



The Impact of European Integration on Income Inequality in the Eurozone Economies

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In 2001, the European Commission identified income inequality as one of the key catalysts of social exclusion. It argued that: “widespread disparities (...) hinder the achievement of the Union’s 10 years strategic goals of sustained economic growth, more and better jobs and greater social cohesion” (European Commission, 2003, p.18).

Although the Lisbon Agenda and Europe 2020 are prominent examples of strategies devised to decrease inequality, many studies suggest that income gaps have actually increased within EU states over the past two decades (OECD, 2011; Bouvet, 2010; O’Connor, 2005; Eißel, 2014; Atkinson et al., 2010). Between 1990 and 2015, income inequality has risen in many countries. Notable examples include Italy, Finland, Latvia, and Greece, with increases of 30 percent, 26 percent, 18 percent, and 16 percent, respectively. The escalating polarization fuels poverty and stifles social mobility. As estimated by Eißel (2014), one in six people in Europe lives below the poverty threshold. Furthermore, over seventeen million Europeans live on less than 5 euro per day. This poses a challenge for policymakers as the need to satisfy both ends of the income distribution impedes the design of meaningful reforms.

Figure 1 of Appendix A (A6) depicts county-specific profiles of income inequality over time. They demonstrate two specific features. Firstly, income inequality has generally been on a rise within the countries. Secondly, most of the European states experience two steep increases in inequality, one around 2000-2001, another around 2007-2009. The former period is around the time when most of the states in the sample adopted the euro. The latter is commonly known as the global financial crisis. Hence, a hypothesis arises - income inequality within the eurozone countries could have been influenced not only by inequality trends caused by the recent recession, but also by European Integration.

In order to shed light on the issue of surging income inequality, this work uses a panel of 17 states in the Economic and Monetary Union (EMU) between 1990 and 2014. The study analyses the changes in inequality in the context of the three milestones of the EMU, being (1) signing the Maastricht Treaty, (2) ratifying the Stability and Growth Pact, and (3) adopting the euro. The paper suggests that income inequality has increased in all of the countries under study partially due to the process of European Integration. One of the possible explanations for this is that the lack of coordination between monetary and fiscal policies in the process of economic unification resulted in an inability to counteract asymmetric shocks, making the Eurozone countries prone to inequality. The paper also argues that there are other factors influencing income gaps, including unemployment, spending on social policies and female labour force participation, among many.

The paper is organized in the following way. Section I puts this study in the context of the existing literature. Section II introduces the data utilized in this study and notes their sources. Section III outlines the methodology employed in the analysis. Section IV discusses the estimation results. Section V concludes.

I. Literature review

There is no consensus in the empirical literature regarding the impact of European Integration on inequality. Disparities between research findings are rooted in the differences in periods covered, methodology used, and the sample considered by the authors.

The majority of papers published in the 1990s and early 2000s draw on country-level data to argue that European regions experience convergence in terms of income levels (Braunerhjelm et al., 2000; European Commission, 1997; Ben-David, 1993). These studies rarely consider European Integration as a separate factor that could influence disparities.

In the mid-2000s, the theory of conditional convergence of income was in vogue, asserting that European regions can be divided into groups based on per capita GDP and that convergence took place only within these groups (Magrini, 2004; Beblo and Knaus, 2001; Papatheodorou and Pavlopoulos, 2003).

Finally, more recent papers are panel data studies dissecting potential reasons for rises in inequality in the European Union (Bouvet, 2010; Brandolini, 2007; Boix, 2004; O'Connor, 2005; Eißel, 2014; Atkinson et al., 2010; Checchi and Garcia-Peñalosa, 2008). The majority of them analyse social, political and institutional variables that are accountable for the increase in disparities within the EU countries. Only a few focus specifically on the impact of European Integration on inequality (Bouvet, 2010; Brandolini, 2007; Checchi and Garcia-Peñalosa, 2008). These mostly define European Integration as a process in time, analysing subsequent stages of the Economic and Monetary Union.

There are two main contributions of this work. Firstly, it defines European Integration not only as a process in time, but also decomposes it into economic variables. Such a treatment enhances the policy conclusions made in the literature. Secondly, the study is focused on a sample that has never been studied in this context. It analyses inequality in the Eurozone countries as they are at the most advanced stage of European Integration – the Economic and Monetary Union.

II. Data

The data used in this study are taken from Eurostat. I use a sample of 17 out of 19 Eurozone economies, excluding Malta and Cyprus due to the lack of statistics for these countries. Furthermore, observations prior to 1990 were not taken into consideration, which is a common feature of existing studies. This is primarily because using these data would lead to additional challenges, including the choice of equalization procedure, conversion to a common currency, and considerations of heterogeneity in price levels. Overcoming these obstacles is beyond the scope of this paper. Please refer to Appendix A for data summary and statistics (A2).

III. Model

The study investigates within-country income inequality after taxes and transfers, as measured by the Gini coefficient. There is a handful of papers that use other inequality measures, such as S80/S20, the Theil index, D5/D1 and P90/P10. The findings of this study have been tested using these indices and are consistent among them.

