



How costly are recessions in terms of inequality?

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Master Dissertation in Economics

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September, 2013

Vita

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Acknowledgements

I would like to thank, in first place, to my father, who argues that the most important bequest a daughter can inherit is a solid academic formation, and to my mother, for all the support she always gave to me, especially during the period in which I was involved in writing this dissertation. This acknowledgement also goes to my grandparents for all the care that they gave to me.

I am also indebted with my two brothers, João Pedro and Rafael, for all the movies and series that I was unable to see with them during these last weekends.

This apologize is also to all my friends and, in particular, I'm thankful to Ângela, Paula, Joana, Joel, Marlene, Alexandre and Manuela for their encouragement in different phases of time during this last year.

Third, I want to thank Ricardo, who was always available to help me, and to Ana Paula Ribeiro and Sandra Silva who, besides supervisors of this work since the first moment, were often my friends.

To my grandfather,

“None of us can thrive in a nation divided between a small number of people receiving an even larger share of the nation’s income and wealth, and everyone else receiving a declining share”
Reich, 2010:15

Abstract

Despite their usual characteristic of a cyclical phenomena featuring economies, recessions and their impacts are extremely difficult, if not impossible, to prevent. In this work we aim at assessing the costs of recessions in terms of inequality.

Inequality may be measured and interpreted in many distinct ways. Here, we refer, essentially, to income inequality. In this context, we review the mechanisms through which recessions impinge on inequality. Among the most relevant mechanisms, we emphasize changes in unemployment, inflation, credit access and wages.

We proceed with an empirical approach focusing on the recent evidence for the European countries, including Portugal. In particular, we study the recent trends in inequality and their correlation with the fluctuations in economic activity through a descriptive analysis. Moreover, we test for the influence of several macroeconomic variables, identified in the literature as being highly cyclical, such as unemployment or the output gap, on disposable income inequality indexes like the Gini Coefficient and the 80/20 earnings ratio. For this purpose, we implement an econometric study based on a panel data set covering several European countries, from 1995 to 2011.

In this framework, since the role played by the government is crucial, we will give special attention on variables capturing public policies aimed at smoothing the impacts of recessions on inequality.

Keywords: recession, unemployment, inequality, government redistributive policies, European Union, descriptive statistical analysis, panel data.

JEL-codes: C33, D31, E32, E24, E64, H24.

Resumo

Embora sejam um fenómeno cíclico recorrente nas economias, as recessões e o seu impacto sobre as economias são extremamente difíceis, se não impossíveis, de prever.

Neste trabalho, pretendemos apurar de que forma as recessões afetam o bem-estar de uma sociedade em termos de desigualdade.

A desigualdade pode ser medida e interpretada de diversas formas. No nosso estudo, referimo-nos essencialmente à desigualdade de rendimentos. Neste contexto, revemos os mecanismos através dos quais a ocorrência de recessões se transmite aos níveis de desigualdade. Entre os mais relevantes, enfatizamos as alterações que possam ocorrer sobre os níveis de desemprego, inflação, acesso a crédito e salários.

Procedemos também a uma abordagem empírica sobre os países da Europa, incluindo Portugal. Em particular, analisamos as tendências recentes nos níveis de desigualdade e tentamos relacioná-las com as flutuações da atividade económica, utilizando para isso uma análise estatística descritiva. Além disso, testamos a influência de variáveis macroeconómicas, identificadas na literatura como fortemente cíclicas, como o desemprego e o hiato do produto, em índices de desigualdade do rendimento disponível – o coeficiente de Gini e o rácio S80/20. Para tal, elaboramos um estudo econométrico utilizando a estimação de dados em painel, com base numa amostra de alguns países da Europa e para o horizonte temporal de 1995 a 2011.

Ainda neste contexto, e uma vez que o papel do Estado se revela crucial, damos especial atenção às variáveis que captam as políticas públicas levadas a cabo para reduzir o impacto das recessões na desigualdade.

Palavras-chave: recessão, desemprego, desigualdade, políticas de redistribuição, União Europeia, análise de estatística descritiva, dados em painel.

Códigos JEL: C33, D31, E32, E24, E64, H24.

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Abbreviations

CEPR	Centre for Economic Policy Research
SILC	Statistic on Income and Living Conditions
ECHP	European Community Household Panel
EU	European Union
GDP	Gross Domestic Product
INE	<i>Instituto Nacional de Estadística</i>
RED	Review of Economic Dynamics
UK	United Kingdom
US	United States
OECD	Organization for Economic Co-Operation and Development
IMF	International Monetary Found
FEM	Fixed Effects Model
REM	Random Effects Model
GMM	General Method of Moments

1. Introduction

The world lives a global financial crisis which began with the 2008 subprime fiasco, in the United States of America (*e.g.*, Reinhart and Rogoff, 2011). Besides the usual determinants characterizing financial crises such as asset price bubbles and negative current accounts, new factors such as a deep financial integration and funding globalization, explain the amplitude and spreading of this crisis (Claessens *et al.*, 2010). European Union (EU) is being particularly affected, currently facing a sovereign debt crisis, most acute in the Southern European countries that are featured by important fragilities associated with structural problems at several levels (Haidar, 2012). According to the Euro Area Business Cycle Dating Committee of the Centre for Economic Policy Research (CEPR), a recession begins just after the economy reaches a peak of activity and ends when the economy reaches its trough and is characterized by *“a significant decline in the level of economic activity, spread across the economy of the euro area, usually visible in two or more consecutive quarters of negative growth in GDP, employment and other measures of aggregate economic activity for the euro area as a whole; and reflecting similar developments in most countries.”* (http://www.cepr.org/press/dating_en.htm, accessed on December 2012).

However, the costs of a recession are not only those attached to these variables and their evolution. Citing Goldman Sachs, *“recessions are like hurricanes - periodic acts of nature with devastating consequences but impossible to prevent”* (Clark, 2011:57). Though, as note Reich (2010:13) *“It is not the multimillionaires who have been hit hardest in the recent economic downturn”*. Indicators such as the rate of unemployment observed for an economy does not give us information on if real income is decreasing for all the unemployed households in the same proportion, or even if unemployment affects overall income distribution. But, certainly, the impact of recessions on these variables is crucial to draw conclusions about the effect of recessions in terms of inequality.

On the one hand, high inequality prevents part of population from having access to a decent life, is positively correlated to several negative social phenomena and can be transformed into persistent inequality (Franzini, 2009). On the other hand, there is the idea that lower inequality can be considered an enemy of economic growth and that *“any large – scale efforts to promote greater equality would violate the rights of*

individuals by taking the market earnings of some order to assist others who have been less successful” (Clark, 2011:74). There are further arguments on the relation between inequality and economic growth, namely that of Fieldstein (1998): according to Pareto principle, an increase in the income of upper-income classes without making anyone else worse off could be good even if it increases inequality. We are aware of the relevance of this controversy; though, we do not propose to assess the optimal level of inequality in the present dissertation. This issue is a normative one and is out of the scope of our work.

In this study we parsimoniously aim at reviewing the main theoretical mechanisms through which recessions affect earnings and income inequality, using measures as Gini Coefficient of disposable income (an average measure) and the S80/20 ratio (a gap measure comparing earnings between the top and bottom quintiles of population) - Section 2. This analysis will be further complemented by records of empirical evidence in the literature, relating the impacts of recent recessions experienced by the European countries, including Portugal, on several dimensions of inequality.

Thus, in Section 3 we analyze the trends in inequality in European countries and we test possible correlations between several business cycle indicators (unemployment, *per capita* growth rate, inflation) and inequality measures, in order to assess if individual countries performance is in line with the other European countries or not. First, we identify recession periods using the deviation approach that identifies recessions with periods of negative output gap (the deviation between the effective and the potential GDP) and cross that information with unemployment, inflation, the S80/20 ratio and the Gini Coefficient. Second, we represent the earnings distribution across quartiles for selected European countries, following the approach by Heathcote *et al.* (2010) for the US. We use data for the longest available period: data on inequality measures from the European Community Household Panel (ECHP) is available only from 1995 onwards and just for some countries.

Irrespectively of the mechanisms through which recessions affect inequality, it is a common place that the intervention of government influences inequality levels. For instance, on inequality and redistribution during the Great Recession, Perri and Steinberg (2012) conclude that, in 2010, taxes and transfers reach the highest levels ever. As a result, although the 20 percent bottom of United States (US) earnings distribution registered a 30 percent fall relative to the median over the course of the

recession, they did not see a significant change in their spending power as measured by disposable income and consumption expenditures of non-durables goods relative to the other groups. Taking this empirical evidence, we cannot ignore the role of the government intervention in smoothing the consumption inequality between the high and low income households, during recession periods.

Following this, still in Section 3, we use the values of median and mean income as measures of inequality (population distribution across incomes is more equal the closer the median is to mean income) to assess if inequality improves/worsens after the intervention of government (essentially through taxes and transfers). From the analysis of the annual changes in this ratio, it is possible to understand if, in face of recession years, the intervention of government corrects more or less the effects on inequality before taxes and transfers.

In Section 4, we use a panel data regression analysis for a sample of European countries to explain inequality dynamics across cycle phases. In this section we present our main results and provide a comparative analysis between them and those expected from the literature, both at theoretical and empirical levels.

To conclude, Section 5 presents the final remarks and limitations to be overcome in future work.

