The Impact of Trade Unions Dynamics on Income Inequality Trends in European Union Countries

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Contents

1 Introduction

The volatile and asymmetrical landscape of the global economy has sharply focused on the subtle linkages between practices adopted in labour markets and the surging prevalence of economic disparity (ILO 2015). Of the multifaceted forces influencing labour market dynamics, collective bargaining has been vaunted as a vital instrument of fairness in employment conditions and equitable distribution of wages (ILO 2024).

Collective bargaining is a well-entrenched process of negotiation between employers and organised worker representatives that culminates in agreements that spelt out working conditions, salaries, benefits and other elements of worker compensation and rights. It has been theoretically advocated to be a potential equaliser within the labour market. The theory proposes that by empowering workers to negotiate collectively, they can achieve a more just distribution of income, enhance job security, and improve working conditions. With these principal changes, some of the causes of economic inequality might also be brought under control (Schmidt and Strauss 1976). However, the effectiveness and impact of collective bargaining are contingent upon various factors including the legal and regulatory framework, the strength and representativeness of labour unions, the economic context, and the adaptability of these institutions to changing labour market conditions. Variants in the power, the decline or stability of membership and the changing composition of membership, among others, of the European trade unions since 1980 have been radical, shaping the landscape of collective bargaining and labour representation. According to the European Trade Union Institute (ETUI), Trade Unions density has notably decreased in many European countries, with estimates indicating a decline from 32.6 percent in 1995 to 26.4 percent in 2001 across the EU25. This is particularly evident for the new member states, where density fell from 42.7 percent to 20.4 percent between 1995 and 2001, while in the EU15, the fall was from 31.0 percent to 27.3 percent in the same period (Jeremy Waddington 2005). This declining trend can also be seen from the below graph, which describes the trend of union density and coverage over time, on average, for European countries.

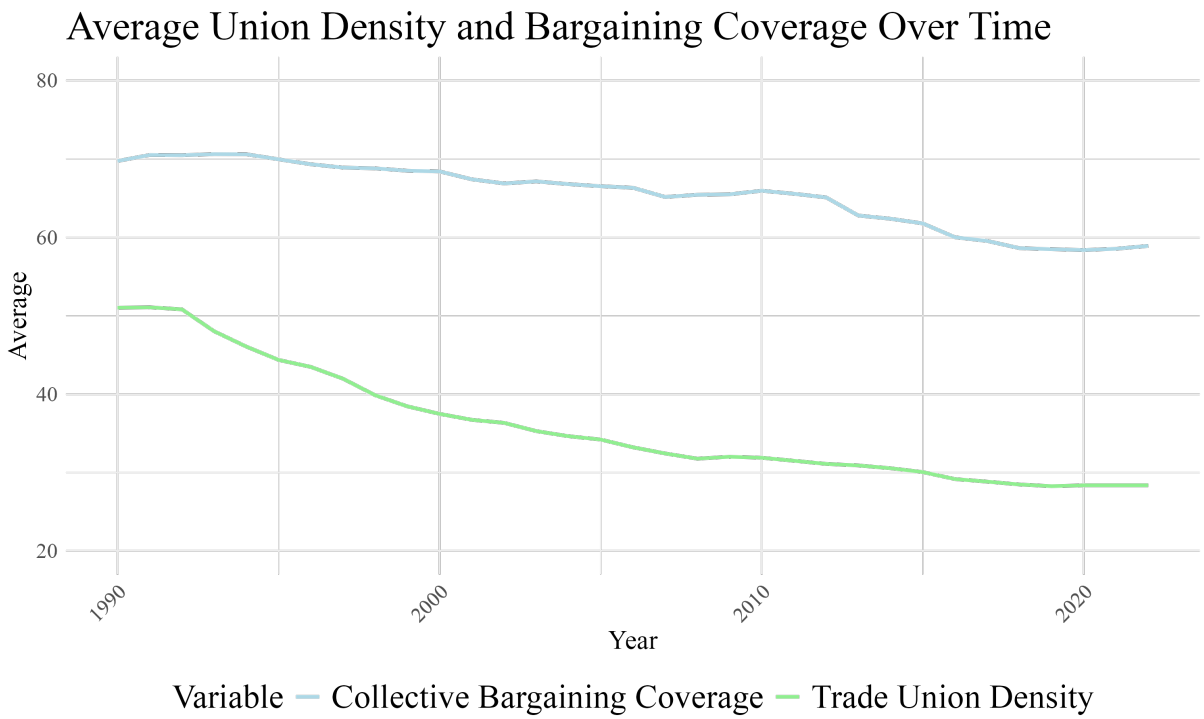

Figure 1: Average Unions Density and Coverage Over Time.

The present analysis, therefore, delves into the depth of the complex interaction between collective bargaining and economic inequality. I will explore the theoretical underpinnings of collective bargaining as an equalizer and develop empirical evidence regarding its effectiveness. I will also consider the various factors that influence the success of collective bargaining efforts and their ultimate impact on reducing economic inequality.

2 Methodology

The complex relationship between the coverage of trade unions and income inequality cannot be properly analysed just by the use of statistical correlations. This paper will go further and attempt to shed light on the mechanisms, implications and policies that follow from it. The effectiveness of collective bargaining is obviously a contingent variable; it depends on a variety of factors, from the legal and institutional environment to the strength of unions and their representativeness, from the economic context to their ability to adapt to the challenges thrown by the impact of an ever-evolving labour market, with the diffusion of the gig economy and automation. This research drew inspiration from the work of David Card (2001) and Richard B. Freeman (1984), adopting a comprehensive approach that encompassed various perspectives (David Card 2001, Richard B. Freeman, James L. Medoff 1985).

This will be accomplished by utilising empirical evidence derived from the World Bank Dataset and OECD databases, focusing on data related to trade union coverage (encompassing both density and coverage rate), income inequality metrics (such as the Gini coefficient), and relevant control variables for EU countries over the past two decades. This period will allow us to represent the potential effect of the recent economic dynamics and reforms, which might have been influenced, for instance, by the eastward expansion of the EU. This will be complemented by a mixed-methods analysis on a selection of EU countries[1], which will present different levels of coverage of trade unions and will vary in density. These country-level qualitative investigations will show the specific channels through which Labour Unions shape wage inequality within the national context of each chosen country.

The selection of these case studies will be guided by the following dimensions: countries of the European Union with contrasting profiles, across four key dimensions, in terms of

[1]Focusing on Austria, Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom.

their characteristics. We will examine the country's legal frameworks, including whether their legal structures support and protect collective bargaining rights or instead restrict union activity. The strength and representativeness of trade unions in relation to organised activity are then considered, as well as the level of organisation and effectiveness of trade unions in representing a wide range of workers, in particular those with precarious or atypical employment relationships. Particular interest is given to the examination of the economic structure of each of the selected countries. Particular attention shall be paid to the sectoral composition in each of them. It also assesses precisely whether it is skewed towards industries where unions have historically been strong, mainly manufacturing, or towards areas where they have historically been weak, such as the service sector.