The paper analyses income inequality within the states, not in the Eurozone as a whole. There are two reasons for such a treatment. The first one is the fact that even though many researchers

aimed at creating a supranational inequality index for the EU (Bonesmo, 2012; Papatheodorou and Pavlopoulos, 2003; Rodriguez-Pose and Tselios, 2008), this task remains challenging due to the lack of sufficient data and a complicated mathematical process of defining such an indicator. The second reason is that, as found by Boix (2004) and Papatheodorou and Pavlopoulos (2003), within-country inequality accounts for over 92 percent of the inequality in the EU as a whole. Hence, analysing within-country income inequality should be sufficient for the objective of this study.

The explanatory variables of the model are grouped into four categories: macroeconomic stability indices, social indicators, policy and institutional variables and European Integration dummies. The paper now justifies such a treatment and discusses the expected impact of those variables on income inequality.

A. *Macroeconomic Stability Indices*

This study uses long-term interest rates as one of the variables to account for economic stability. This leverages on Piketty's (2014) thesis that if the interest rates in a country are high, it experiences elevated levels of income disparity. He argues that only those at the top of the distribution own assets generating income in the form of dividends, interest, and rents. Thus, if the return on capital increases, the level of income disparity in the society amplifies. Changes in the long-term interest rates indicate both: the behaviour of the short-term rates, which decrease in recessions and increase in booms, and public expectations of the future. Hence, they are a comprehensive indicator of macroeconomic stability.

The second index used in the model is per capita GDP. Adding it to the regressions captures the impact of the recent recession on the EMU economies. According to Kuznets (1955), developed countries should experience low inequality levels, a relationship commonly referred to as the Kuznets curve. Since all of the countries in the sample are classified as developed by the World Bank, we may expect a negative relationship between per capita GDP and the Gini index. However, the relation discovered by Kuznets was solely based on the analysis of economies undergoing an industrial transformation (US, England and Germany). As a result, the existence of Kuznets curve relationship in the modern setup of the Eurozone is debatable. In fact, there are many studies that contradict Kuznets' predictions in highly industrialized countries (Angeles, 2010; Kwasi Fosu, 1993).

B. *Social Indicators*

Understanding the current social climate is crucial for dissecting the reasons for rising inequality. This study controls for four social indicators. Firstly, since women's participation in the labour market has increased by 10 percent over the period between 1990 and 2014, the model includes female labour participation rate. Predicting its relation to inequality is challenging. Cacian and Daziger (1993) argue that if more women undertake employment, income disparity in a country falls since the income of middle class households increases. On the other hand, Thurow (1987) claims that since the probability of breaks in professional career is higher for women, high female labour force participation leads to elevated inequality levels.

Secondly, the paper includes unemployment rate as another explanatory variable. Most EMU countries saw substantial increases in unemployment after the outbreak of the financial crisis. Since the occurrence usually concerns people at the lower end of income distribution, one can hypothesise that if unemployment rate increases, income inequality rises.

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Thirdly, the model includes the share of employment in agriculture as a social indicator. Over the past 20 years the amount of people working in that sector has decreased substantially in the European countries due to the fact that more and more people pursue university education (Bouvet, 2010). Since agriculture is characterized by low productivity levels and low wages, the less people involved in agriculture, the more equal is the income distribution.

Finally, the study analyses educational attainment measured as a percentage of people over 25 who have completed secondary education, which has increased by 12 percent over the past 20 years in the European countries (OECD, 2011). The literature suggests that the more educated the people in society are, the lower is the level of inequality (Gustafson and Johansson, 1999).

C. Policy and Institutions

This set of variables accounts for how current policies influence income disparity. Including them in the regression helps to evaluate how successful the mitigation of inequality in the Eurozone economies was so far and helps to identify potential areas for improvement.

The model includes social spending as a proportion of GDP, which has risen significantly due to initiatives aimed at increasing social cohesion, e.g. the Lisbon Agenda. Social transfers, i.e. unemployment benefits, state pensions, etc., should increase the income of poor households, lowering inequality.

Labour union density is another explanatory variable that belongs to this category. Recent trends for this variable differ across European states. For instance, Norway and Belgium have seen union density increase in recent years to 74 percent and 50 percent, respectively. On the other hand, unionization fell to 8 percent in France and 10 percent in Lithuania (Bonesmo, 2012).

It is challenging to predict the theoretical relationship between labour union density and income inequality. Freeman (2000) believes that unionization may result in wages set above the equilibrium level, increasing income inequality. However, the OECD report (2011) argues that the effect of labour unions on inequality is actually opposite – they may protect the level of wages of lower-income households, thus reducing income disparity.

D. European Integration

The study takes a two-step approach to defining European Integration. Firstly, it analyses it as a process in time. There are three key milestones for a country to join the Economic and Monetary Union. The first one is signing the Maastricht Treaty, an accord that established the European Union and outlined the need for the convergence criteria that the countries needed to fulfil in order to synchronize their economies before adopting a common currency. The second milestone is ratifying the Stability and Growth Pact, an agreement that actually specified convergence requirements for the purpose of maintaining the stability of the Economic and Monetary Union. These included coordinating long-term interest rates and inflation rates as well as the levels of debt and deficit. Finally, the last stage involves adopting the euro as a common currency.