2. On inequality and recessions: a literature review

Some authors advocate that unemployment is the main driving force through which recessions have larger impacts on earnings inequality (Perri and Steinberg, 2012; Agnello and Sousa, 2012; Callan *et al.*, 2010; Nolan, 2009; Johnson and Shipp, 1999). The way how recessions lead to higher levels of earnings inequality through unemployment is consensual for all authors who address this mechanism. In periods of economic downturns, the unemployment rate is expected to rise. To illustrate this situation we have the case of Spain, for instance, that experienced a recession in 1992-1993 and observed subsequently (1991 up to 1995) an increase in the unemployment rate from 15% to 25%. In these years, it was possible to verify an increase in earnings inequality, concentrated in the lower tail of the distribution (Pijoan-Mas and Sánchez-Marcos, 2010).

Perri and Steinberg (2012) argue that the 50/20 ratio rises in all recessions due precisely to the increase in unemployment that induces a fall in the 20th percentile of earnings distribution. Nolan (2009) also refers that the increase in unemployment has a negative impact towards the bottom of the distribution.

Furthermore, if we make the “inverse thinking” as in Agnello and Sousa (2012), we are driven to the same conclusion of Perri and Steinberg (2012). As Agnello and Sousa (2012) refer, during expansions inequality is reduced because unemployment falls and there is a more easy access to the credit from the banking sector. This make possible for the households in the low end of the income distribution to achieve higher living standards thought borrowing. Thinking in the opposite sense, a rise in unemployment and a difficult access to credit push households towards the lower end of the income distribution and living standards, which results in a rise in inequality. Thus, the underlying argument that unemployment increases earnings inequality is that the unemployment rise during a recession is biased towards individuals who are in the bottom of the earnings distribution, namely the low-skilled and the youngest workers. For instance, in a study focusing the specific case of Ireland, Callan *et al.* (2011) show that, during recessions, the most affected by unemployment are the newly employees. In line, Reich (2010) also states that recessions may affect permanently low-skilled workers and the youngest generation.

Krueger *et al.* (2010) also argue that, due to unemployment, the level of inequality in disposable income is larger at the bottom than at the top layers of the income distribution. This can be observed for most of the countries in the sample of this study - Canada, Germany, Italy, Mexico, Russia, Spain, United Kingdom (UK), and the US - with just the exception of Sweden. For the year 2000, considering these nine countries, the level of income inequality measured for the top of the distribution by the 90/50 ratio was, on average, 2.33 while for the bottom, the 50/10 ratio was around 3.

On this issue, Nolan (2009) makes an important observation, saying that it is also important to have in mind that the effect of increasing unemployment depends not only on the individual earnings but also on how those individuals appear concentrated in the same families. Whenever there is a strong concentration of unemployed individuals by family, the impact of increasing unemployment on the earnings of households is much higher comparing with situations where there is a higher dispersion of unemployed by families.

Moreover, unemployment is expected to affect differently inequality in earnings and in wage. Earnings inequality differs from wage inequality because the former is measured as hourly-wage times hours worked and, thus, is more volatile to movements in the dispersion of hours worked; for this reason, during recession periods, earnings inequality increases more rapidly than wage inequality (Krueger *et al.*, 2010). The authors explain that, for all recessions in all countries of their study, what drives earnings at bottom of the distribution to increase sharply during bad times is the *“rise of unemployment which pushes a larger number of individuals to the bottom of the hours and hence – earnings distribution”* (Krueger *et al.*, 2010:8).

In fact, for United States, Perri and Steinberg (2012) show that earnings at the bottom layers fell by more than 30 percent (in real terms) from 2008 to 2010, while for the middle layers the fall in earnings was only of 5 percent; this is because the total hours worked fell by 25 percent in the bottom layers at the distribution.

Furthermore, besides the level of unemployment, we have to take into account how recessions shape the structure of the employed workers. Changes in the employment structure during recession periods are not neutral to wage dispersion because, as Franzini (2009) argues, the increase in wage dispersion is due not only to an increase in

unemployment but also to an increase of workers engaged in atypical forms of work. Such dispersion weakens the potential positive effects on inequality from growing employment, when it exists, and for that reason, there is a case to clarify how recession periods, with decreasing employment levels, affect the structure of employment and the wage dispersion.

To conclude, we have to take into account if changes in levels of unemployment have a transitory or permanent nature. It is not clear the existence of a positive relationship between a rise in unemployment and the increase on inequality measures. Johnson and Shipp (1999) conclude that, since the 1980s in the United States, the unemployment has not significantly affected inequality measures. In this country, from 1982 to 1988, while unemployment fell, inequality continued to increase. Others authors show that this kind of evidence can be explained by the permanent nature assumed for unemployment in the early 1980's because, in this period, the share of unemployment due to the permanent job loss was greater than it was before 1980 (Medoff, 1994; and Perry and Schultze, 1993, in Johnson and Shipp, 1999). The effect of the high rates of unemployment of the early 1980's due their permanent nature did not allow macroeconomic conditions decrease levels of inequality from 1982 to 1988. This also happened in Italy, where, in 2004, and although unemployment had fallen during several years since the 1992 recession, earnings inequality was still above its respective pre-recession level. Once again, the explanation is the permanent nature assumed by the increase in wage inequality that surged during the 1992 recession (Krueger *et al.*, 2010).

Certainly, permanent levels of unemployment can be transmitted to permanent levels of earnings inequality, which means that levels of inequality that result from downturn periods can become permanent, unless for some deciles of the earnings distribution. This is the case for the 10th percentile of the earning distribution in the United States that in 2005 earned no more than in 1970 (Heathcote *et al.*, 2010).

Credit constraints are among the other mechanisms through which recessions may exacerbate income inequality (Agnello and Sousa, 2012). During recessions, smaller increases in consumption inequality relative to those in disposable income result because, as above mentioned, the increase in inequality that occur during recession is

mostly due to increases in unemployment. But, since an increase in unemployment is a transitory shock, only partial effects on consumption inequality are to be expected.

Krueger *et al.* (2010) find evidence that agents' rationally insure themselves against income shocks since disposable income inequality grows faster than consumption inequality over the life cycle for all the countries in their sample except Mexico. This reminds us the importance of the different behavior that agents adopt when they face transitory or permanent shocks.

Also, Pastor and Serrano (2008) are quite critical of the analysis assessing inequality between countries that only consider a given period of time, arguing that a complete evaluation of the inequality between households cannot be made if we not consider the whole of their life cycle because it is total income obtained in the household whole entire life that determines its actions more than just the income of one year. Hence, a more complete picture of inequality among countries is given when inequality and convergence among countries are analyzed using a life-cycle perspective.

Whereas households can smooth their earnings against transitory shocks by borrowing, saving or receiving public transfers, the latter effects on consumption inequality can, however, be amplified if credit constraints are binding.

During recessions, and in particular during severe crisis episodes like the Great Depression or the recent 2007-8 crisis, we expect growing constraints to credit access, which are more pronounced for households that have lower incomes. This is so because, during recessions, default risk rises and, usually, collaterals lose value. Thus, the banking sector rations the amount of loans while increasing the interest rate spread and thus, makes a selective choice towards less riskier/wealthier households. However, Iacovello (2008) does not see the easiness/difficulty in credit access as a driving force to decrease/increase inequality. Conversely, and in spite of household's debt moving inversely with economic activity in cyclical frequencies, the author concludes that households' debt dynamics follow the trend of earnings inequality for long-run frequencies. Thus, he concludes for the reverse causality that income inequality is the cause of debt increases.

Other mechanism capable of explaining why recessions impinge on inequality is the low wages in public and private sector. Calan *et al.* (2010) detect that a reduction in

public sector pay through pension levy and wage cuts – most likely to occur during recessions – has a larger impact on top half and most strongly on top deciles of income distribution, because public employees are located in middle-upper part of income distribution and pension levy and wage cuts are structured in progressive way. Moreover, public earnings dynamics are usually passed on to the private sector. According to this argument, recessions are expected to reduce income inequality.

Another important role to account for is associated with inflation. Examining the impact of this macroeconomic variable, the conclusion could be that inflation reduces income inequality (Johnson and Shipp, 1999). In their study for the period 1980-1994 in the US, they show that a decrease in inflation during the 1980s was associated with an increase in inequality. The way how these variables are correlated is explained by the transfer of wealth that occurs from the creditors (that have higher incomes) to debtors when the level of prices increases and consequently, the initial debt loses value. They refer, also, the importance of inflation to the households in the lower income groups that are more likely to receive transfers. If transfers do not rise as quickly as average wages, inflation level becomes detrimental for these groups. In a recessive environment, we expect a fall in inflation and, consequently, there is a redistribution of income in favor of creditors, increasing inequality. However, when recessions are driven by cost-push shocks, inflation is expected to increase, thereby reducing income inequality.

Concerning to inflation and according Kuznets model, there is advantage of maintaining price stability under income equality. Bulir (2001) augments the Kuznets Hypothesis¹ defending that *“past inflation affects current levels of income inequality as measured by Gini Coefficient”* (Bulir, 2011:140) but the other important conclusion is that *“effects of price stabilization on income distribution are nonlinear – countries with inflation below 5 percent a year seem to benefit less than countries with inflation between 5 percent and 40 percent”* (Bulir, 2011:154). Nevertheless, it is questionable if in our work we can see clearly the effect of inflation on inequality indexes, once that Europe has a price stabilization policy. This is refereed in Bulir (2001) ’s paper where he concludes that only in Europe the other variables used in his model have significantly stronger effects than inflation.

¹ Postulated by Kuznets in 1955, this hypothesis say that exists a nonlinear relationship between a measure of income distribution and the level of economic development.

Moreover, a comprehensive study on the relationship between recessions and inequality requires also the analysis of the long-run (structural) trends beyond the business cycle. Technological change and the way economic agents incorporate new technologies (Barlevy and Tsiddon, 2006) as well as the way product cycle changes due to globalization (Zhu, 2004) may not be neutral for the impacts of recessions on inequality. Moreover, long-run determinants may enable the understanding on why the economies face different levels of inequality; this is also important as impacts of recessions on inequality may also be related to the existent level of inequality previous to the downturn.