Finally, the historical trajectory of unionization in the country will be explored. In this way, I could examine how past trends in unionization shaped the contemporary landscape of labour relations and income inequality. Such varied characteristics need to be taken into account within the case studies to provide dimension to the understanding of the relationship between trade union coverage and income inequality. To highlight the causal pathways from unions to inequality, one draws on a number of theoretical frameworks consolidated from the literature on labour economics and inequality. These include theories of wage bargaining, monopsony power, and rent-seeking behaviour. Such a comprehensive approach is not only based on correlation. By combining the empirical, case and theoretical approaches, we try to generate a coherent and robust analysis of the relationship between union density and income inequality in European countries. This study aims to provide policymakers and stakeholders valuable insights into the modern economic landscape. It could guide future policies that use union coverage as one of the tools needed to address income inequality while respecting the associated challenges and opportunities.

3 The Importance of Trade Unions

Trade unions have long played the role of backbone in the workforce, advocating for workers' rights and ensuring fair treatment within the workplaces throughout history (Engeman 2021). At the centre of trade union activities lies collective bargaining, which not only brings many advantages in its stride but also poses some challenges. This chapter highlights the critical role of trade unions and the delicate details of collective bargaining, underpinning the far-reaching implications for the workforce and society at large (ibid.). Collective bargaining goes all the way to increase the compensation and support of the union members. Trade unions can achieve gains for workers that would be difficult, or even impossible, on an individual basis. The upshot is that normally, unionized workers receive wages that are considerably higher than their non-union counterparts. This is just one dimension, in that collective agreements draw the outlines of equitable policies in the workplace, which then, in turn, encourage justice and due process. These structures are in the favor of the employee and the employer equally since they ensure a fair and orderly work environment. It is very often noted in the literature that the unionization process is connected with the benefits that arise subsequently, such as enhanced job satisfaction and productivity. Members of the union often reported higher levels of job satisfaction, which was then connected with better pay, better benefits, and better workplace conditions (Bustillo and Pedraza n.d.). Further, collective bargaining has continued to secure social justice in the sense that it promotes an equitable distribution of economic return. It tends to narrow the wage differentials between top management and the average worker and is, therefore, a potent instrument in the war on economic disparity (Angell 1974). Another critical feature is the empowerment of workers, as unions provide workers with a collective voice that enables them to influence decisions and policies affecting their working conditions. That empowerment leads to a more democratic and responsive working environment.

The benefits of collective bargaining extend not only to the union members but also provide stability in economic downturns and set standards that non-union employers must

compete with (ILO 2015). This spillover effect leads to higher overall wages and benefits and increased rates of participation from women and older workers, contributing to a more diversified workforce. Because it redistributes income from capital to labour, collective bargaining contributes to diminishing economic inequities and promotes more equitable economic growth. Effective dispute resolution in union contracts lowers the chances of arbitration or litigation, and the potential for innovation and flexibility arises as an outcome of the cooperation between unions and management. Raising the practices across industries pushes non-union firms to up their practices so that they remain competitive, and creates a system of checks and balances, ensuring corporate power is balanced by workers with a voice in decisions that impact their livelihood.

3.1 The Extent of Decline

Nowadays, trade unions represent a smaller proportion of the employed workforce in Europe than at any other time since 1950. But it has to be said that in the Nordic countries (Norway, Island, Denmark, Finland, Sweden) and Belgium, the decline is marginal, due in part to the Ghent system, where trade unions participate in the administration of unemployment benefits and insurance (Jelle Visser 2019). Alongside the trend of declining membership, there have been critical changes in the structure of the unionized labour force over the last three decades (Onaran and Guschanski 2018). In Primis, there is a growing share of members who are working in the public sector. This development is faster than the rate of de-unionisation in other sectors, such as industry and private sector services, in most countries. Secondly, there is a notable increase in the unionization of female workers (Jelle Visser 2019). In several countries, women now comprise more than half of union membership. Union membership is becoming increasingly feminized, with women making up more than half of unionists in several countries of the EU. Finally, retired and unemployed people constitute a growing proportion of union membership, ranging from 15 to 20 percent in the EU, with considerable variation across member states (ibid.). The consequences of membership decline and the shifts in composition are far-reaching for the organization of trade unions. Scarcities in financial and material resources materially limit the capacity to implement the necessary reforms to address social challenges (Jeremy Waddington 2005). These shifts underscore the complex dynamics of trade unions' role and effectiveness in Europe's evolving labour landscape, with implications for collective bargaining and efforts to address economic inequality (ibid.).

Unions have historically been a key point of representation and advocacy for workers in the labour market. However, the role of unions in the contemporary economy has faced dramatic challenges. The reasons behind the decline in union membership can be attributed to both external pressures and internal shortcomings within the trade unions themselves (Onaran and Guschanski 2018). At the heart of it, this decline represents a conflict between the adaptability required by a changing social and economic landscape and the inflexibility of traditional organized labour. One prevailing argument posits that

the modern individual is increasingly inclined towards individualisation, potentially diminishing their inclination to join trade unions (Jeremy Waddington 2005).

According to the literature, the primary drivers of the decline in union membership are typically categorized into two dominant factors: external pressures and internal challenges. External pressures facing trade unions are quite complex and are often attributed to the broader context of globalization, increased international competition, and deregulation. One of the most direct contributors to declining membership is the steep rise in unemployment. Traditionally, trade unions offer limited support for the unemployed, causing many members to abandon their memberships when they lose their jobs. Additionally, shifting labour force dynamics, such as the transition from industrial to service sector employment and the emergence of non-traditional work arrangements, present obstacles to union adaptation.

Key internal challenges for trade unions include organizational rigidity and antiquity, a lack of diversity in leadership, inadequate representation, and a disconnection between leadership and membership. Many trade unions have been criticized for being inflexible and outdated in organizational practices. The dominance of middle-aged men in leadership roles diminishes the appeal of unions to diverse demographics, and certain groups feel marginalized within union frameworks, hindering their involvement. Furthermore, union leaders are often perceived as disconnected from the current realities of workplaces. In essence, trade unions confront the dual challenge of diminishing resources and increasing membership diversity. Consequently, comprehensive reforms are imperative to ensure their relevance in an evolving labour landscape. This chapter endeavours to delve into these factors comprehensively, shedding light on the intricate dynamics driving the decline in union membership and proposing strategies to revitalize union effectiveness and relevance in the modern era.

3.2 Labour Markets and Income Inequality

This analysis is based on datasets retrieved from the Organisation for Economic Cooperation and Development (OECD) statistics and World Bank Data[2], aiming at a set of variables critical to understanding the dynamics of labour markets and income distribution (Trapeznikova 2019).