Thus, the first specification is strictly qualitative. It involves intruding three time dummy variables to capture the effects of these milestones. *MAASTRICHT* that takes the value 1 once a country has adopted the Treaty of the European Union up to 2014, and 0 otherwise. This allows to capture the effect of the first stage of integration – the introduction of the Single

Market. The second dummy variable, *SGPACT*, takes the value 1 from the year when the country adopted the Stability and Growth Pact to 2014, and 0 otherwise. It fosters one's understanding of the impact of the convergence criteria on income disparity. Finally, dummy *CURRENCY* takes the value 1 once a country has adopted the euro up to 2014, and 0 otherwise. It is used to determine the effect that the adoption of the euro had on the EMU economies.

More formally,

$$(1) \text{ Maastricht}_{i,t} = \begin{cases} 1, & \text{for } t \geq a; \text{ } a \text{ being the year when country } i \text{ adopted the Treaty;} \\ 0, & \text{otherwise;} \end{cases}$$

$$(2) \text{ SGPact}_{i,t} = \begin{cases} 1, & \text{for } t \geq b; \text{ } b \text{ being the year when country } i \text{ adopted the Pact;} \\ 0, & \text{otherwise;} \end{cases}$$

$$(3) \text{ Currency}_{i,t} = \begin{cases} 1, & \text{for } t \geq c; \text{ } c \text{ being the year when country } i \text{ adopted the Euro;} \\ 0, & \text{otherwise;} \end{cases}$$

where the subscript i stands for one of the 17 countries in the sample, and the subscript t is the year between 1990-2014. The country-specific dates of completing each stage of integration are included in Table 3 in Appendix A (A3).

The second step involves decomposing the dummies in order to disentangle the different effects of economic unification of the EMU. For the sake of cohesion, I will refer to this specification as quantitative; one where dummy variables become insignificant. Hence, in the second step, I add three out of four convergence criteria to the model. These include: government deficit as a proportion of GDP, government debt as a percentage of GDP, and inflation rates. The fourth convergence criterion, long term interest rates, had already been included in the original model as a macroeconomic stability index. The reason why I attempted to decompose the dummies by adding the convergence criteria is because they are the only conditions that countries willing to join the EMU need to follow.

Moreover, the model also includes intra-EU trade – a sum of a country's imports and exports to the EU – as a proportion of a country's total imports and exports. Trade gains stemming from the Single Market are one of the key reasons why countries decide to join the Eurozone. Thus, adding intra-EU trade to the regression will determine how economic gains interact with the social ones.

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These four decomposing variables are included in the regression for two purposes. Firstly, to determine whether or not they help to explain the variation in the Gini coefficient. Secondly, to verify how they interact with the European Integration dummies for the purpose of designing appropriate policy recommendations.

The paper specifies the following model:

$$(4) \text{ Inequality}_{i,t} = \beta_0 + \beta_1 x_{i,t} + \beta_2 z_{i,t} + \beta_3 w_{i,t} + \beta_4 s_{i,t} + \alpha t + u_{i,t}$$

In the equation above the subscript i stands for one of the 17 countries in the sample, and the subscript t is the year between 1990-2014. The variable $x_{i,t}$ is a matrix of macroeconomic stability indicators. The following ones, $z_{i,t}$, $w_{i,t}$ and $s_{i,t}$ are the matrices of social, institutional and European Integration regressors, while variable t is a time trend.

The qualitative and quantitative specifications differ in the last matrix. In the former $s_{i,t}$ contains only the European Integration dummy variables, i.e.

$$(5) s_{i,t} = \begin{bmatrix} \text{Maastricht}_{i,t} \\ \text{SGPact}_{i,t} \\ \text{Currency}_{i,t} \end{bmatrix}$$

whilst in the latter, the matrix also includes the four decomposing variables. For the sake of clarity, let us call the matrix of European Integration regressors in the quantitative specification $s'_{i,t}$.

Hence,

$$(6) s'_{i,t} = \begin{bmatrix} Maastricht_{i,t} \\ SGPact_{i,t} \\ Currency_{i,t} \\ IntraEU Trade_{i,t} \\ Gov. Deficit_{i,t} \\ Gov. Debt_{i,t} \\ Inflation rate_{i,t} \end{bmatrix}$$

EMU countries differ in many respects, which cannot be accounted for in this study. Examples of such factors include: language, attitude towards inequality and culture. This puts the model at risk of omitted variable bias and endogeneity, which could lead to the bias and inconsistency of estimated parameters. In order to counteract this, let the error term, $u_{i,t}$, be defined as $u_{i,t} = a_i + v_{i,t}$, where a_i stands for the unobserved country-specific heterogeneities and where $v_{i,t}$ is a white-noise process. The paper performs a fixed effects estimation that treats the unobserved effects as time-invariant across countries and eliminates the correlation between the model variables and the error term, $u_{i,t}$. Moreover, the standard errors reported in brackets are clustered, which allows to group errors across countries and control for potential time-series correlation of residuals in specific Eurozone state-samples. Finally, the model is also estimated with time-fixed effects to dissect whether or not part of the time series variation in the Gini index can be explained by general time trends.

