary monetary shocks stimulate economic activity and asset prices but the real

---

[115] R P Murphy & Magness, P. R. (2015). "The Data Problems with Capital in the 21st Century." *Journal of Private Enterprise*, 30(2), 1–18.
[116] Goes. "Testing Piketty's Hypothesis on the Drivers of Income Inequality: Evidence from Panel VARs with Heterogeneous Dynamics."
[117] McKay and Wolf, "Monetary Policy and Inequality," *Journal of Economic Perspectives*
[118] Davide Furceri, Prakash Loungani, and Aleksandra Zdzienicka, *The Effects of Monetary Policy Shocks on Inequality*, IMF Working Paper 16/245 (Washington, DC: International Monetary Fund, 2016), https://www.imf.org/external/pubs/ft/wp/2016/wp16245.pdf.

effect on inequality is relatively small due to opposing forces which come in the form of higher employment benefits and lower-income groups, instead asset price increases mainly favor the wealthy. In this study, even if significant coefficients were not found, the direction of the relationships and the improved model fit could indicate that monetary policy plays an indirect or supporting role in shaping inequality trends.

Nonetheless, what should truly be noted is the lack of statistical evidence within this model. This would seem to confirm the findings of Maarten Dossche and his colleagues in their paper "Monetary Policy and Inequality", published by the ECB: that monetary policy is not likely to be a substantial driver of inequality.[119] The work of this study, intimates that although there might be a relationship between certain monetary policy stances and the rise or fall of inequality, this is considered a secondary effect that should be acknowledged, but which only partially influences the broader and more complex topic of inequality. Hypothesis 3: Cross-Country Differences

As previously mentioned in the opening paragraph, cross-country dummies were consistently significant. Germany, Italy, and the Eurozone displayed higher top-income shares compared to France. These persistent differences highlight the importance of structural and institutional factors. In alignment with institutional theories of inequality, underscoring how inequality is not simply a function of capital dynamics or ECB policy, but of national choices.

C. CONTRIBUTION TO THE LITERATURE

It can be argued that this research contributes to the literature on this topic in various ways. The first contribution to literature lies in the manner in which it constructs a more refined r variable that blends housing, equity, and bond returns. Although a composite (r) had already been theorized by Carlos Goes it was never formally computed, and by blending this theoretical framework with the portfolio composition from the ECB it truly reflects the return on capital hypothesized by Piketty and needed for short run computations.[120] Furthermore, this study criticizes the empirical findings of Thomas

[119] Maarten Dossche, Jiří Slačálek, and Guido Wolswijk, "Monetary Policy and Inequality," *ECB Economic Bulletin*, no. 2 (2021): 84–99, https://www.ecb.europa.eu/pub/pdf/ecbu/eb202102.en.pdf.
[120] Goes, Carlos. "Testing Piketty's Hypothesis on the Drivers of Income Inequality: Evidence from Panel VARs with Heterogeneous Dynamics.",

Piketty's paper by highlighting, once again, the lack of universality of the central relationship between the increase of the return on capital with inequality. This paper also adds to the already existing research on monetary policy and its effects on inequality by focusing on Eurozone countries post-2008, a section that has only been partially addressed by existing research. [121]Due to both the combination of unconventional monetary policies and the prolonged effect that they have had, this topic has yet to be formally developed by researchers, even if some studies have been carried out by the ECB with controversial findings.

D. LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Despite the robust methodology and extensive research conducted during this study, the innovative and experimental suggested by the research and applied in chapter 4.0 necessitate an acknowledgement of the limitations. Arguably, the main limitation is in the timeframe of this study, as in fact it adopts a Short Panel (2008–2023) time frame which may neither capture long term capital accumulation dynamics nor some unconventional monetary policy. Furthermore this model might not account for some omitted variables for factors such as education, inheritance, and political shifts. These factors might influence the validity of some of the variables in our model. Although not a key limitation, it could be argued that the variable for the real return on capital is overly simplified. Despite improvements in the overall construction, equity returns are proxied using national stock market indices, and the manual computation of the return on housing amplifies the possible degree of error due to data constraints and estimation assumptions. Another limitation to this model is that this study does not establish causal relationships, as it is based on correlation through regression analysis.

Future research could address these limitations by incorporating improvements in the form of micro level, extending the time frame and in-depth country specific case study. Micro level panels would allow for the inclusion of household level variations, which could better trace policy impacts on inequality. Expanding the time period of this

[121] Goes. "Testing Piketty's Hypothesis on the Drivers of Income Inequality: Evidence from Panel VARs with Heterogeneous Dynamics.",

research could help capture long term trends, but it may also limit the visibility of recent monetary policy effects. Finally, future studies could explore specific national cases in greater depth to further validate the different nations mechanisms which have partially been observed in this research.