In the first instance, before jumping to the results comparison of the model, it is fundamental to understand the choice of variables in building the models. For measuring Income Inequality, economists have used alternative measures including the Gini Index, Decile Ratios, Palma Ratio, and Theil Index (ibid.). All of them have their own sets of advantages and disadvantages. For this case study, the dependent variable will be the Gini Index. The OECD defines the Gini Index as the distribution of cumulative shares of the population by cumulative shares of the income they receive. A Lorenz curve of 0 represents perfect equality, and a Lorenz curve of 1 represents perfect inequality (ILO 2024)("Inequality - Income Inequality - OECD Data," n.d). In this particular case, income is defined as household disposable income for a specific year. It comprises earnings, self-employment, capital income, and public cash transfers. Hence the reason for choosing the Gini Coefficient is that it uses information from the entire income distribution and is independent of the size of the country's economy and population. Additionally, the Gini Index makes it easier to interpret regression results.

Now the attention shifts to the two important independent variables: Trade Union Density and Collective Bargain Coverage. According to the European Industrial Relations Dictionary, Trade Union Density is defined as the ratio of salary and wage earners who are trade union members to the total number of wage and salary earners in the economy. It is a valuable metric to assess the power of trade unions across countries (EuroFound 2019). On the other hand, Collective Bargaining Coverage is a broader indicator that demonstrates how workers' employment is influenced by negotiations within their organization (EuroFound 2022). The spectrum in Europe is, according to the EuroFound,

[2]Datasets can be retrieved at https://stats.oecd.org/; and https://data.worldbank.org/

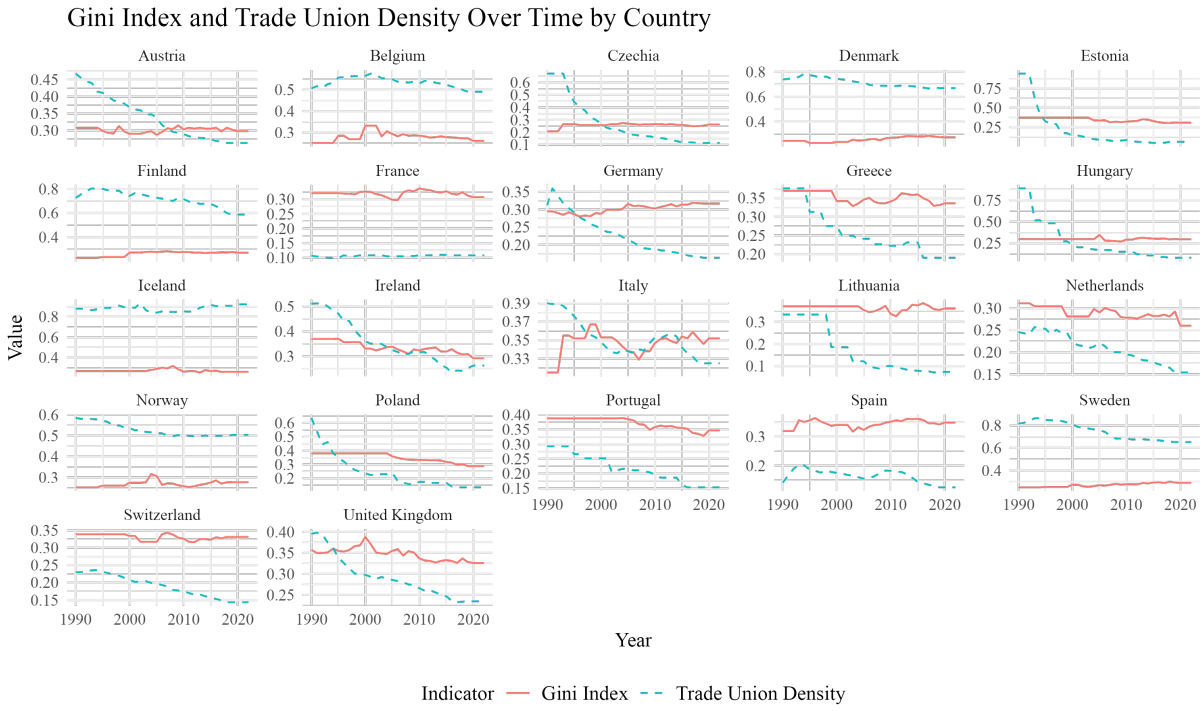

Figure 2: Evolution of Gini Index and Trade Union Density Over Time for all Countries.

polarized, having a group of countries with close-to full coverage like Italy, Austria, Spain, Finland, France, Iceland, and Sweden, and another group with hardly any coverage, like Estonia, Czechia, Lithuania, Poland, United Kingdom, and Hungary (EuroFound 2022, Bental and Demougin 2010). This is further supported by Figure 3, where a K-Mean algorithm was employed to ascertain the average coverage and density over time for the countries under analysis.

Since the 1980s, the density of trade union membership has been falling in most EU countries, partly owing to employees increasingly opting out of joining unions and partly due to the rise of non-standard forms of employment. In addition, as Bertal and Demougin have shown, most European countries have launched substantial institutional reforms since the beginning of the 2000s. The industrial output has been increasing significantly, while the labour share in the national income has been decreasing (ibid.). Despite this, trade union density, which measures the proportion of unionized workers in the total workforce, displays more stability and reflects labour market trends. This stability was most clearly demonstrated during the recent economic downturn when the economy in the unions fell