IV. Empirical Evidence

A. Qualitative Specification

Table 1 presents the regression results using the qualitative specification. Models (1) to (3) gradually add matrices of variables to determine the extent to which macroeconomic stability indices, social indicators, and policy and institutional variables explain income inequality in the Eurozone countries. Regressions (4) to (6) include the European Integration dummy variables. For the purpose of exposition, the Gini coefficient is multiplied by a hundred. Fixed effects have been examined using an F-test and were found statistically significant across all models. Thus, not including them in the regression would have caused endogeneity problems, leading to inconsistency and bias of model parameters.

Model (1) includes the macroeconomic stability indices. Long term interest rates are not statistically significant across the six models. This may come as a surprise, especially taking into account the fact that the Eurozone has been dealing with the ramifications of the global recession for the past seven years. From the viewpoint of conventional monetary policy, in recession, the central bank would increase money supply in order to stimulate economic growth, thus reducing interest rates. This would indicate that high interest rates are associated with high inequality levels.

However, the insignificance of long term interest rates can be explained by the fact that in the aftermath of the financial crisis of 2008-2009, central bankers switched to unconventional monetary policy measures. In fear of entering a liquidity trap, the European Central Bank introduced quantitative easing, a process of electronically expanding its balance sheet, to

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counteract the recession. In other words, unconventional monetary policy did not involve interest rate manipulation, which can be the reason why there is no significant relationship between inequality and long term interest rates. This finding is in line with the existing literature (Bouvet, 2010; OECD, 2011; Bertola, 2008).

The second explanatory variable in model (1), GDP per capita, was also statistically insignificant in explaining the variation in the Gini index within the EMU countries. That is not to say that the findings of this paper contradict the Kuznets curve relationship. One of the possible explanations for the lack of significance is the fact that the Kuznets curve was estimated based on the performance of economies undergoing a large transformation from agriculture to industrial production. This resulted in large increases in the per capita GDP, which could have decreased income inequality in these countries. Since the Eurozone economies have not experienced a parallel process over the period under study, income per head does not play a major role in explaining the changes in inequality.

The second model regresses the matrices of macroeconomic and social variables on the Gini coefficient. Its performance is significantly better, as it explains over 30 percent of the variation in income inequality in the EMU countries. The first variable of this set, the share of women in employment, is negatively related to inequality. If more women participate in the labour market, the average income of middle- and low- income household increases, reducing disparities. In model (2), a 1 percentage point increase in female labour force participation rate, decreases the Gini coefficient by 0.347.

Table 1. Regression results: qualitative specification
Dependent variable: Gini coefficient (x100)

	(1)	(2)	(3)	(4)	(5)	(6)
Macroeconomic Stability						
Interest rates	0.057 (0.050)	0.054 (0.049)	0.024 (0.050)	0.038 (0.053)	0.050 (0.052)	0.011 (0.051)
GDP per capita	0.008 (0.357)	0.004 (0.348)	0.004 (0.358)	0.004 (0.358)	0.003 (0.358)	0.003 (0.359)
Social Indicators						
Female Labour Force Participation Rate		-0.347** (0.117)	-0.244** (0.116)	-0.271** (0.116)	-0.260** (0.117)	-0.228** (0.116)
Unemployment rate		0.126*** (0.038)	0.177*** (0.040)	0.165*** (0.038)	0.176*** (0.039)	0.159*** (0.040)
Share of employment in agriculture		0.105 (0.120)	0.137 (0.120)	0.154 (0.121)	0.187 (0.117)	0.115 (0.117)
Educational attainment		-0.042* (0.021)	-0.047** (0.020)	-0.045** (0.020)	-0.044* (0.021)	-0.056** (0.022)

	(0.023)	(0.023)	(0.023)	(0.024)	(0.025)	
Policy and Institutions						
Social Spending as a % of GDP	-	-	-	-	-	
	0.196***	0.231***	0.215***	0.273***	0.273***	
	(0.067)	(0.068)	(0.067)	(0.076)	(0.076)	
Labour Union Membership	-0.059**	-0.064**	-0.068**	-0.049*	-0.049*	
	(0.029)	(0.027)	(0.030)	(0.028)	(0.028)	
European Integration						
Maastricht			-0.214*			
			(0.112)			
SGPact				0.304*		
				(0.175)		
Currency					0.442**	
					(0.191)	
Other						
Trend	-0.022**	-0.011	-0.012	-0.011	-0.013	-0.012
	(0.009)	(0.009)	(0.010)	(0.011)	(0.009)	(0.009)
Constant	13.918***	7.360***	1.256	1.771	1.574	1.112
	(1.293)	(1.320)	(1.306)	(1.317)	(1.391)	(1.323)
Observations	291	291	291	291	291	291
R ²	0.017	0.314	0.522	0.521	0.514	0.519
F-stat. that country specif. effects=0	136.39	138.21	143.41	141.43	142.12	144.83
(p-value)	0.000	0.000	0.000	0.000	0.000	0.000

Standard errors in brackets

** significant at 10 percent; ** significant at 5 percent; *** significant at 1percent*

The unemployment rate is always statistically robust and positively related to inequality. In the discussed model an increase in the unemployment rate of 1 percentage point, leads to a rise in the Gini coefficient of 0.126. This result can be justified by the fact that the more unemployment there is, the less disposable income households in the lower part of the distribution have, which increases disparities in the society.