Bibliography

Acemoglu and Robinson, “Democracy, Redistribution, and Inequality”, Handbook of Income Distribution Volume 2, 2015, Pages 1885-1966.

Ahnert, Henning, et al. “New European Wealth Gauge Helps Policymakers Address Inequality.” *IMF*. 19 Nov. 2024.

Andersen, Asger Lau, Niels Johannesen, Mia Jørgensen, and José-Luis Peydró. 2023. "Monetary Policy and Inequality." *The Journal of Finance* 78 (5): 2945–2995.

Blanchet, Thomas, et al. “Why is Europe more equal than the United States?” *American Economic Journal: Applied Economics*, vol. 14, no. 4, 1 Oct. 2022, pp. 480–518, https://doi.org/10.1257/app.20200703.

Branko, Milanovic,. “The Return of ‘Patrimonial Capitalism’: A Review of Thomas Piketty’s ‘Capital in the Twenty-First Century.’” *Journal of Economic Literature* 52, no. 2 (2014): 519–34. http://www.jstor.org/stable/24433816.

Cohen-Setton, Jérémie. 2015. "Piketty Theory Controversy." *Bruegel*, February 20, 2015. https://www.bruegel.org/blog-post/piketty-theory-controversy.

Collignon, Stefan. “The Paradox of Prosperity and Poverty: Confronting Inequality in Norway,” *The Lancet Regional Health – Europe* 37 (2025): 100799. https://doi.org/10.1016/j.lanepe.2024.100799.

Costa, Rita Neves, and Sébastien Pérez-Duarte. “Not All Inequality Measures Were Created Equal.” *ECB*. n.d. Web.

DeLong, Brad. “What New Theories of Distribution and Growth Do We Need?” *Equitable Growth*. 25 Sept. 2015. Web. 25 May 2025.

Dossche, Maarten and Jiří Slačálek, and Guido Wolswijk, “Monetary Policy and Inequality,” *ECB Economic Bulletin*, no. 2 (2021): 84–99, https://www.ecb.europa.eu/pub/pdf/ecbu/eb202102.en.pdf.

Engel, Janina, et al. “New Insights into Inequality and Wealth in the Euro Area.” *SUERF*. 2022. Web. 25 May 2025 .

European Central Bank. “Asset purchase programmes.” Accessed May 30, 2025. https://www.ecb.europa.eu/mopo/implement/app/html/index.en.html.

European Central Bank (2021). *Monetary policy and inequality*. Occasional Paper Series.

Eurostat. *Gini Coefficient of Equivalence Income – EU-SILC Survey*. Accessed April 22.

European Central Bank, “The Household Wealth Distribution in the Euro Area: The Role of Housing, Portfolio Composition and the Impact of Monetary Policy on Households,” *ECB Economic Bulletin*, Issue 1 (2020).

European Central Bank. “What is the main refinancing operations rate?” Last updated September 13, 2024. https://www.ecb.europa.eu/ecb-and-you/explainers/tell-me/html/mro.en.html

European Central Bank. “What is the deposit facility rate?” https://www.ecb.europa.eu/ecb-and-you/explainers/tell-me/html/what-is-the-deposit-facility-rate.en.html.

Furceri, Davide and Prakash Loungani, and Aleksandra Zdzienicka, *The Effects of Monetary Policy Shocks on Inequality*, IMF Working Paper 16/245 (Washington, DC: InternationalMonetary Fund, 2016), https://www.imf.org/external/pubs/ft/wp/2016/wp16245.pdf.

Goes, Carlos. “Testing Piketty’s Hypothesis on the Drivers of Income Inequality: Evidence from Panel VARs with Heterogeneous Dynamics.” *https://www.imf.org/external/pubs/ft/wp/2016/wp16160.pdf*. IMF Working Paper, Feb. 2016. Print.

Gradín, Carlos. "Why Is Income Inequality So High in Spain?" Working Paper, University of Vigo, 2015. https://cgradin.webs.uvigo.esf.

Hayek, Friedrich A. *The Constitution of Liberty* (Chicago: University of Chicago Press, 1960), 85–98.

Jackson, Tim, and Peter A. Victor. “Does Slow Growth Increase Inequality? Some Reflections on Piketty’s Fundamental Laws of Capitalism.” University of Surrey, 2014.

Jaumotte, Florence, and Carolina Osorio Buitron. “Inequality and Labor Market Institutions.” *https://www.imf.org/external/pubs/ft/sdn/2015/sdn1514*. July 2015.

Kadigi, M.J. and Elizabeth Robinson. “Revisiting the Solow-Swan Model of Income Convergence in the Context of Coffee Producing and Re-Exporting Countries in the World.” Sustainable Futures, May 22, 2022.