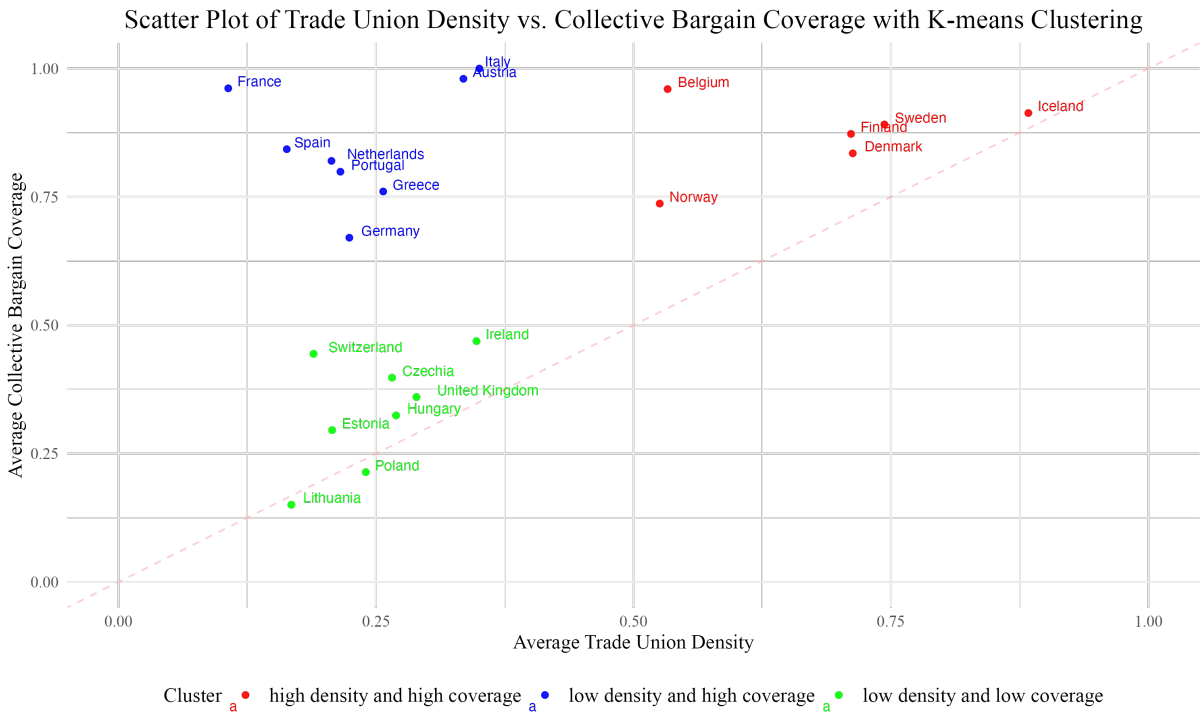

Figure 3: K-Mean clustering of Trade Union Density vs Coverage.

as employment dropped significantly (Onaran and Guschanski 2018).

Union density varies widely across Europe, with the rate remaining high in Scandinavian countries and low in Central and Eastern Europe, and a general falling trend across Continental and Mediterranean countries. Cross-country differences are mirrored by a pronounced variation in union density across sectors within each country, with the public sector typically enjoying higher rates due to better job security and working conditions (Bental and Demougin 2010). These differences can be explained, inter alia, by institutional arrangements, such as those governing the extension of collective bargaining agreements, by the range and variations in union services, and by the way unions mesh with the welfare system. Notably, the Ghent system, which combines a strong role for trade unions or labour organizations in administering unemployment benefits or the payments linked to them, is more prevalent in Coordinated Market Economies (CMEs) than in Liberal Market Economies (LMEs), where there is a greater reliance on market mechanisms and individual responsibility for social welfare provision.

Lastly, it is important to list the variables that have been used in the analysis. This research explored the relationship between trade union density and income inequality while

considering various macroeconomic, labour-economic, and social-political factors. The variables included Gross Domestic Product (GDP), Foreign Direct Investments (both Inflow and Outflow), Inflation, Wage Growth, Tax Contribution, Percentage of Government Debt, Labour Market Conditions, Female Workers' Unemployment Rates, Labour Participation Rate, Economic and Social Development Index such as Civic Participation, and Rule of Law Index.

3.3 The non-linear relationship between Density and Gini Index

The estimation results suggest that non-linear interactions should be taken into account when assessing the impact of Trade Unions Density [3] on the Gini Index. At first sight, the linear model pointed to a direct positive relationship between union density and income inequality. The estimated coefficient was significant at a 1 percent confidence level (Estimate = 0.0345, $p < 0.001$). However, the R-squared of this model was only 0.023, indicating it held a very limited level of explanatory power. When a quadratic term for Trade Unions Density was introduced in the non-linear model, a more nuanced relationship emerged. The non-linear model reported a significant positive coefficient for the linear term (Estimate = 0.2574, $p < 0.001$) and a significant negative coefficient for the quadratic term (Estimate = -0.2425, $p < 0.001$). Therefore, the effect of union density on income inequality diminishes at higher levels of union density, suggesting a curvilinear relationship. The non-linear model showed that R-squared was 0.173, which suggests that the model has a better fit to the data.

Table 1: Regression Results

	Dependent variable:	
	Gini Index	
	(1)	(2)
Trade Unions Density	0.035^{***}	0.257^{***}
	(0.009)	(0.022)
Trade Unions Density Squared		-0.242^{***}
		(0.022)
Observations	726	726
R^2	0.023	0.173
Adjusted R^2	-0.055	0.105
Note:	*p<0.05; **p<0.01; ***p<0.001	

In addition, AIC and BIC statistics confirmed the superiority of the non-linear model. The AIC from the linear model is -5945 and BIC -5940. On the other hand, the AIC value and BIC statistics from the non-linear model are -6063 and -6054, respectively, which are

[3] It must be specified that in the regression tables, the variable will be named "density2", referring to the square of trade unions density. Meanwhile, throughout the discussion of the results, it is also referred to as Bargaining Power.

much lower in both cases. As the AIC and BIC values are metrics that are evaluated based on model fit while taking into consideration model complexity, lower AIC and BIC values suggest better model fit. The fact that both AIC and BIC for the non-linear model dropped significantly compared to the linear model suggests that the non-linear model captures the underlying dynamics of how Trade Unions Density affects the Gini Index more effectively.

Model	AIC	BIC
Linear Model	-5945.00	-5940.41
Non-linear Model	-6063.37	-6054.19

Table 2: AIC and BIC for Linear and Non-linear Models

The overall analysis indicates that the non-linear model provides a more accurate representation of the relationship between Trade Union Density and the Gini Index compared to the linear model. This underscores the importance of considering non-linear dynamics to fully capture the impact of union density on income inequality.

Additionally, Quantile-Quantile (QQ) plots were employed to assess whether the residuals of the models followed a normal distribution. The QQ plot for the linear model indicated some deviations from normality, particularly at the tails, suggesting that the model's residuals were not perfectly normally distributed. This deviation implies potential issues with the linear model's ability to capture all underlying patterns in the data. Conversely, the QQ plot for the non-linear model showed a better alignment of the residuals with the theoretical quantiles of a normal distribution. This alignment indicates that the non-linear model provides a more accurate representation of the data structure, resulting in residuals that are closer to a normal distribution.

The need to modulate Density in a non-linear way becomes evident from these results. A linear approach oversimplifies the complex interactions and fails to account for the diminishing returns of union density on reducing income inequality. By adopting a non-linear model, we achieve a more accurate and comprehensive understanding of how

collective bargaining influences economic disparities. This approach not only improves model fit but also provides more reliable insights for policymakers aiming to address income inequality through labour union strategies.