The share of employment in agriculture is never statistically significant across the six models. Since it is difficult to combine both studying and working in agriculture, and educational attainment is high in the Eurozone countries, the latter may be a better social indicator for this study. In fact, educational attainment is always statistically robust and negatively related to

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inequality. In model (2), an increase in educational attainment rate by 1 percentage point leads to a decrease in the Gini coefficient by 4.2 percentage points.

The third model adds the political and institutional variables to the regression, which decrease the size of the coefficients of the social indicators. Both social transfers as a proportion of GDP and the level of unionization have negative and statistically robust impact on income inequality. The former indicates that the more the government spends on social protection, the lower is income inequality. The latter can be explained by the fact that labour unions protect the wages of households in the lower deciles of the income distribution, thus decreasing inequality.

When it comes to the impact of European Integration on income disparities in the Eurozone countries, models (3) to (6) present diverse results. Since the periods covered by the variables coincide, the dummies are added in three separate models in order to avoid multicollinearity.

The fourth model introduces the dummy variable *MAASTRICHT* that captures the effect of the Single Market on inequality. It appears that signing the Treaty decreases within-country income inequality. The negative sign of the coefficient could be caused by the fact that the variable captures the effect of the Structural and Cohesion Funds on inequality. They were 126.5 billion euro funds established in 1995, right after the ratification of the Treaty, allocated to the growth of underdeveloped European regions. In other words, signing the Maastricht Treaty gave a country the right to apply for the funds, which aim at decreasing inequality. Bouvet (2010) disentangles the effects of the Single Market and the Cohesion Fund. She finds that the Cohesion Fund indeed has a negative effect of inequality, but joining the Single Market actually increases income disparities in a country.

This is alarming especially when dissecting the results of regressions (5) and (6). Both dummy variables *SGPACT*, which captures the effect of the convergence criteria on inequality, and *CURRENCY*, which indicates the impact of adopting the euro, are positively related to income disparities. These results suggest that the more integrated the Eurozone countries become, the more unequal they are. Furthermore, the findings from the qualitative specification imply that there is something inherently built into the structures of the Eurozone that defies the objective to decrease income gaps.

The regression with time-fixed effects, the results of which are included in Table 5 in Appendix A (A5), highlights another interesting phenomenon. Testing for joint significance of the dummies from 2007 to 2013, the F-test strongly rejects the null hypothesis, with the F-statistics of 85.32. This indicates that there is a positive trend in income inequality in the Eurozone countries due to a feature that changes over time, but not across the states. This upward trend can be explained by the adverse effects of the financial crisis that were not captured by the macroeconomic stability indices in Table 1. Nonetheless, even with time fixed-effects, the European integration dummy variables remain significant.

B. Quantitative Specification

The quantitative specification sheds more light on the issue. It makes a substantial contribution to the findings when it comes to dissecting the European Integration dummies. The results are presented in Table 2. In model (1), intra-EU trade is positively related to income inequality. If the amount of EU-traded goods as a percentage of total imports and exports increases by 1 percentage point, the Gini coefficient increases by 0.007. This effect remains statistically significant at the 5 percent level across all the models. The result seems counterintuitive, as one may think that the more the countries trade with each other, the more economic wealth

they create, decreasing unemployment and income inequality. One potential explanation for this outcome was proposed by De Grauwe (2013), who argues that the degree of trade specialization has increased in the past twenty five years in the EU countries. That is to say that particular industries are focused in specific states, e.g., the automotive industry in Germany, the financial industry in the UK, etc. Trade specialization allows European companies to both cut production costs and provide the produced good to the whole of the Eurozone without any exchange rate-related risks.

Nonetheless, if one of the industries is hit by an adverse shock, for instance, an increase in the oil prices, the country where this particular industry is most prevalent will suffer. Unemployment will rise, increasing income inequality. The high degree of trade specialization is visible in model (4), which demonstrates that it is the export not the import component of intra-EU trade that is positively related to inequality. Increased demand for exports of one country would raise production, expanding the product's industry in that particular state, thus increasing trade specialization. Hence, omnipresent in the Eurozone countries, trade specialization comes at the price of inequality one has to pay in times of an industry-specific shock. Another reason for the positive correlation of intra-EU trade and the Gini coefficient could be that increased trade specialization benefits only a proportion of the society. As a result, those at the higher end of income distribution increase their share of the national income vis-à-vis those in the lower deciles.

Government deficit as a proportion of GDP is negatively related to the Gini coefficient. Intuitively, when a government runs a deficit, spending more than it collects in taxes, it uses the money to create jobs, implement policies or as social transfers. These in turn decrease the level of disparities in a country. Nevertheless, the stock of deficit, the government debt as a percentage of GDP, is positively related to income inequality. Increased levels of government debt require bigger interest payments that the countries need to make every year. In order to remain fiscally responsible, most governments pay the interest on their debts, which decreases the amount of funds that they have for social programs with potential inequality-decreasing effects. However, in the context of the European debt crisis, whose origins are embedded in the structure of the Eurozone, i.e. the incoordination of the monetary and fiscal policies on a supranational level, one can argue that it is because of economic integration that the debt levels are elevated, increasing income inequality.

The validity of this claim is further supported by model (5), which introduces interaction terms to study whether the quantitative European integration variables, i.e., intra-EU trade, debt and deficit levels, influence inequality *after* the country adopts a common currency. The interaction terms are significant, which implies that it is because of joining the EMU that the discussed variables changed thus influencing income inequality.