Barlevy and Tsiddon (2006) argue that long-run trends in earnings inequality may be important for understanding how cyclical fluctuations ultimately influence earnings' distribution. Trends in inequality are driven by the dynamics of the rate at which different agents absorb technology changes: when a technology change occurs, an increase in earnings is expected for those who are more apt to incorporate the new technology, enlarging the earnings gap relatively to those that adjust slower to technology changes. As more workers adjust to the technology shift (technology becomes more widespread), trend inequality falls. The argument that recessions amplify the trend in inequality operates here through the incentives of pro-cyclical real wage. During recessions, the fall in real wages means that the cost of opportunity of learning the new technology is lower – thus, skill accumulation is more concentrated in periods of low productivity. When trend inequality is rising, more able workers have even more incentives to accumulate skills; in periods where the trend inequality falls, the less able workers catch up more quickly with those who have already adopted the new technology. Thus, *“recession should contribute more to raising inequality when inequality is rising over the long run than when it is falling”* (Barlevy and Tsiddon, 2006: 63).

Barlevy and Tsiddon (2006) analyze the prediction that the downturns are associated with more rapid growth in inequality in periods of rising inequality and with more rapid reductions in inequality in periods of falling inequality by looking at the US economy, over the past century: between the early 1900s and the late 1920s there was an increase in the measures of inequality; from the late 1920s to the early 1950s there was a decline in these measures and, finally, a resurgence in earnings inequality started from the late

1960s and persisted until, at least, the end of the 20th century. Beginning with the period of declining inequality, between 1929 and 1932 the share of economic income of the top 1% declined at a rate of 0.53% per year and between 1937 and 1938 this share fell 1.46% per year. So, the decrease in earnings inequality was concentrated in the Great Recession and in the recession of 1937, the periods of most rapid decline in earnings inequality when we consider the period from 1920 to 1950. Looking for two periods of increasing inequality, the pre-War era and post-War eras, we have that contractions were associated with faster growth in the share of the top 1%, increasing the earnings inequality. So, the same measure that appears to fall during the Great Depression rises in the most recent recessions.

Reich (2010) also refers the emergence of new technology as a mechanism with an important role in explaining inequality in America. He states that the structural inequality problem of America began with the emergence of a wave of new technologies in the 1970s, in which the income of most workers flattened or dropped, while the income of well-connected graduates of prestigious colleges and MBA programs increased.

Besides technology, other structural features may determine different levels of existing inequality. Krueger *et al.* (2010), in a study covering 9 developed countries, refer that larger wage disparity is expected in countries where the institutional framework of labor markets is more flexible: Canada and US have a variance of hourly wage of 0.45 while Spain, Italy and Germany have half this value.

Krueger *et al.* (2010) show that for the year of 2000, the levels of gender, experience and college premium are not very different across the countries of the study. For instance, gender premium on wages (the average wage of men relative to the average wage of women) is very similar in most of the countries they analyze: between 1.2 and 1.4, with the exception of Spain and Italy that have a smaller gender premium and Russia that have a gender premium of 1.49. This analysis can be adapted to the college premium (ratio between the average hourly wage of college graduates and the average hourly wage of high-school graduates) that is between 1.4 and 1.6 across all European countries and the experience premium (ratio between the average hourly wage of those

with 45-55 years old and the average hourly wage of those with 25-35 years old) that is between 1.3 and 1.4 in most countries.

As above mentioned, since inequality in disposable income during a recession rises less than inequality in earnings (Krueger *et al.*, 2010), the analysis of the role of government policies during recession regarding income and consumption inequality is in order.

In recession periods, inequality in disposable income rises less than inequality in earnings mostly due to the action of fiscal automatic stabilizers. Moreover, this role is not in the same proportion in all countries.

In fact, inequality in earnings and in consumption is quite different across countries due, to a large extent, to government policies. Nevertheless, there are other explanations like the fact that the richest people accumulate positive financial assets over time that could be transferred under the form of credit to the poorer, decreasing the inequality in consumption as private assistance flows (Iacovello, 2008).

In this regard, some authors as Agnello and Sousa (2012) argue that the intervention of the government is not capable *per se* to affect income inequality. This conclusion is based on their study for 62 OECD and Non OECD countries, for the period 1980 to 2006, in which they do not find a significant effect of government size on income inequality. This conclusion may challenge the importance of redistributive fiscal policy.

Nolan (2009) notices that the level of social insurance and means-tested pensions are crucial to assess the impact of an increase in unemployment on income distribution. In particular, Nolan (2009) finds a negative relationship between inequality and social welfare spending on the basis that “*low spenders generally have high levels of income inequality and vice-versa*” (Nolan, 2009: 497); however, the author argues that variations in social spending alone are not enough to explain why the ranking of the countries in terms of inequality and higher social spending does not guarantee *per se* low inequality. He argues that in order to account for the observed pattern, it is also necessary to include the role of education, training and the way labor market is structured and interacts with social protection and institutions.

In turn, Perri and Steinberg (2012) and Krueger *et al.* (2010) conclude that consumption inequality does not follow the trend of income/earnings inequality due, precisely, to government intervention. For United States, while earnings for the bottom 20 percent of

households fell dramatically over the Great Recession, which is notorious by the increase in the 50/20 ratio from around 2.7 in 2007 to 3.3 in 2009, disposable income in the same group was virtually constant around 1.8 (Perri and Steinberg, 2012).

Also, Krueger *et al.* (2010) conclude that, with the exception of Sweden, in the 8 other countries in their study, in average, inequality in disposable income is higher than inequality in consumption.

Instead, covering for the period of 1980-1994 in the United States, Johnson and Shipp (1999) conclude that the trends in the distribution of income and consumption were similar and, thus, given that consumption is a good measure of permanent income, it follows that changes in income inequality may not be due to transitory changes. This can be explained by the fact that the quantitative impact of automatic stabilizers in US is smaller when compared with other countries like Canada or Germany, for instance (Krueger *et al.*, 2010).

In order to summarize the above-described mechanisms through which recessions can smooth or amplify inequality in its different dimensions (income, earnings and consumption), Table 1 provides the identification of the mechanism with the authors that have referred to it, either in the empirical or theoretical papers just reviewed.

Table 1: Main mechanisms on the relationship between recession and inequality

Mechanism	Authors (year)
Unemployment	Perri and Steinberg (2012), Agnello and Sousa (2012), Callan <i>et al.</i> (2010), Pijoan-Mas and Sánchez-Marcos (2010), Krueger <i>et al...</i> (2010), Nolan (2009), Johnson and Shipp (1999).
Inflation	Johnson and Shipp (1999), Bulir (2001).
Credit Constraints	Agnello and Sousa (2012), Iacovello (2008).
Wages and inequality	Callan <i>et al.</i> (2010), Franzini (2009).
Long-run trends / Technological changes	Reich (2010), Pastor and Serrano (2008), Barlevy and Tsiddon (2006).
Government intervention	Agnello and Sousa (2012), Perri and Steinberg (2012), Krueger <i>et al.</i> (2010), Nolan (2009), Johnson and Shipp (1999).

In light of the review of the mechanisms through which recessions impinge on inequality, we propose to analyze the trends of inequality in European countries and verify if these mechanisms are most notorious in recession periods than in expansion periods. Accordingly, in the next section we aim at assessing if and how (through which mechanisms) recessions have shaped the trends in inequality in Europe, highlighting the case of Portugal.

3. Recessions and inequality in Europe: a descriptive analysis

3.1. Methodology

After reviewing some evidence presented in the literature on the link between recessions and inequality in the US and in several European countries in the previous chapter, we now propose a comprehensive study on if and how recessions have shaped the inequality trends for a set of European countries and for Europe, on average.

First, we identify recession periods following the so-called deviation approach that extracts output gap (deviation between the effective and the potential GDP) through a de-trending method applied to gross output (*e.g.*, Hodrick-Prescott (HP) filter). For this purpose, we gathered the estimates of the output gap for several countries, since 1995 up to 2011, from *the International Monetary Fund, World Economic Outlook Database, October 2012* (<http://www.imf.org>, accessed in 28/02/2013). Recession years are characterized by negative output gaps.

After identifying the recession periods, we use this information to represent the relation between cycles and inequality. By depicting the Gini coefficient trend together with the recession periods, we are able to enlighten the evolution of inequality when countries are going through recession periods. With this procedure we aim at getting more evidence that will allow us to further explore which macroeconomic mechanisms are mostly operating in the link recessions-inequality. Annual data on the Gini coefficient is available in the ECHP, although only for the period 1995-2011, with several missing data for some countries.

To further support the evidence on income distribution, we will also use information on the S80/20 ratio and on income distribution across quartiles. The choice of quartiles instead of percentiles was due to lot of missing data for the percentiles in ECHP. We represent the behavior of each quartile in a logarithm form of basis 100, relative to the basis year of 1995. Starting in 1995, we calculate the growth rate of income in each quartile and plot the dynamics of the quartiles across time.