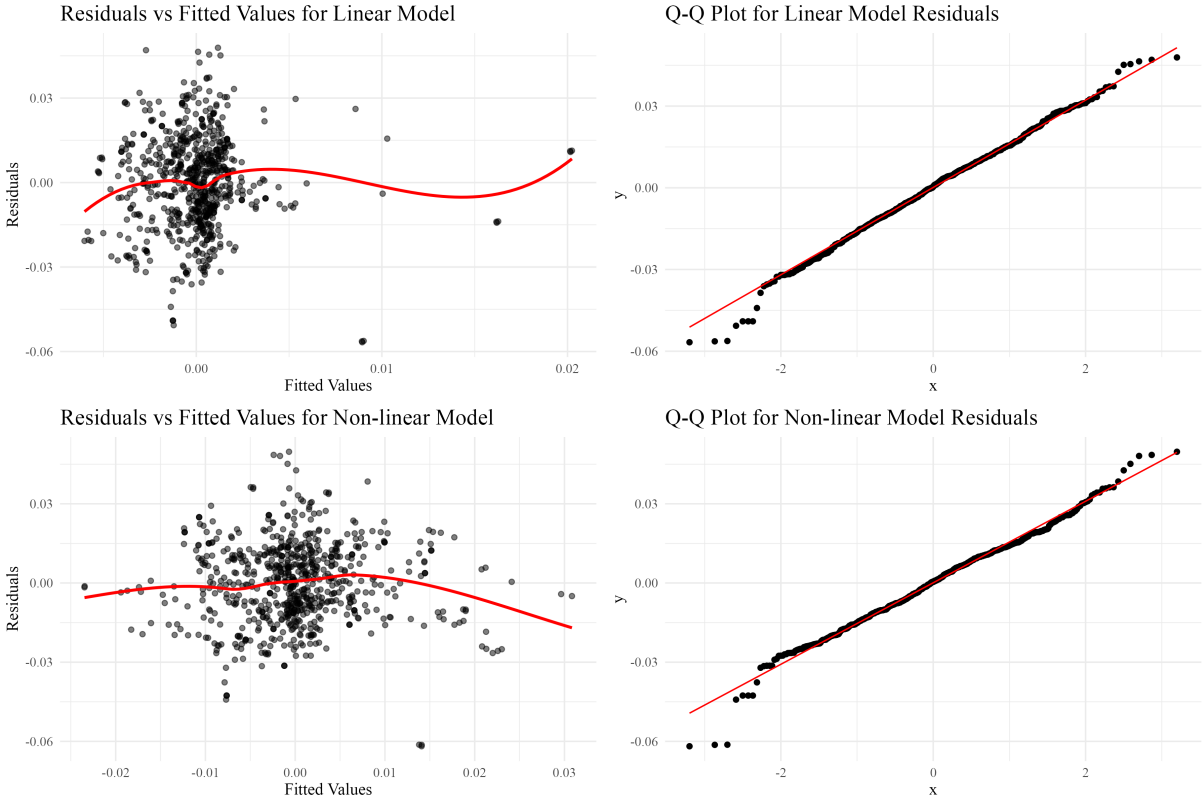

Figure 4: Residuals and Fitted Values for Linear and Non-Linear Model.

4 Model Selection

The use of the two-way fixed-effects model with country and year fixed effects is at the core of the analytical technique to study the influence of trade union activity on income inequality in European countries. This is one of the most suitable methods to adopt, according to the literature, considering the socio-economic heterogeneity that is inherent in the EU. Compared to other methodological approaches, the fixed-effects model is one of the best in isolating the causal effect of shifts in trade unions with meticulous control of the unobserved country-specific factors. The unobserved factors are denoted as fixed effects and relate to any national features that significantly and persistently determine labour dynamics over a long period. Specifically, such features in relation to this discussion include a legal framework for worker rights and collective bargaining, cultural norms that influence the level of attachment of workers in work and social upward mobility, and a historical pattern of industry development, among others.

$$\text{Gini Index}_{it} = \alpha + \beta_1 \times \text{density2}_{it} + \beta_2 \times X_{it} + \cdots + \mu_i + \lambda_t + \epsilon_{it} \tag{1}$$

Such features relatively stick within a single country over time, while they do differ in proportions across a very diversified EU. The fixed-effects model then disentangles the intrinsic effect of trade union activities from country-specific factors with immutable national traits. This approach gives much more to the richness of the perspective toward the relationship between trade unionism and income inequality. Moreover, this kind of use of fixed-effects model is especially suitable for catching the incremental, yet more meaningful changes that occur within individual countries over time. It helps to throw light on how trade unions influence income distribution within the very complex interplay of country-specific factors. This kind of attention to the within-country variation, however, is the special characteristic of this kind of study which makes it different from cross-sectional studies, which may be more exposed to biased results due to pre-existing national differences. This methodological commitment to the fixed-effects model underlies a stringent approach designed to ferret out subtle patterns in the data. Through great

care with fixed-effects controls, the analysis seeks causally interpretable inferences reflecting the true impact of trade union activity on income distribution in the multifaceted economic landscape of the European Union.

Before proceeding with the creation of the models, one main factor had to be taken into consideration: multicollinearity. This situation arises when the $X'X$ matrix is near singular, i.e., when the columns of X are close to linearly dependent. One potential complication that might arise from the near singularity of matrices is that the numerical reliability of calculation may be reduced.

$$\frac{1}{n}X'X = \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix} \tag{2}$$

And

$$\text{var}\,(\beta \mid X) = \frac{\sigma^2}{n}\left(\begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix}\right)^{-1} = \frac{\sigma^2}{n(1-\rho^2)}\begin{pmatrix} 1 & -\rho \\ -\rho & 1 \end{pmatrix} \tag{3}$$

The correlation ρ indexes collinearity, since as ρ approaches 1, the matrix becomes singular. It is for this reason that two particular tests have been discussed: in the first place, the Eigenvalue test, and then, the VIF test for a double check of other issues. This may be so due to the fact that the number of regressors is large. Yet, another problem that comes with multicollinearity is that the individual coefficient estimates can be imprecise. Nevertheless, the results showed that there is no trace of multicollinearity since all the values of the VIF are below the threshold (5).

The evaluation of multicollinearity is pivotal in ensuring the integrity and reliability of the regression model. Thus, the thorough assessment of multicollinearity underscores its significance in robust statistical modelling.

Table 3: Eigenvalues and VIF of Independent Variables

	Variables	Eigenvalue	VIF
demo	Democratic Governance	2.333	2.038
density2	Trade Unions Density	2.067	2.524
CollectiveBargain_Coverage	Bargaining Coverage	1.341	2.096
Inflation	Inflation	1.278	1.111
WageGrowth	Wage Growth	0.967	1.288
Gov_debt	Government Debt (%)	0.837	1.283
ln_labor	Log of Labor participation	0.691	2.397
WomenUnemployment_rate	Women Unemployment Rate	0.580	1.631
net_export	Net Export	0.447	1.979
net_FDI	Net FDI	0.274	1.151
Tax_contribution	Tax Contribution	0.184	1.675

4.1 Instrument Variable and Endogeneity

A second major issue which can arise is endogeneity. It can be identified, in the linear model, when

$$\text{Gini Index}_i = \text{density2}_i \times \beta + \epsilon_i$$

If with β, $\mathbb{E}(\text{density2}_i, \epsilon_i) \neq 0$. Therefore, β would need a structural interpretation because it is defined by a linear projection. In this case, to avoid the issue of endogeneity, an Instrumental Variable has been introduced.