The inflation rate, the final convergence criterion, remains insignificant across the models in Table 2. This could be explained by the Phillips-curve relationship between unemployment and inflation. One possible explanation for this result is that the inclusion of unemployment rate as an explanatory variable was sufficient enough to explain the variation in the Gini coefficient. Since unemployment and inflation are negatively related, the former can capture the effect of the latter in this study.

Let us now analyse what happens to the dummy variables when the additional regressors have been added. Model (1) illustrates that adding intra-EU trade, government deficit and debt as a percentage of GDP, and inflation rates decreases the size of the dummy variable

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MAASTRICHT. The coefficient decreases in absolute terms from -0.214 to -0.003 between models (4; Table 1) and (1; Table 2), remaining statistically significant at the 10 percent level. Hence, the inclusion of additional regressors decreases the influence of the dummy on income inequality. However, the interesting feature of model (1) is the fact that the dummy *MAASTRICHT* remains statistically robust even after the addition of the four regressors. Moreover, signing the Maastricht Treaty seems to decrease the level of economic disparities. This can be explained by the fact that the variable still captures the effect of the Structural and Cohesion Funds on inequality discussed in detail above. Although this may seem to contradict the thesis of this paper, taking into consideration the results of the models (2)-(5) discussed further in this section, the net effect of European integration actually increases income inequality.

Model (2) presents a similar story, with the difference that the integration dummy, *SGPACT*, becomes insignificant. Such a result means that the additional variables fully dissect the effect of economic integration on inequality caused by signing the Stability and Growth Pact. However, the most interesting point is depicted by models (3)-(5); namely, even after adding the four regressors, the dummy *CURRENCY* is statistically robust with a coefficient of 0.218. This indicates that sharing a currency has a strong effect on the Gini coefficient, increasing income inequality.

An explanation of this outcome is offered by the theory of Optimum Currency Areas (OCAs) developed by Mundell in 1961. The main point of controversy on the existing setup of the Eurozone revolves around the fact that economic shocks in Europe are asymmetric due to the inherent heterogeneities of European economies. This prevents the Eurozone from satisfying one of the key OCA criteria, thus suggesting that adopting a common monetary policy was not the best course of action.

Asymmetry of shocks in Europe has been demonstrated by De Grauwe (2009) and Eichengreen (1991). The former supports this argument by analysing the German policy of yearly wage increases by 3 percentage points. He concludes that as a result, the German labour market became more competitive, creating an asymmetry that needed correction. The latter claims that country-specific shocks have bigger effects in Europe than in Canada. He found that the ratio of share prices between Düsseldorf and Paris is five times more volatile than between Montreal and Toronto. As a result, countries in the Eurozone need state-specific policy responses, a requirement which cannot be met by the European Central Bank.

Table 2. Regression results: quantitative specification

Dependent variable: Gini coefficient (x100)

	(1)	(2)	(3)	(4)	(5)
Macroeconomic stability					
Interest rates	0.037 (0.050)	0.045 (0.049)	0.034 (0.050)	0.043 (0.050)	0.042 (0.049)
GDP per capita	0.007 (0.357)	0.005 (0.348)	0.007 (0.348)	0.007 (0.348)	0.006 (0.349)
Social Indicators					
Female Labor Force Participation Rate	-0.201* (0.115)	-0.213* (0.117)	-0.207* (0.117)	-0.203* (0.117)	-0.209* (0.116)
Unemployment rate	0.194*** (0.038)	0.192*** (0.040)	0.184** (0.040)	0.186** (0.041)	0.190** (0.040)
Share of employment in agriculture	0.186 (0.120)	0.132 (0.120)	0.168 (0.121)	0.134 (0.124)	0.146 (0.121)
Educational attainment	-0.054** (0.025)	-0.047* (0.028)	-0.048* (0.028)	-0.049** (0.028)	-0.046** (0.027)
Policy and institutions					
Social Spending as a % of GDP	-0.215*** (0.067)	-0.228*** (0.067)	-0.236*** (0.067)	-0.233*** (0.068)	-0.229*** (0.068)
Labor Union Membership	-0.102*** (0.029)	-0.112*** (0.027)	-0.107*** (0.030)	-0.102*** (0.030)	-0.110*** (0.029)
European Integration: Decomposing the Dummies					
Intra-EU trade	0.007*** (0.001)	0.007*** (0.001)	0.005** (0.002)		0.001 (0.002)
Imports				-0.009 (0.261)	
Exports				0.003*** (0.001)	
Gov. deficit as % of GDP	-0.027* (0.016)	-0.024* (0.014)	-0.028* (0.016)	-0.027* (0.016)	-0.022 (0.016)
Debt as % of GDP	0.011** (0.005)	0.012** (0.005)	0.012** (0.005)	0.014*** (0.005)	0.008* (0.005)