Kagan, Julia. “How Much Income Puts You in the Top 1%, 5%, 10%?” Investopedia, July 2024. https://www.investopedia.com/personal-finance/how-much-income-puts-you-top-1-5-10 /.

Kanbur, Ravi, and Joseph E. Stiglitz. “Dynastic Inequality, Mobility and Equality of Opportunity - The Journal of Economic Inequality.” *SpringerLink*. Springer US, 13 July 201

Kumospace, May 2024. https://www.kumospace.com/blog/solow-growth-model.

Kuznets, Simon “Economic Growth and Income Inequality,” *American Economic Review* 45, no. 1 (1955): 1–28

Lenza, Michele, and Jiri Slacalek, “How does monetary policy affect income and wealth inequality? Evidence from quantitative easing in the euro area” Journal of Applied EconometricsVolume 39, Issue 5 2024.

Lyubimov, Ivan. “Income Inequality Revisited 60 Years Later: Piketty vs Kuznets .” *Russian Journal of Economics 3* . 2017. Web.

McKay, Alisdair.and Christian K. Wolf. “Monetary Policy and Inequality.” *The Journal of Economic Perspectives* 37, no. 1 (2023): 121–44. https://www.jstor.org/stable/27192412.

Moffitt. Drew “Decoding Solow’s Model: Insights Into Economic Development and Growth.”

MSCI Indexes.” *MSCI Indexes*. n.d. Web. 04 May 2025.

Murphy, Robert P. and Phillip W. Magness, *Contra Piketty: The Flaws and Fallacies in Capital in the Twenty-First Century* (Washington, DC: Cato Institute, 2015).

“New Insights into Inequality and Wealth in the Euro Area.” *SUERF*. n.d. Web. 25 May 2025.

Nozick, Robert *Anarchy, State, and Utopia* (New York: Basic Books, 1974), 149–182.

OECD, *Divided We Stand: Why Inequality Keeps Rising* (Paris: OECD Publishing, 2011).

O’Farrell, Rory, Łukasz Rawdanowicz, and Kei-Ichiro Inaba. *Monetary Policy and Inequality*. OECD Economics Department Working Papers No. 1281. Paris: Organisation for Economic Co-operation and Development, 2016.

Phair, David, and Kerryn Warren. “Saunders’ (2019) Research Onion A Straightforward, Plain-Language Explainer .” Saunders, January 2021.

Piketty, Thomas (2014). *Capital in the Twenty-First Century*. Cambridge: Harvard University Press

Rallo . Juan Ramon, *Some fundamental problems with Thomas Piketty’s ...* 2018. Web. 26 May 2025.

Rawls, John, *A Theory of Justice* (Cambridge, MA: Harvard University Press, 1971), 75–83.

Sen, Amartya, *Development as Freedom* (New York: Anchor Books, 1999), 87–110.

Silvo, Aaro, Mikael Paloviita, and Juha Kilponen. 2021. “The Impact of Monetary Policy on Income and Wealth Inequality in Finland.” *VoxEU.org*, October 5, 2021. https://cepr.org/voxeu/columns/impact-monetary-policy-income-and-wealth-inequality

“Statistics Explained.” *Housing price statistics - house price index - Statistics Explained - Eurostat*. n.d. Web. 04 May 2025.

Stiglitz, Joseph, and Ravi Kanbur. *Wealth and income distribution: New theories needed for a new era | CEPR*. 2015.

Strauss, David. and Daniel Ventosa-Santaularia. "Does R-g Cause Wealth Inequality? The Case of the United State." *https://www.researchgate.net/publication/372552452_Does_r-g_cause_wealth_inequality_The_case_of_the_United_States*. 2023.

The Luxury Playbook, "Rental Yield in European Cities and How to Calculate It – 2024 Guide," accessed April

The PhD Club. "Saunders' Research Onion." *The PhD Club*. 2024.

Trapeznikova, Ija. "Measuring Income Inequality." *IZA World of Labor*. 17 July 2019.

Team, T. I. (n.d.). *Monetary policy meaning, types, and Tools*. Investopedia. https://www.investopedia.com/terms/m/monetarypolicy.asp#:~:text

University of Siena. 2024. *Monetary Policy and Wage Inequality: Evidence from Italian Administrative Data*. Dipartimento di Economia Politica e Statistica, Working Paper No. 912.

Yield Curve Spot Rate, 10-Year Maturity - Government Bond, Nominal, All Issuers Whose Rating Is Triple A - Euro Area (Changing Composition), Euro Area (Changing Composition), Daily - Businessweek." | *ECB Data Portal*. n.d. Web. 04 May 2025.