In the instrumental variables (IV) analysis, the variable "density2" was first detected to be potentially endogenous with regard to the Gini index, demanding the need to proceed with an instrumental variable approach to get an unbiased and consistent estimation. Demo has been chosen as an instrument, and it is hypothesized that this variable affects the Gini Index only through its effect on Union Density (density2). In the intricate web of factors that influence labour unions and their efficacy, the concept of Democratic Governance emerges as a pivotal variable. This new construct, borne out of the interaction between Civic Participation and the Rule of Law Index, offers a lens through which to examine the political and legal environment that shapes labour union activities. Both variables have been scraped from the Rule of Law Index Database[4]. Democratic Gover-

[4]The dataset can be accessed via this website: https://worldjusticeproject.org/rule-of-law-index/.

nance encapsulates the degree to which citizens can participate in civil society and the extent to which legal norms are respected and enforced, both of which are critical to the functioning and impact of labour unions Bastian Herre et al. 2022. Moreover, this variable provides a valuable assessment of the extent to which individuals can voice concerns on diverse governmental issues and whether these concerns are attentively considered by various institutional bodies ibid.

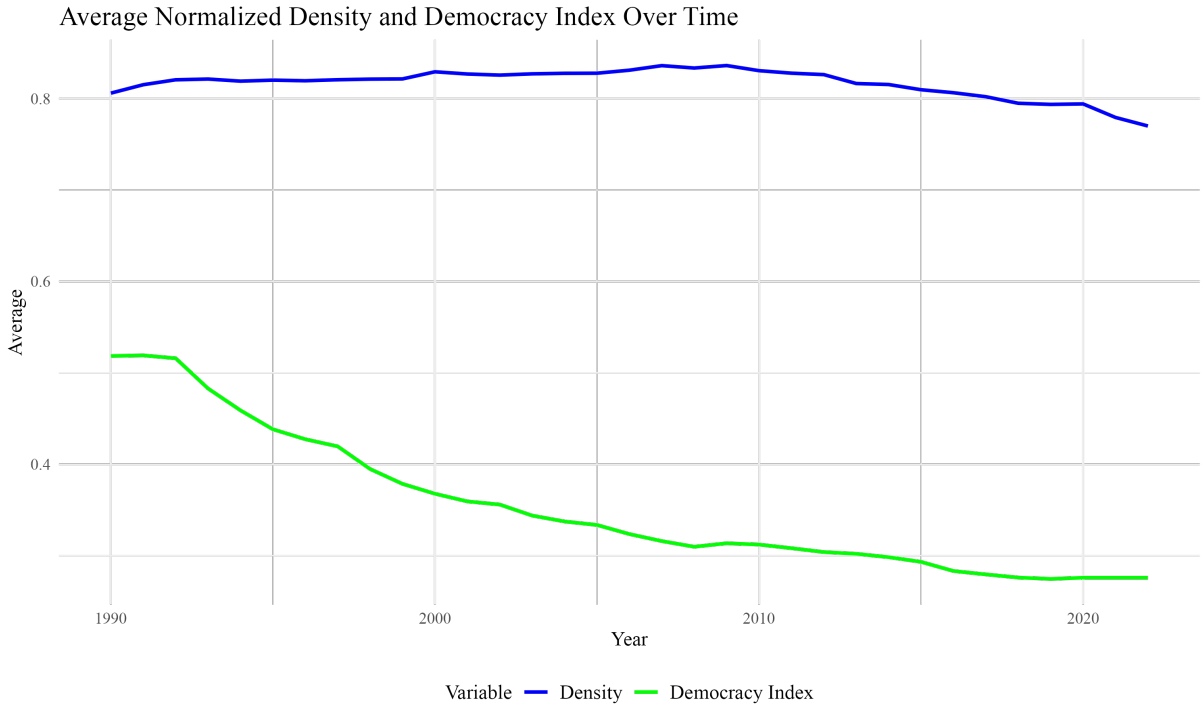

Figure 5: Aggregate trends for Democratic Governance and Trade Union Density over time. Both variables, in this case, have been normalized to a scale from 0 to 1.

The first step to be done is to run the potentially endogenous variable, density2, (which will also be called Bargaining Power) on the instrumental variable, demo, (Democratic Governance) and the control variables: Collective Bargaining Coverage, Inflation, Wage Growth, Government Debt, and Logarithm of Labor Force, and Women's Unemployment Rate. The idea of this step is to check the instrument's relevance, by ensuring it significantly predicts the endogenous variable. The estimation output on the first-stage regression has given significant results, notably for the Democratic Governance variable. The Estimate is 0.4693 with $p < 7.38 \times 10^{-15}$. The significant relationship would mean

that the instrument is relevant and therefore there can exist an effect of the Bargaining Power on the Gini Index which is the dependent variable. The analysis has further shown an F-statistic of 113.9 with an extraordinarily low p-value that is less than 2.2×10^{-16}, which, in economic terms, has proved that the instrument effectively explains variations in Bargaining Power. The correlation between demo and the residuals from the first-stage regression is approximately 0. This suggests that demo is uncorrelated with the error term in the first-stage regression, supporting the assumption of exogeneity.

Table 4: First-Stage Regression Results

	Dependent variable:
	density2
Demo	0.469^{***}
	(0.059)
Collective Bargain Coverage	0.227^{***}
	(0.024)
Inflation	0.0002^{***}
	(0.0001)
Wage Growth	0.003
	(0.002)
Government Debt	0.001^{***}
	(0.0002)
Log Labor	-0.095^{***}
	(0.005)
Women Unemployment Rate	-0.005^{***}
	(0.001)
Constant	1.080^{***}
	(0.087)
Country	No
Year	No
Observations	726
R-squared	0.526
Adjusted R-squared	0.522
Residual Std. Error	0.156
Correlation between demo and residuals	0
Observations	726
R^2	0.526
Adjusted R^2	0.522
Residual Std. Error	0.156 (df = 718)
F Statistic	113.946^{***} (df = 7; 718)
Note:	*p<0.1; **p<0.05; ***p<0.01

The second stage hence, pulls attention to the real relationship of interest. The Gini Index, being our dependent variable, is regressed on the derived estimates of Bargaining Power from the first stage together with its original control variables. The logic follows that through this approach, the aim would be to uncover the unbiased effect of Bargaining Power on the Gini Index free from the potential endogeneity issues. The second-stage results reveal a marginally significant coefficient (Estimate = -0.0537, p = 0.05) for the fitted Bargaining Power values (at a 5 percent significance level). This suggests a subtle, yet potentially important, influence of Bargaining Power on the Gini Index after controlling for endogeneity through the instrumental variable (IV) method. Democratic Governance is not directly related to the Gini Index and only affects it through its relationship with Bargaining Power (density2), supporting the exclusion restriction assumption. In general, the results from 2SLS regression indicate that the use of "demo" as an instrument can address the endogeneity of "density2," such that the estimates on inequality are more reliable. Summary statistics indicate the very significant influence of the rest of the control variables over the Gini Index. The IV analysis testifies to the validity and strength of Democratic Governance as an instrument of Bargaining Power. More significantly, it sheds light on the intricate relationship between Bargaining Power and the Gini Index. This further gives weight to the choice and validation of strong instrumental variables to achieve unbiased and accurate econometric results.