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Inflation rate	0.070 (0.65)	0.067 (0.64)	0.069 (0.65)	0.065 (0.64)	0.071 (0.64)
Maastricht	-0.003* (0.002)				
SGPact		0.001			
Currency			0.218*** (0.023)	0.214*** (0.023)	0.115*** (0.022)
Intra-EU trade * Currency					0.004*** (0.001)
Gov. deficit as % of GDP * Currency					-0.003* (0.002)
Debt as % of GDP * Currency					0.002** (0.001)
		Other			
Trend	-0.123 (0.089)	-0.128 (0.089)	-0.126 (0.090)	-0.123 (0.089)	-0.122 (0.089)
Constant	1.333 (1.320)	1.089 (1.316)	1.110 (1.317)	1.197 (1.376)	1.124 (1.372)
<i>Observations</i>	291	291	291	291	291
<i>R</i> ²	0.527	0.534	0.517	0.521	0.519
F-statistic that country specific effects=0 (<i>p-value</i>)	121.12 0.000	122.22 0.000	122.63 0.000	121.21 0.000	121.36 0.000

Standard errors in brackets

* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

The asymmetry of shocks in itself should not be the reason to abandon a common currency. After all, even successful monetary unions like the United States experience idiosyncratic shocks only in particular states. Irregular disturbances become a problem if there is not enough labour mobility between the regions, which happens to be another OCA criterion violated by the EMU. For instance, if Pennsylvania is hit by a state-specific shock, due to the same language and similar culture, those who become unemployed can easily search for employment in other states. Unfortunately, labour mobility in Europe is only half as large as in the United States (Eichengreen, 1991). Since the countries in the Eurozone differ much more in terms of language and culture than states in the US, the Euroland economies cannot use factor mobility as a mechanism to alleviate the effects of asymmetric shocks.

Is there any insurance mechanism that the Eurozone could set up in order to counteract the consequences of asymmetric shocks? A fiscal union is a straightforward answer. Creating a

community-wide tax and transfer system and coordinating fiscal policy on a European level could be one way forward.

In the context of rising inequality a supranational fiscal body has two *raisons d'être*. Firstly, it would ensure effective transfer of income to the countries hit by adverse asymmetric shocks. Secondly, it would encourage fiscal responsibility. The former entails creating a community-wide taxes and transfers system that would allow the Eurozone countries to pull their resources together. Since the current EU budget is around 1 percent of the EU's GNI and out of that only 35.7 percent is spent on reducing inequalities between regions, fiscal unification would increase the amount of funds available for social cohesion (Milio, 2012). Moreover, a community-wide tax and transfer system could act as an automatic stabilizer in times of asymmetric shocks. That is to say that if the German automotive industry is hit by an adverse shock, the country would automatically receive funds from the common budget, cushioning it from an increase in income inequality. The latter would lay in its power to cut spending and increase taxes, which would decrease the probability of future European debt crises. Since, as found by this study, debt levels are correlated with inequality, a supranational fiscal would not only encourage, but also execute fiscal responsibility. This in turn would stabilize the Eurozone's fiscal stance, decreasing income inequality. That is not to say that national governments should not be completely abolished. Because of their proximity to the citizens, they could facilitate the process of political integration. Moreover, since they understand country-specific needs better than any supranational body, they could be used in the process of diminishing income inequality.

V. CONCLUSION

This paper conducted a panel data analysis on a sample of 17 eurozone countries over the period between 1990 and 2014. It suggests that European Integration contributed to the increase in income gaps in the Eurozone. This result can be explained by the lack of coordination between monetary and fiscal policies at a supranational level. Such an incoordination may result in an inability to counteract asymmetric shocks, which increases inequality levels. Moreover, this work identifies other factors influencing country-specific income gaps. These include educational attainment, female labour force participation, unemployment, social spending, and labour union membership. Finally, using the time-fixed effects approach, the paper demonstrates that apart from policy variables, the global financial crisis exacerbated inequality levels in the Eurozone countries.

One of the ways to decrease income inequality in the Eurozone is to coordinate fiscal and monetary policies at a supranational level. Since the Eurozone is not an Optimum Currency Area, this coordination would cushion the effects of asymmetric shocks on income gaps. One way to achieve this is to establish a supranational fiscal body responsible for a community-wide system of taxes and transfers that would act both as an automatic stabilizer against shocks and an enforcer of fiscal responsibility. It is a controversial step due to the fact that the countries would have to give up their sovereignty to achieve this goal. Nonetheless, some policies should remain in the hands of national governments to decrease income inequality. These include: increasing educational attainment or encouraging women to participate in the labour market. Further research is needed in the area of the practical division of authority between the national governments a supranational fiscal body.

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VII. APPENDIX A**(A1)** Table 1. Countries in the sample

Austria, Belgium, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Portugal, Slovakia, Slovenia, Spain.