In order to understand the macro mechanisms at play in the link recessions - inequality, it is essential to analyze the behavior of inequality across cycle fluctuations for several European countries. Only with such an exercise it will be possible to understand if we

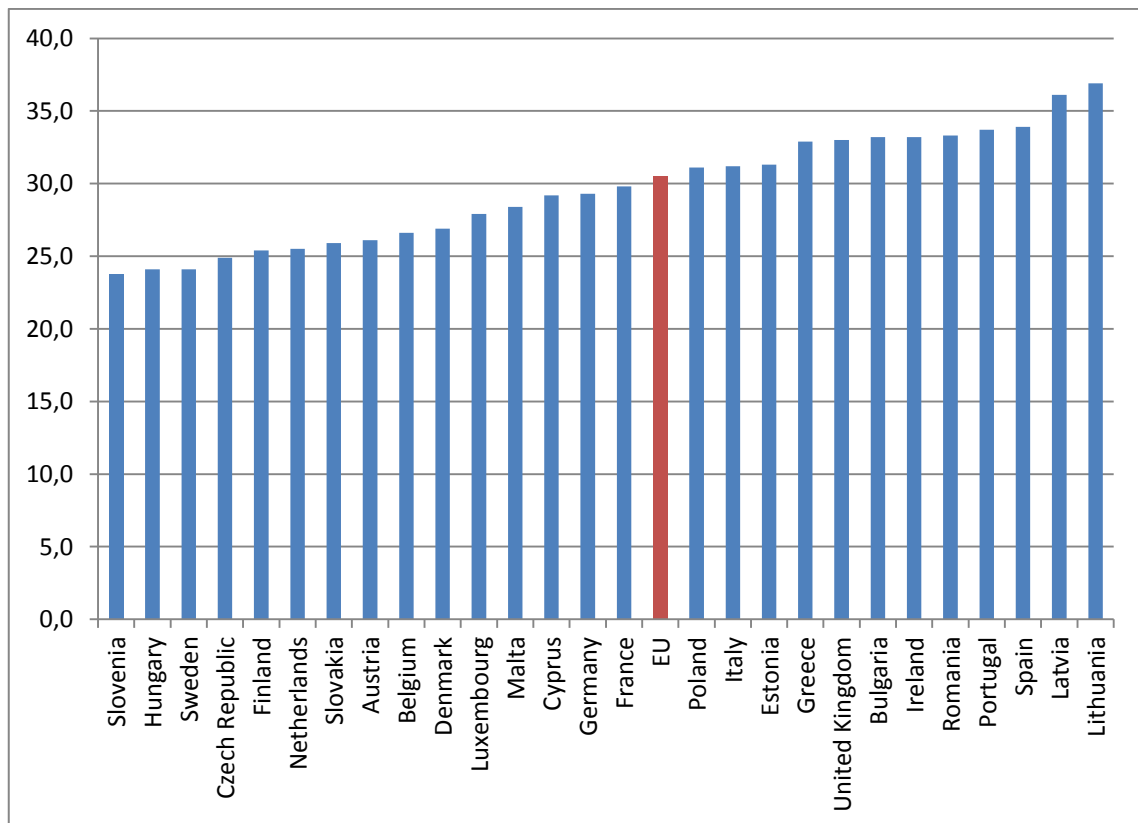
can address the issue of inequality for Europe as a whole just based on the pattern seen in Figure 1, or if very different realities are operating beneath the average behavior, namely determined by different dynamics across cycle phases.

Franzini (2009) defends the existence of advantages in treating Europe as a whole when the goal of analysis is to control inequality. The author starts by referring that distances between European countries have a significant magnitude, as the division between Northern and Mediterranean countries show: the first group has a Gini coefficient on disposable income of 0.23, while the second one exhibits a higher value, around 0.3. Nevertheless, the author also mentions that for almost European countries, economic inequality has been worsening in the last 25 years, making Europe to currently exhibit a high level of inequality.

Bearing this last evidence in mind, we want to analyze if the behavior of inequality indexes observed in different European countries across recession periods is similar or if inequality measures show different adjustment patterns across cycle phases. Moreover, we want to analyze if inequality shifts due to cycle effects exhibit persistence. About the same Arestis *et al.* (2011: 6) say that *“if substantial and sustained inequalities remain between countries around the world, it is also the case that there are substantial disparities in income within countries and that these disparities have also had a tendency to persist.”*

Our conviction is that, since Europe reveals very different values for inequality indicators across countries (see Figure 1), treating all these distinct realities in one block seems to be an oversimplified approach, despite the arguments of some studies such as Franzini (2009).

Figure 1: Gini coefficient in Europe, 2010



Source: SILC-EHCP (<http://epp.eurostat.ec.europa.eu>, accessed in 17/01/2013)

Figure 1 depicts the Gini coefficient for the 27 EU member countries in 2010. It is notorious the dispersion between European countries in what concerns inequality. We have, as Franzini (2009) refers, some Mediterranean countries like Portugal, Spain and Greece with the highest levels of inequality, clearly above the EU average, and some Northern countries like Sweden, Finland and Netherlands with the lowest values for this coefficient, far below the EU average.

Since inequality levels have increased in Europe for the last 25 years (*e.g.*, Franzini, 2009), and the current high level (30.5) observed for the EU average in 2010 is associated with a significant dispersion across countries (Figure 1), we now propose the following: to assess how business cycle phases, namely recessions, are related with the evolution of inequality in different European countries, through using a statistical descriptive analysis and confronting the results with those provided by the related literature. In this context, for a sample of countries, we propose to plot the evolution of several inequality measures - namely the Gini coefficient, the S80/20 ratio and the quartiles of disposable income - together with that of typical cycle variables - namely

inflation and unemployment rates - from 1995 to 2011. We also identify recession years as those observing an output gap below zero (shaded bar areas in the subsequent figures), following the definition and data from the *IMF World Economic Outlook*. Data on inequality measures were taken from the Statistics on Income and Living Conditions from European Community of Household Panel (SILC-ECHP) database and the quartiles are not available for all countries. Moreover, for almost all countries, we have some point data missing for the inequality measures; thus we use a trend function based on available values for most of the years to estimate the missing values. Data from unemployment and inflation were taken from *IMF World Economic Outlook*.

We select countries for this detailed analysis, relying both on literature and on the dispersion evidenced in Figure 1. We include a group of Nordic countries – Sweden, Netherlands and Finland - as they are among those countries exhibiting the lowest Gini coefficients in the EU and where, according to several pieces of literature, redistributive policies have a large importance. In contrast, Mediterranean countries, such as Portugal and Spain, exhibit among the largest values for Gini coefficients in the EU and for which redistributive policies appear to be less effective. Belgium and the UK are also analyzed as intermediate cases, exhibiting, respectively, higher and lower income dispersion when compared to the Nordic and the Mediterranean countries. Finally, Italy and Germany are also chosen as they represent income dispersion close to the EU average.

3.2. Results

We begin this statistical analysis with the countries of our sample that present the lowest levels of income inequality (as measured by the Gini coefficient). One of these countries is Sweden.

Domeij and Floden (2010) study the Swedish case, identifying the year 1990 as a recession period for this country. During this recession, although both unemployment and gross earnings inequality increased, the deviation between earnings after redistributive policy have remained rather stable, showing the relevant role of government through the implementation of taxes and transfers. In this case, the authors argue that inequality has increased at the same pace across the whole distribution, which means that higher unemployment does not necessarily lead to higher inequality.

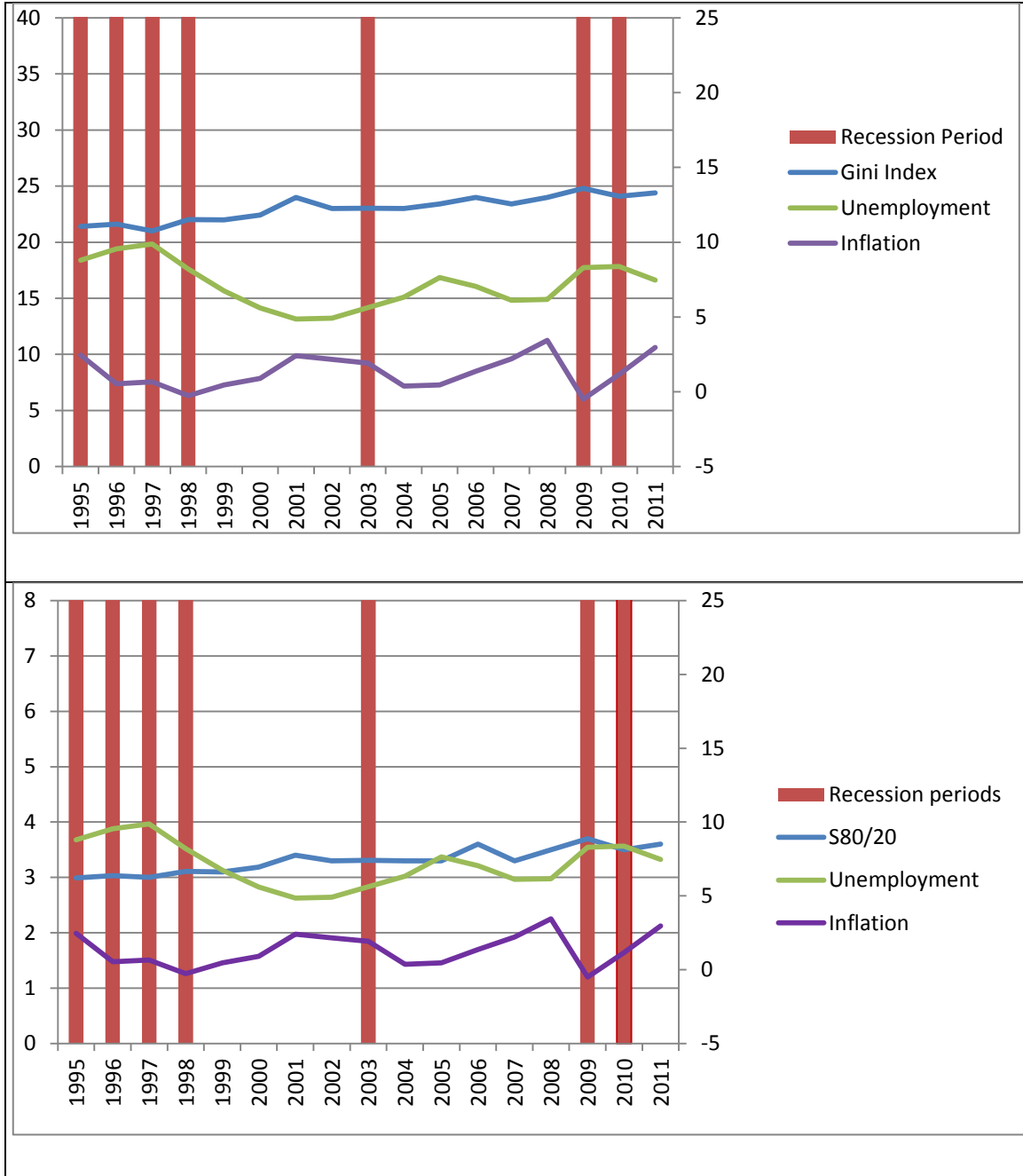
In order to investigate for a potentially significant government role in the inequality evolution for the Swedish case, we also test if data in our sample makes the argumentation in Domeij and Floden (2010) robust for alternative inequality measures and more recent recession periods.