That the coefficient on "fitted values of density2" is near significant at the 10 percent level may suggest that there is still some residual endogeneity or that there are other problems that affect the precision of the estimates. In this regard, even if the IV approach with "demo" can still mitigate endogeneity concerns to a large extent, further affirmations need robustness checks or alternative instruments for the causal explanation between union density and income inequality.

Table 5: Second-Stage Regression Results

	Dependent variable:
	Gini_Index
Fitted Density Squared	-0.054^{*}
	(0.028)
Collective Bargain Coverage	-0.028^{***}
	(0.010)
Inflation	0.00003^{*}
	(0.00002)
Wage Growth	-0.0002
	(0.0004)
Net Export	-0.00005
	(0.00004)
ln_labor	-0.0003
	(0.003)
WomenUnemployment_rate	0.003^{***}
	(0.0004)
net_export	0.0001
	(0.0001)
Constant	0.327^{***}
	(0.047)
Country	No
Year	No
Observations	726
R-squared	0.32
Adjusted R-squared	0.313
Residual Std. Error	0.034
Observations	726
R^2	0.320
Adjusted R^2	0.313
Residual Std. Error	0.034 (df = 717)
F Statistic	42.253^{***} (df = 8; 717)
Note:	*p<0.1; **p<0.05; ***p<0.01

5 Model Results

The instrumental-variable fixed effects regression model offers a more robust method to run the causal analysis between key labour market variables and income inequality as measured by the Gini Index. The IV model includes the instrumental variable 'demo' to control for the independent variation in an economy's income inequality that is caused by its status of democratic governance when isolating the causal effect of stronger collective bargaining on income inequality.

The negative coefficient of 'density2' was consistent across model specifications—in a large set, the coefficient ranged between -0.021* and -0.027***, with standard errors around 0.011. This implies that increasing bargaining power is statistically significant in driving income inequality down. Also, the model results show a negative Average Treatment Effect (ATE) of Trade Union Density on the Gini Index, reinforcing the role of unionization in diminishing income disparity. Meanwhile, the highest unionization rate is associated with the lowest inequality in incomes and reflects the substantial power of labour unions in negotiations in the labour markets. This also means that labour unions are an effective social tool for making it real that incomes are distributed more evenly across the different European countries.

Remarkably the IV approach based on the 'demo' instrumental variable makes it possible to interpret the above relationships as causal ones and not just correlational. This would suggest that the observed relationships are less plagued by omitted variable bias or, conversely, causality in the other direction. These results are, therefore, from the current study quite informative to policy discussions in the context of reduced income inequality and better labour market results. This, however, sits well with more traditional views on the role of unions toward the indentation of income differentials in favour of fair wages, postulated by David Card (David Card 2001). A higher union density represents a higher proportion of workers whose wage is determined by unions using a process of collective representation to demand policies and wage determination for a much broader base of workers than just those in the upper echelons. In this framework, the analysis shows that further controls, such as Gross Domestic Product, have a stronger impact on the Gini

Table 6: Regression Results

	Dependent variable:		
	Gini_Index		
	(1)	(2)	(3)
Density Squared	−0.027***	−0.024**	−0.021*
	(0.011)	(0.011)	(0.011)
Collective Bargain Coverage	0.022***	0.024***	0.026***
	(0.008)	(0.008)	(0.008)
Inflation	−0.001	−0.001	−0.001
	(0.002)	(0.002)	(0.002)
Wage Growth	0.003	0.003	0.002
	(0.002)	(0.002)	(0.002)
Female Workers	−0.00000	0.00000	−0.00000
	(0.00001)	(0.00001)	(0.00001)
Log Minimum Wage	−0.001***	−0.001**	−0.0005**
	(0.0002)	(0.0002)	(0.0002)
Log GDP	−0.001	−0.001	−0.001
	(0.001)	(0.001)	(0.001)
lnGDP	−0.038***	−0.038***	−0.037***
	(0.004)	(0.004)	(0.004)
Female_Workers	−0.001***	−0.001***	−0.001***
	(0.0002)	(0.0002)	(0.0002)
density2:cluster2	0.002	0.002	0.003
	(0.007)	(0.007)	(0.007)
density2:cluster3	−0.001	−0.001	−0.0003
	(0.007)	(0.007)	(0.007)
Constant	0.959***	0.936***	0.882***
	(0.201)	(0.201)	(0.202)
Country	Yes	Yes	Yes
Year	Yes	Yes	Yes
Government Debt	Yes	Yes	Yes
Log Labor	Yes	Yes	Yes
Part-time Employment	Yes	Yes	Yes
Women Unemployment Rate	Yes	Yes	Yes
Net Export	No	Yes	Yes
Net FDI	No	No	Yes
Tax Contribution	No	No	Yes
Observations	726	726	726
R-squared	0.865	0.865	0.867
Adjusted R-squared	0.851	0.851	0.853
Residual Std. Error	0.016	0.016	0.016
Observations	726	726	726
R^2	0.865	0.865	0.867
Adjusted R^2	0.851	0.851	0.853
Residual Std. Error	0.016 (df = 657)	0.016 (df = 656)	0.016 (df = 654)

Note: *p<0.1; **p<0.05; ***p<0.01

Index. The growth in a country's economic size is a very important determinant in the development of income inequality since it represents a direct impact on people's incomes and with people of different income levels. Another crucial factor in the analysis is the Wage Growth. This variable, although not statistically significant, shows an important correlation with the dependent variable. Higher wage growth may mean that the distribution of income is more equitable since individuals within different income levels may suffer the largest proportion of the growth in earnings, and this may bring down the Gini Index.

The above Instrumental Variable analysis not only demonstrates the strength of the robustness of the methodology but also shows the critical role that the variable of Democratic Governance plays as a determinant of the level of Bargaining Power for the labour unions. In fact, in all countries, and particularly in European ones, in which the political influences are strictly intertwined with the union, the power of these could be strongly correlated with the political environment. Democracy is imperative to present as the greatest determinant of the bargaining power of unions in European countries since it is a good proxy for the degree of protection of labour rights and the degree of institutionalization of collective bargaining rights in the constitution. Strong democratic institutions make it ideal for unions to coordinate and bargain for fair wages, benefits, and working conditions for their members (Hyman 2007). More importantly, it shows the intricate link between Bargaining Power and the Gini Index. This means that the model of Two-Way Fixed-Effects with Instrumental Variable, introduced by demo, is found to be a robust model for the causal intervention of changing labour market conditions on income inequality. The importance of collective bargaining power and trade union density in income equalization has been proven by large and negative coefficients of important variables kept stable across different model specifications.