(A2) Table 2. Variable definitions and sources

Variable	Definition	Source
<i>Gini coefficient</i>	Measure of income inequality, takes value 0 when the distribution of income in a country is equal and 100 when one individual has all the income in a country. Values taken are after taxes and transfers.	Eurostat
<i>Interest rates</i>	Long-run interest rates	Eurostat
<i>GDP per capita</i>	Gross Domestic Product Purchasing Power Standard per inhabitant	Eurostat
<i>Female Labour Participation Rate</i>	Proportion on women in total employment	Eurostat
<i>Unemployment Rate</i>	Annual average unemployment rate	Eurostat
<i>Share of employment in agriculture</i>	Proportion of people working in agriculture to the total working population	Eurostat
<i>Educational attainment</i>	Percentage of population with upper secondary, post-secondary non-tertiary, first and second stage of tertiary education	Eurostat
<i>Social Spending as a % of GDP</i>	Total Social Expenditure Purchasing Power Standard per inhabitant	Eurostat
<i>Labour Union Membership</i>	Trade Union Density, %	Eurostat
<i>Intra-EU trade</i>	Sum of exports and imports of the country to the rest of the EU	Eurostat
<i>Imports</i>	Imports in million of Euro (total products)	Eurostat
<i>Exports</i>	Exports in million of Euro (total products)	Eurostat

<i>Gov. Deficit as % of GDP</i>	Government deficit as a proportion of GDP	Eurostat
<i>Debt as % of GDP</i>	Government debt as a proportion of GDP	Eurostat
<i>Inflation rate</i>	Annual average rate of change of prices	Eurostat
<i>Maastricht</i>	Time dummy variable for when a country signed the Maastricht Treaty; takes value 1 from the year a country signed the treaty and 0 otherwise.	European Commission
<i>SGPact</i>	Time dummy variable for when a country signed the Stability and Growth Pact; takes value 1 from the year a country signed the Pact and 0 otherwise.	European Commission
<i>Currency</i>	Time dummy variable for when a country adopted the Euro; takes value 1 from the year a country adopted the Euro and 0 otherwise.	European Commission

(A3) Table 3. Summary of descriptive statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
<i>Gini coefficient</i>	29.67364	3.249908	19.1	43.4
<i>Interest rates</i>	5.868202	3.247748	1.5	24.13
<i>GDP per capita</i>	20242.73	10812.19	2700	68400
<i>Female Labour Participation Rate</i>	43.4654	4.466158	32.69	52.67
<i>Unemployment Rate</i>	9.10838	4.545954	1.6	27.5
<i>Share of employment in agriculture</i>	7.075452	4.955182	1.2	23.4
<i>Educational attainment</i>	58.30678	19.1155	14.6	88.5
<i>Social Spending as a % of GDP</i>	22.21011	4.682644	5.8	33
<i>Labour Union Membership</i>	30.37517	17.523	6.41	80.65
<i>Intra-EU trade</i>	934336.34	137017.8	873	803152
<i>Imports</i>	46082.65	66231.62	362	332239

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<i>Exports</i>	47353.69	7356.61	256	470913
<i>Gov. Deficit as % of GDP</i>	-2.833887	3.95641	-32.4	6.9
<i>Debt as % of GDP</i>	57.25254	33.89236	6	174.9
<i>Inflation rate</i>	2.719218	2.275916	-1.7	15.3

(A4) Table 4. Summary of three stages of the European Integration: a timeline for each country in the sample

Country	Maastricht Treaty	Stability and Growth Pact	Euro
Austria	1994	1997	1999
Belgium	1992	1997	1999
Estonia	2004	2005	2011
Finland	1994	1997	1999
France	1992	1997	1999
Germany	1992	1997	1999
Greece	1992	1997	2002
Ireland	1992	1997	1999
Italy	1992	1997	1999
Latvia	2004	2005	2014
Lithuania	2005	2006	2015
Luxembourg	1992	1997	1999
Netherlands	1992	1997	1999
Portugal	1992	1997	1999
Slovakia	2004	2005	2009
Slovenia	2004	2005	2007
Spain	1992	1997	1999

(A5) Table 5. Regression results: time-fixed effects included

Dependent variable: Gini coefficient after taxes and transfers (x100)

	(1)
Interest rates	0.010 (0.051)
GDP per capita	0.003 (0.359)
Female Labor Force Participation Rate	-0.222** (0.116)
Unemployment rate	0.161*** (0.040)
Share of employment in agriculture	0.103 (0.117)
Educational attainment	-0.051** (0.025)
Social Spending as a % of GDP	- 0.261*** (0.076)
Labor Union Membership	-0.051* (0.028)
Currency	0.392** (0.186)
y.1991	0.084 (0.613)
y.1992	0.665 (0.627)
y.1993	0.938 (0.659)
y.1994	1.157 (0.983)
y.1995	2.326* (1.342)

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y.1996	1.751 (1.562)
y.1997	1.081 (0.605)
y.1998	0.964 (0.605)
y.1999	1.107 (0.606)
y.2000	0.787 (0.585)
y.2001	0.802 (0.587)
y.2002	1.321 (0.713)
y.2003	1.254 (0.693)
y.2004	1.427** (0.629)
y.2005	0.924 (0.573)
y.2006	1.865*** (0.578)
y.2007	1.430** (0.578)
y.2008	1.789*** (0.578)
y.2009	1.759*** (0.578)
y.2010	1.472** (0.578)
y.2011	1.513*** (0.578)
y.2012	2.503*** (0.587)

y.2013	2.312*** (0.583)
Constant	1.297 (1.333)
<i>Observations</i>	291
R^2	0.591
F-stat. that time effects=0 (<i>p-value</i>)	1.42 0.0816

Robust standard errors in brackets
 * significant at 10%; ** significant at 5%; ***significant at 1%

(A6) Figure 1. Gini Coefficient of Income Inequality (after taxes and transfers) in the Eurozone countries over time