From Figure 2 it is possible to analyze the evolution of unemployment rate and inflation. In fact, during recessions, they are negatively correlated in Sweden, which seems to suggest that the depicted recessions have been, in general, motivated by demand-side shocks. For the period between 1995 and 1998, identified as recession years, data shows that the Gini coefficient remained at low levels in Sweden (between 20 and 25). For 2009 (most evident) and 2010 the Gini coefficient increased. This evidence, regarding the first recession period, seems to support that, for this country, recession periods are not automatically associated with higher levels of disposable income inequality. It is possible to confirm (Figure 2) that the Gini coefficient remained at low levels: even when unemployment reached 9.8% in the first recession period (1995-98), it seems that the government was successful in mitigating the impact of higher unemployment on inequality income levels. Hence, unemployment does not seem to be an important determinant of increases in inequality levels in countries as Sweden, since the role of stabilization played by the government seems to be quite strong.

It is interesting to confirm that the S80/20 ratio also does not seem to be responsive in recession years. In Figure 2 it is clear the evidence documented by Domeij and Floden (2010). In fact, for the period 1995 up to 1998, the S80/20 ratio is rather stable, which means that the ratio between the earnings received by the 20% of the population that receives more – top quintile and the 20% of the population that receives less – bottom quintile, does not significantly change during recession years. At a first glance, we could argue that, if inequality is equally transmitting to the difference between income levels of households at the top and at the bottom of the distribution, the government has an important role in smoothing the unemployment effect on income inequality. This may suggest that, for Sweden, automatic stabilizers are working efficiently, smoothing the negative impact of recession periods on income inequality. As we referred early, the very stable behavior of the S80/20 ratio is clearer in the first recession period; in 2009 there is an increase in the ratio, which reaches its highest value for the whole period

under analysis (3.7). Despite that, in 2010 the ratio registers a fall, which may reveal a lagged effect of government's intervention.

Figure 2: Recessions, Gini coefficient, S80/20, unemployment and inflation - Sweden, 1995 - 2011



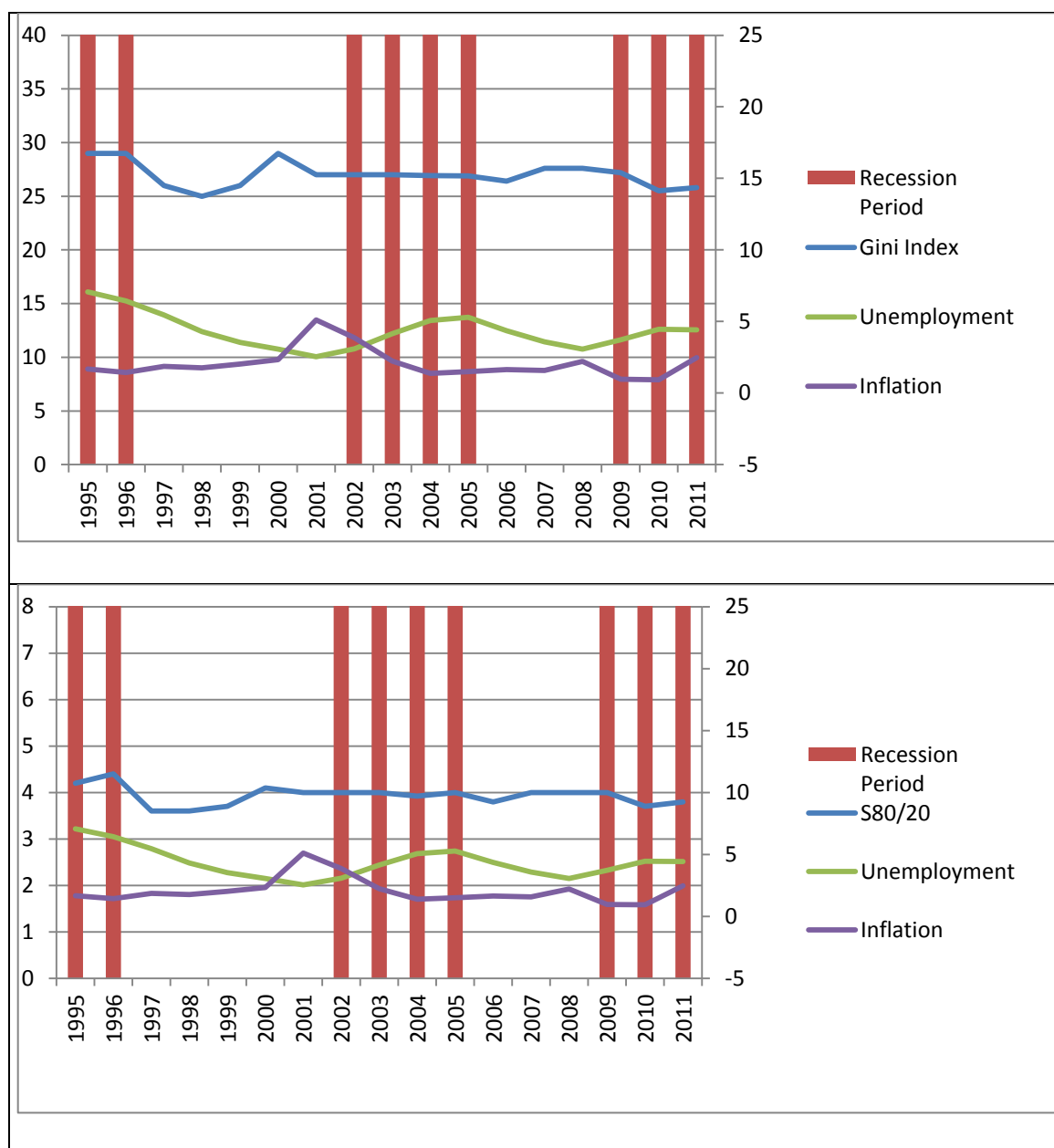
Source: Recession periods are identified from the IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013. Gini Index and S80/20 were taken from SILC-ECHP, accessed in 27/02/2013 (left-hand scale). Unemployment and inflation rates are from IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013 (right-hand scale).

This evidence also seems to be in line with Krueger *et al.* (2010). This study identifies Sweden as the only exception in a large sample of countries since it does not observe a set of facts that are common to the rest of the sample: the level of inequality in disposable income is larger at the bottom than at the top of the distribution, the level of inequality in disposable income is larger than inequality in consumption and long-run changes in disposable income inequality is larger at the bottom than at the top of the distribution.

Concerning inflation, we have from the related literature that inflation reduces income inequality. In our analysis we see that this variable reached its lowest value in 2009 and, for the same year, the Gini coefficient reached its highest figure. This is in line with the idea that in a recession period with a fall in inflation there is an increase in inequality (because there is redistribution in favor of creditors). However, in this case, the evolution of these variables does not affect, in demarked way the levels of disposable income inequality.

Since Sweden is a very peculiar case even among the Northern European countries, we will analyze other countries in the North of Europe in order to have a more complete picture about these countries. Hence, we implement the same type of analysis for the Netherlands and, in Figure 3 we represent the recession periods, the Gini coefficient, the S80/20 ratio and the quartiles for this country, over the period 1995-2011.

Figure 3: Recessions, Gini coefficient, S80/20, unemployment and inflation - Netherlands, 1995 - 2011



Source: Recession periods are identified from the IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013. Gini Index and S80/20 were taken from SILC-ECHP, accessed in 27/02/2013 (left-handscale). Unemployment and inflation rates are from IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013 (right-handscale).

From Figure 3, it is difficult to identify a clear relationship between the recession periods and the evolution of the Gini coefficient. The highest level of this indicator was observed in 2000, which corresponds to a period of expansion. For the recession periods, 1995-96 and 2002-05, the Gini coefficient remained rather stable, whereas in the recession 2009-11, it decreased. Again, for the last two recession periods, inflation

falls while unemployment increases, characterizing negative demand-side shocks. Hence, also the Netherlands does not seem to follow the more standard behavior regarding the link recessions-inequality. In fact, during periods of recession, the Gini coefficient has been stable or decreasing.

A similar conclusion results from the analysis of the S80/20 ratio, also represented in Figure 3. It is possible to see, that with the exception of 1996, year in which the ratio increased, the ratio is decreasing or remained stable in recession periods. This fact seems to show that recessions do not have a direct effect on income inequality. It seems that, although the unemployment rate increases in recession periods (except for the first recession period of 1995-1996), the Gini coefficient and the 80/20 ratio do not increase, which, like in Sweden, may point to the importance and effectiveness of government policy in this country.