6 Policy Considerations

The regression results estimated in the previous section are important and have several policy implications. For example, the negative relationship between collective bargaining and trade union density on one side and the level of the Gini Index on the other side implies that a policy that strengthens labour unions and the associated collective bargaining processes in place is an effective policy tool towards the reduction of income inequality. Governments, therefore, may have a case for enacting and enforcing legislation that would protect the rights of workers to organize and collectively bargain, and policy that would encourage union membership. Additionally, promoting a fair minimum wage would be a companion policy to reduce income inequality further. These, along with wider coverage of collective bargaining, will ensure that not only income distribution would be more equitable but also businesses could enjoy a more stable and motivated workforce, which would be for the good of the economy as a whole. In that sense, the strengthening of trade unions and facilitation of collective bargaining are relevant not only to labour rights but should be at the core of any comprehensive scheme aimed at social inequality reduction.

6.1 Heterogeneity of the Effects: Who Benefits Most?

Again in line with theory, the effect of collective bargaining on inequality is highly heterogeneous across worker types and other industry-specific factors. On the other hand, low-skill workers benefit more through collective bargaining, mainly because the unions help in wage enhancement and working conditions. For the high-skill workers, who already have a relatively greater individual bargaining power, even though there is some increase in the wage premium, it is undetermined how much more they will benefit in the security term of the job and other negotiated benefits with the employer. Women may benefit from collective bargaining that is motivated to remove gender-based discrimination with regard to pay and other working conditions. The effects are stronger for new entrants with lower experience upon entry to the labour market, as unionization helps ensure that they receive fair wages and do not get stuck in low-level positions. There are also effects specific to various industries: manufacturing industries, for example, with higher union

presence see more consistent wage structures and a lower level of income inequality compared to the more fragmented, less unionized service sector. Public sectors, with their higher unionization rates, produce more equitable pay scales and more comprehensive benefits, as opposed to the vast differences inherent in the private sector. Geographical variation also affects the outcomes of collective bargaining; urban areas bargain most aggressively for wage increases because of the higher cost of living, while rural areas are more concerned with job security and benefits. Therefore, subgroup analysis is crucial for understanding the subtleties of how collective bargaining impacts income distribution, thus important for targeted policies that leverage its positive impact on different sections of the workforce inclusively and equitably.

6.2 Complementary Mechanisms: Beyond Wages

Enhancing labour unions influence income inequality beyond their wage-setting impacts through several other complementary mechanisms. Unions are also generally in favour of policies that increase job security, thereby protecting workers from the vagaries of income fluctuations. Unions also push for access to training programs that enhance the skill level and employability of workers, which in turn increases their opportunities for promotion into higher positions and higher long-term earnings. Unions also have a role in the strengthening of social safety nets, such as health benefits and pensions, and in providing unemployment insurance, as a means of softening economic shocks to specific individuals. All of these mechanisms contribute to a reduction in income inequality, over and above the wage effect. Unions more effectively reduce income inequality because they can address various critical dimensions related to workers' economic well-being, such as pensions, wage-bargaining, and collective voice. Future research should more fully investigate the relative importance of such complementarities for understanding how each of the mechanisms can contribute to a more equal distribution of income and which type of policy works best in which kind of context. That kind of insight would help develop more targeted and effective strategies to promote income equality through collective bargaining and other labour-market interventions.

6.3 Dynamic Effects: A Long-Term Perspective

The relationship between collective bargaining and union density on one side and income inequality on the other side is dynamic, reflecting more general changes in the economy and institutions. The huge decline in unionization rates in many countries over recent decades has likely exacerbated the income inequalities, borne of the associated diminution of collective bargaining power. A longitudinal analysis will give a closer look at how changes in collective bargaining strength or union density affect income inequality. Such an approach may help to throw light on the long-term dynamics of these various relationships, emphasizing how institutional changes in the labour market are driving income distribution over time (David Card 2001, Hyman 2007). For instance, we can go beyond the average treatment effect by looking into the heterogeneity, possible complementary mechanisms, and dynamic effects of collective bargaining on income inequality. For example, the effect of unionization might be particularly pronounced among the poorest category precisely because they would stand to gain more from the scale of wages brought about by collective bargaining within a firm as opposed to workers higher up the earnings scale, who can bargain individually for high wages. It also follows that because wage adjustment is a very important and central mechanism through which collective bargaining might have an effect on income inequality, complementary mechanisms further promoted by unions include the policies of job security, the promotion of training programs, and the improvement of social safety nets. Additionally, it could further enhance probing into the possible mechanisms and mediators underlying the observed set of associations, including the impact of some particular labour market policies or institutional factors, so as to further enrich our understanding of the dynamics that shape income inequality (ibid.).

7 Conclusions

Labour unions and collective bargaining institutions have long been seen as key institutional elements to income distribution, but the details of how they work across countries in the EU are quite complex. The use of a two-way fixed effects regression model with instrumental variables offers a strong narrative for the causal pathways within the labour market. The results point clearly to collective bargaining and its measure, trade union density, being instrumental in producing equitable economic results, given their highly significant negative effect on the Gini Index. The synergy of collective bargaining strength, represented by the variable 'density2', and the interaction of 'robust' in this model gives just one more solid determinant for the diminution of income inequality. As can be gleaned from the ATE, the stronger the bargaining power, the lower the Gini Index, which would suggest that robust collective bargaining mechanisms are at the heart of income equity. The continuing presence of trade union density, despite the declining membership, does not indicate anything else but the continuing significance of unions in the struggle for social justice. Including Democratic Governance as one of the instrumental variables shows that at the very least, strong democratic institutions and practices are all necessary to strengthen the effective representation of labour. Because this represents the degree to which citizens can participate in the decision-making process of their socio-economic reality, this factor alone can change the fabric with which labour works. These results, from a policy perspective, lay the ground for supporting and strengthening labour unions and collective bargaining frameworks. This support would come both in the form of supportive legislation, incentivizing the membership of unions, and programs that would encourage collective bargaining—particularly in the face of a changing landscape of the labour market. In either case, such steps can be for the perspectives of not only short-term economic inequalities but also for the preparation of grounds for a robust and inclusive economy. This paper, in this context, falls within the more substantial literature on labour economics and social equity and is by now rich in quoting evidence of the channels in which collective bargaining or trade union density shapes income distribution. As this paper examines and tries to unearth the dark patches in the sprawling network of a globalized

economy, we find at every turn that the pursuit of inclusive growth has to substantially account for the crucial role of labour institutions in promoting equitable labour market outcomes.

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