Regarding the evolution of inflation, if we look, for example, for the recession period 2002-05, we see that after reaching its highest value in 2001, inflation starts decreasing until 2005. If prices are lower, it will be expected a transfer of wealth from debtors to creditors and an increase in income inequality. But this does not seem to occur in the Netherlands since, for the referred period, both Gini coefficient and the S80/20 ratio do not suffer significant variations.

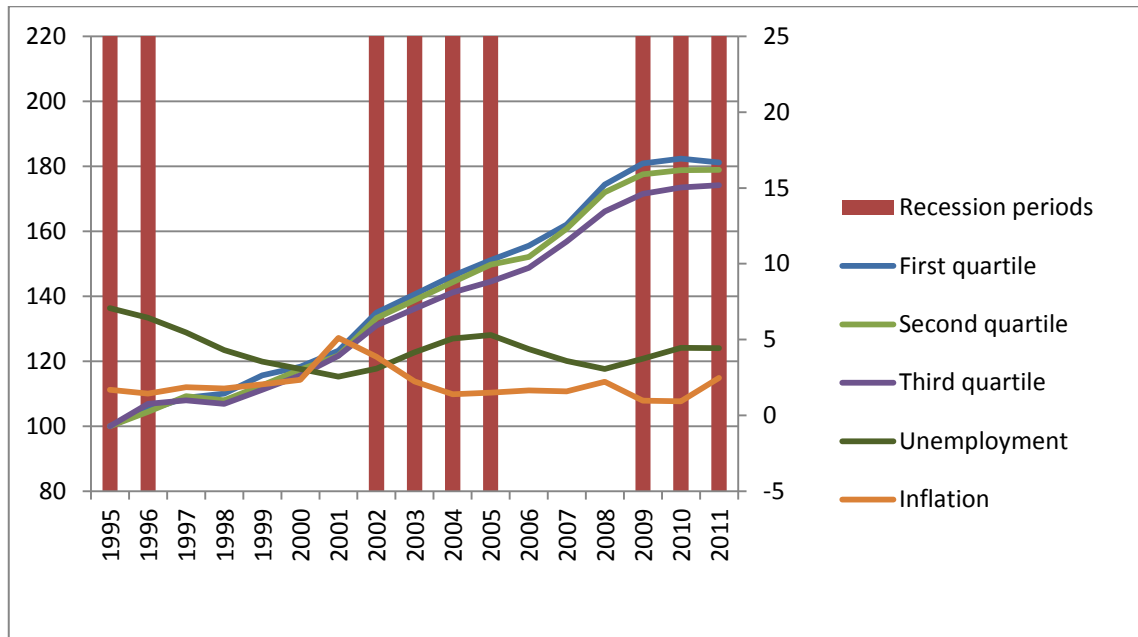
To complete our analysis for the Netherlands, we represent, in the next figure, the recession periods, the trends associated with quartiles of disposable income and the evolution of inflation and unemployment.¹

We use now this information, making a transformation of the absolute values of each quartile. In each year, we compute a growth rate relatively to 1995 (that we consider as a base year) and show the evolution of income distribution for each quartile of income, using the logarithm of basis 100 (Figure 5).² In this case, in our interpretation we cannot see the distance between the quartiles as dispersion or biggest inequality.

¹We did not use this representation for Sweden because there was a large amount of missing data.

²We have the evolution of the values for each quartile of disposable income relative to those in the year of 1995. The values should be read as increasing or decreasing compared to 1995. As such, values for quartiles may cross each other.

Figure 4: Recessions, quartiles of disposable income, inflation and unemployment - Netherlands, 1995-2011



Source: Recession periods are identified from the IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013. Quartiles of disposable income were taken from SILC-ECHP, accessed in 27/02/2013 (left-handscale). Unemployment and inflation rates are from IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013 (right-handscale).

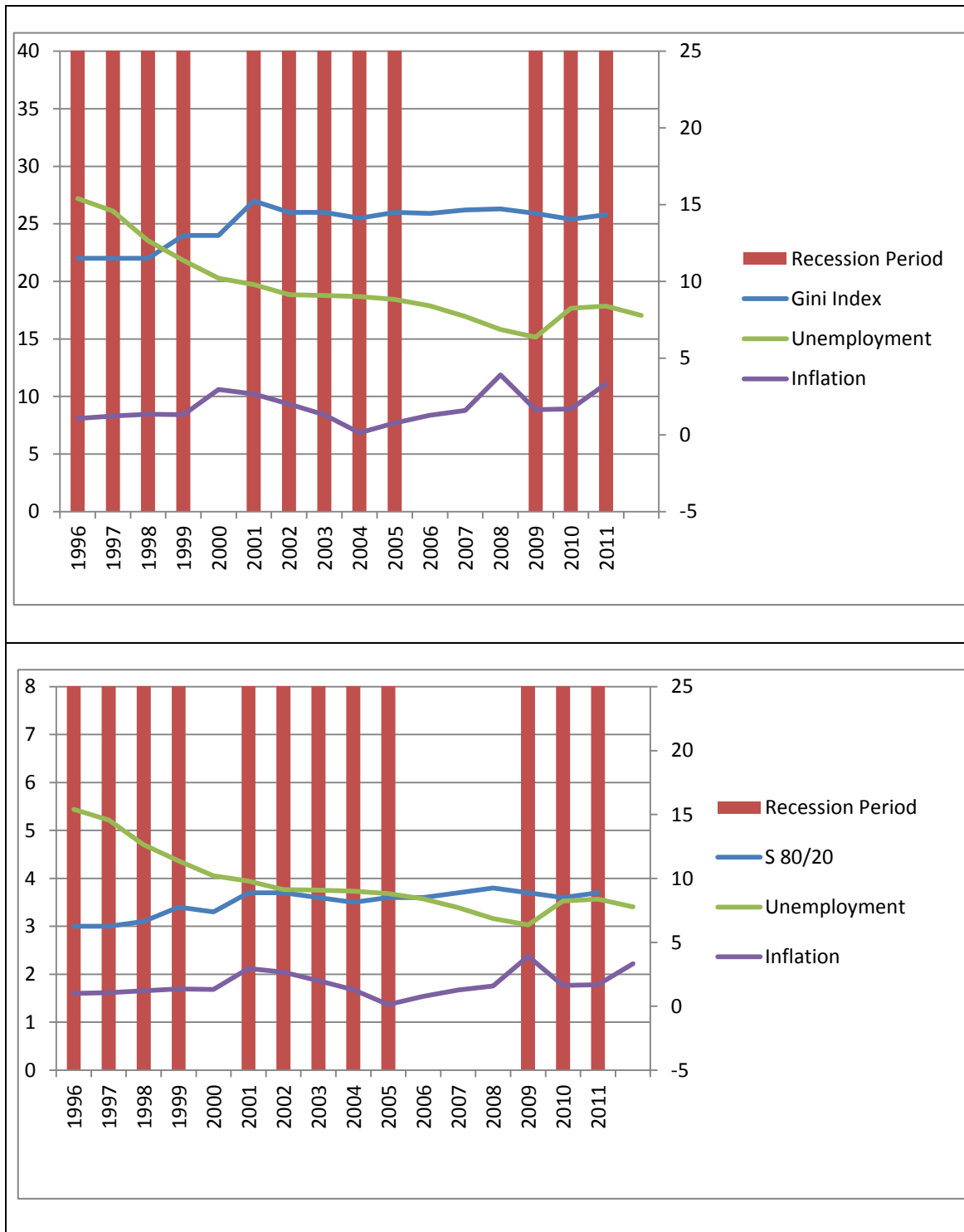
For the period under analysis, we see that using 1995 as base year, disposable income is rising along the period because we see an increase for the three quartiles until 2011. Moreover, from 1995 onwards, there is a reduction in disposable income dispersion as the income for the first and second quartiles increased, by more, than that of the 25% richest. Apparently, during recession period 2002-05, there was a reduction in income dispersion, while during the period 2009-11, dispersion became larger along with a fall in the disposable income of the bottom 25%. During the last recession period, unemployment increased in 2009-10 and inflation followed in 2010-11: on the one hand, unemployment typically affects the low-productivity workers and social benefits are rather rigid in nominal terms. Also, during the expansionary periods, we can figure that dispersion increases because the income of the top 25% increases by more than that of the poorest; but this can also be a lagged effect resulting from the large increase in unemployment observed through 2003-2005. This is why the Gini coefficient increased during the periods of expansion.

Until now, through the analysis of the Northern countries, we have a common point: it seems that recessions do not, necessarily, lead to higher levels of inequality. However,

while Sweden shows, relatively stable, low levels of inequality, the Netherlands exhibits much more volatility in inequality measures.

Finally, we proceed with the analysis of the last Northern European country of our sample - Finland. Comparatively, this country has experienced recession over much more periods during the time span between 1995 and 2011. Despite the increase observed in the Gini coefficient in 1999 and 2001, afterwards the indicator did not vary in a significant way. Regarding the whole period, the level of inequality has increased similarly to what happened in Sweden, and in line with Franzini (2009), on the worsening of inequality in the last years (see Figure 5).

Figure 5: Recessions, Gini coefficient, S80/20, unemployment and inflation - Finland, 1995 - 2011



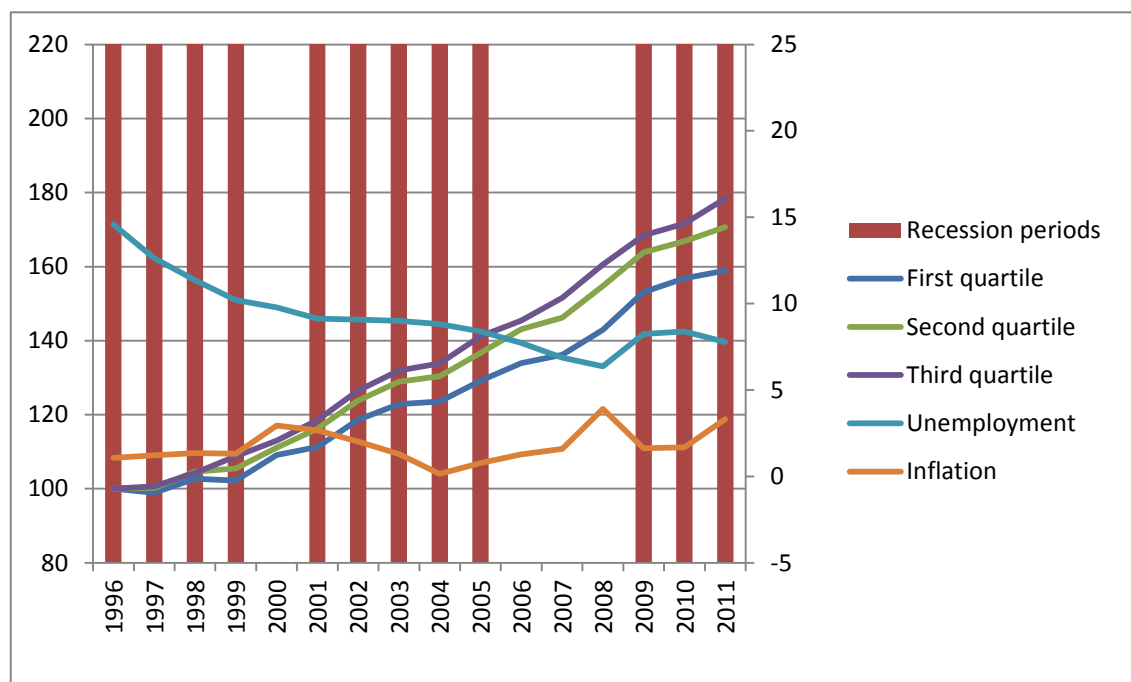
Source: Recession periods are identified from the IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013. Gini Index and S80/20 were taken from SILC-ECHP, accessed in 27/02/2013 (left-handscale). Unemployment and inflation rates are from IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013 (right-handscale).

There is no clear association between recession years and increase in inequality. In the first recession period (1996-99), there is an increase in both Gini coefficient and S80/20 ratio in the last year, but in the following recession period (2001-05), there is no evidence of increase in any of these inequality measures. On the contrary, what we see is a decrease or maintenance of these values. The same applies to the last recession period (2009-11) in focus.

In what regards unemployment, this variable has decreased since 1996, reaching a low value in 2009 and just observing a slight increase during the recent international crisis. However, the Gini coefficient presents nowadays higher levels than in 1996, and the same happens with S80/20 ratio. Inflation remains between 0 and 4 percent and its behavior does not present any significant variation, in opposition to what happened with unemployment. Apparently, and given the decreasing path in the unemployment rate, income dispersion increase exhibits a larger correlation with inflation than with unemployment (see Figure 5).

Moreover, during this 16-year period, there was an increase in disposable income and, at the same time, the dispersion between quartiles increased, particularly during the latter recession period (Figure 6).

Figure 6: Recessions, quartiles of disposable income, unemployment and inflation - Finland, 1996-2011³



Source: Recession periods are identified from the IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013. Quartiles of disposable income were taken from SILC-ECHP, accessed in 27/02/2013 (left-handscale). Unemployment and inflation rates are from IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013 (right-handscale).

From Figure 6, and similarly to what occurred in the Netherlands, we observe an increase in disposable income for the three quartiles throughout the period but, instead, disposable income dispersion has substantially increased, especially in the last recession period (2009-11). Indeed, and especially during the last recession, income growth of the 25% poorest was smaller than that of the higher quartiles, and it also slowed down for the second quartile relatively to the top 25%. Once again, higher inflation rates appear to be correlated with (persistent) increases in income dispersion across quartiles (see Figure 6).

Once again, and for concluding the analysis of Northern countries in our sample, we see that measures of inequality are not directly related with indicators of recession. In Finland, the Gini coefficient and the S80/20 ratio are not so stable like in Sweden, but their instability does not seem to be associated with the cycles. In fact, during periods of

³We use the data from 1996 onwards because there is no information for 1995, and we decided to use the value of 1996 instead of estimating the value for 1995.

recession, these measures are mostly stable or decrease, with the exception of the first period. However, income dispersion appears to be positively correlated with inflation, exhibiting persistence after a rise in inequality. Despite this, the highest level of Gini coefficient is reached in a recession year. Comparatively, Sweden and the Netherlands exhibit low sensitivity to recessions in what concerns income inequality: even in the presence of rising unemployment, inequality falls or keeps rather stable during recessions. We conjecture that given the strong role of social protection in these countries, inequality reacts more to increasing inflation (in most of the reported cases associated with positive demand-side shocks) than to increasing unemployment (and low inflation, during recessions).

In order to better clarify this evidence, we will develop an analysis based on a comparison of the dispersion of disposable income before and after taxes; with such an analysis we also aim better assessing the role of government (end of this section).

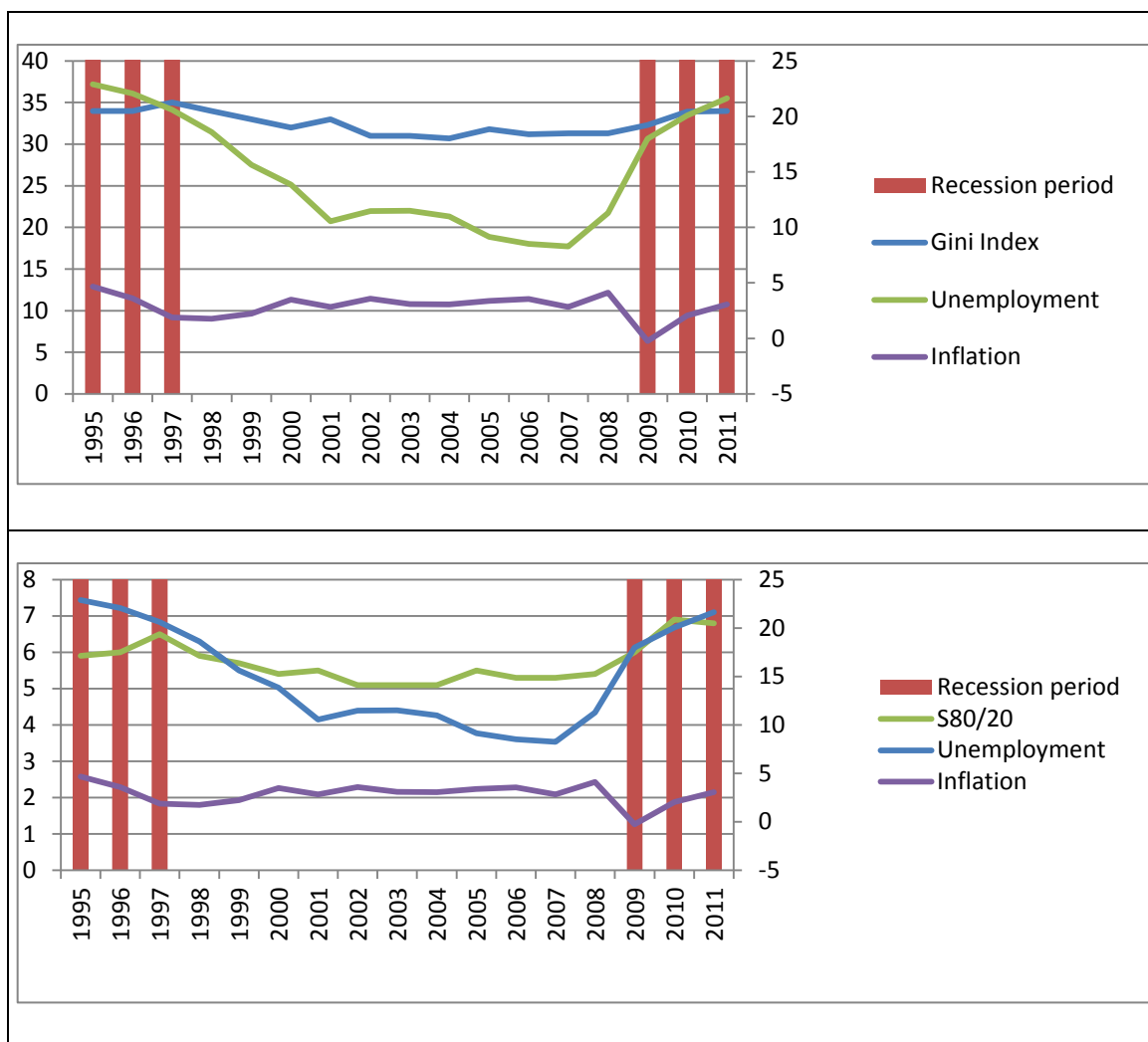
We will now proceed with the analysis of the Mediterranean countries in the sample. These countries typically present higher levels of inequality than the EU average. Also, from the related literature, it is expected that, for this group of countries, the role of the government is not as strong in mitigating the (unemployment) effects of recessions on inequality.

Pijoan-Mas and Sánchez-Marcos (2010) put in evidence the Spanish case, which exhibits a very dissimilar behavior relative to the Northern countries under analysis in what refers to the evolution of the inequality across cycle phases. According to Pijoan-Mas and Sánchez-Marcos (2010), from 1985 up to 2000, Spain exhibits a decrease in earnings inequality. They analyze the recession period 1992-93, characterized by a significant increase in unemployment. During this period, the evidence shows that there was an increase in inequality, being interesting that, when considered at the household level, the increase in inequality of earnings did affect the distribution upper tail, while, at the individual level, there was no significant influence. This recession has also led to an increase in consumption inequality, which was, nevertheless, smaller than the increase in income inequality.

For the Spanish case, our data shows that despite the fact that the Gini coefficient and the S80/20 in 2011 do not significantly differ from the 1995 levels, there is an inverted

U-shaped behavior of these measures from 1995 to 2011. Moreover, as we can see in the next figures, there is a matching between the periods where both the Gini coefficient and the S80/20 ratio are lower and the periods are expansionary.

Figure 7: Recession periods, Gini coefficient, S80/20 ratio, inflation and unemployment - Spain, 1995 - 2011

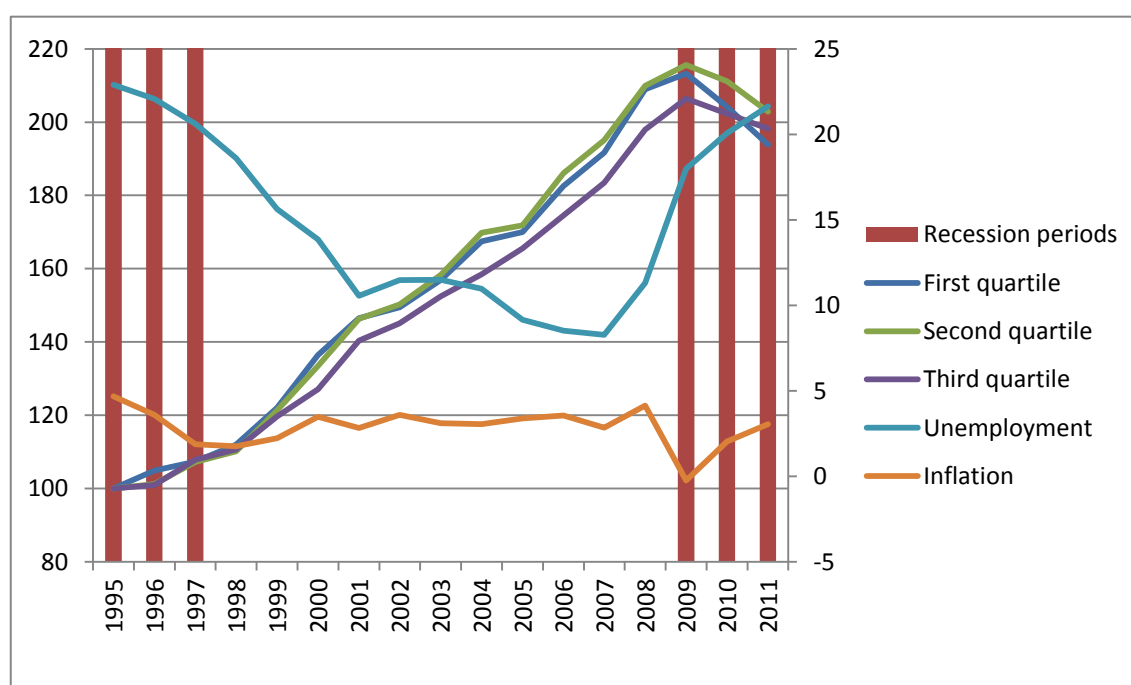


Source: Recession periods are identified from the IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013. Gini Index and S80/20 were taken from SILC-ECHP, accessed in 27/02/2013 (left-handscale). Unemployment and inflation rates are from IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013 (right-handscale).

In our data, we identify two recession periods, 1995-97 and 2009-11. It is during these periods that the highest values for Gini coefficient are observed (35 in 1997 and close to this value in 2011). This analysis is similar in what refers to the S80/20 ratio.

These measures are consistent with the behavior of unemployment, especially in the last recession period. In the first period, it is not so linear because unemployment is very high but decreasing from 1995 to 1997, whereas in 1997 both Gini and S80/20 ratio reach their highest values during the period. The last recession period is associated with a strong impact on unemployment, which increases significantly after a period of recovery since 1995. At the same time, inequality measures also increase. Regarding inflation, its behavior is rather stable during the period under analysis so it does not seem to affect in significant terms the evolution of inequality measures.

Figure 8: Recessions, quartiles of disposable income, unemployment and inflation - Spain, 1995-2011



Source: Recession periods are identified from the IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013. Quartiles of disposable income were taken from SILC-ECHP, accessed in 27/02/2013 (left-hand scale). Unemployment and inflation rates are from IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013 (right-hand scale).

Disposable income has been increasing throughout the seventeen years in focus (Figure 8). In what concerns the dispersion between the quartiles of household's disposable income, it is not notorious the increase in the recession periods, with the exception of the second recessive period. On average, dispersion of income between the lower layers (first and second quartiles) and the top 25% has been reducing (blue and green lines in

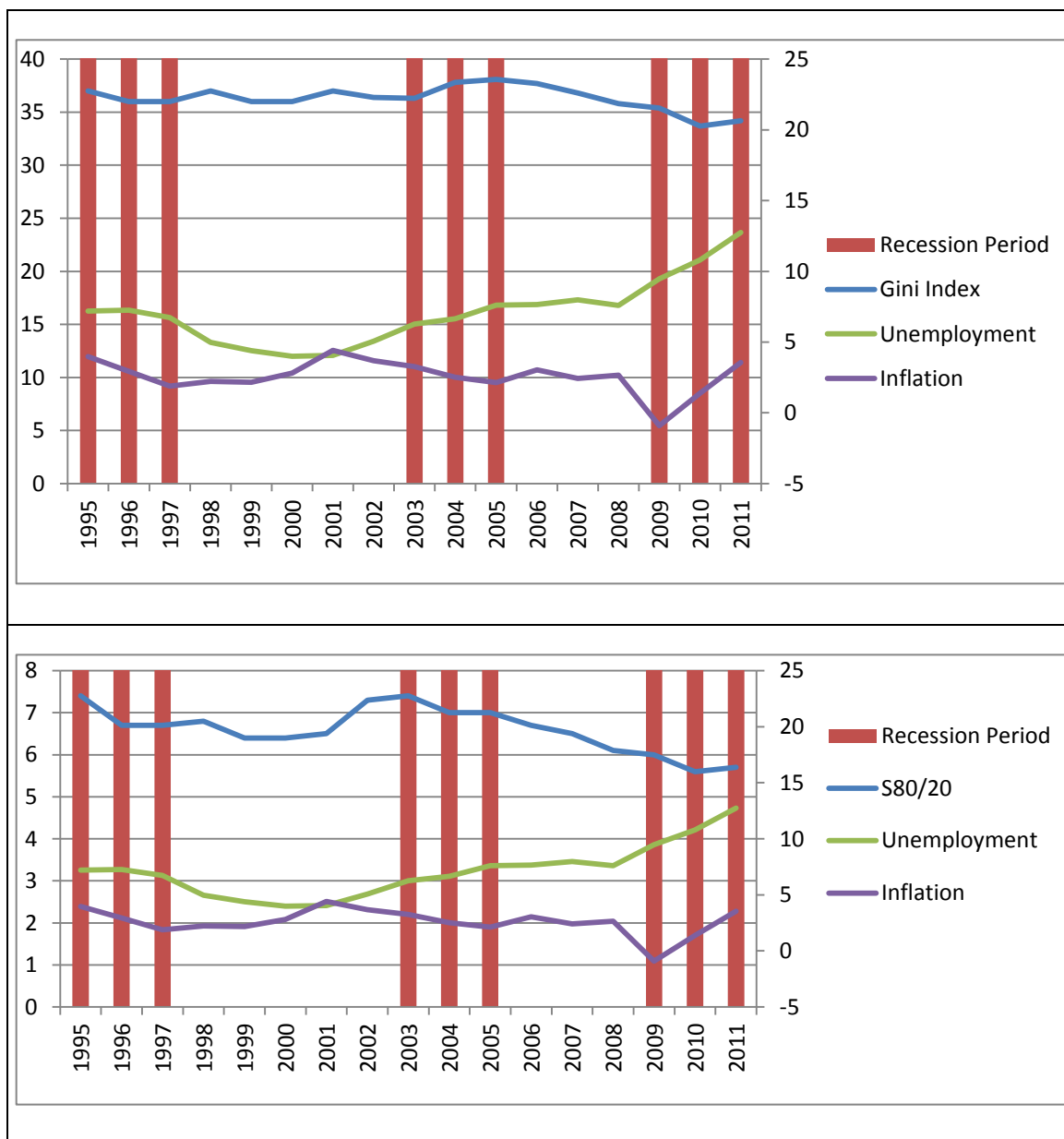
the figure lay, systematically, above the purple line). However, dispersion between the bottom 25% and the second quartile evolved negatively, especially during last recession (2009-11) due to a stronger fall in the disposable income of the bottom 25% income households relative to higher layers.

To conclude the analysis of Spain it is important to emphasize that, in opposition to what typically occurs in Northern countries, data seems to confirm a significant correlation between recession periods (high unemployment) and inequality measures. Furthermore, while for the Northern countries evidence seems to confirm the importance of policy role in smoothing the impacts of unemployment on inequality, for Spain, both inequality measures seem to be very sensitive to unemployment variations. Hence, it is in order an exploratory assessment on the role of social protection policies on dampening the effects of recessions in the Southern countries when compared with the Northern ones.

Next, we will bring to the analysis another Mediterranean country, Portugal, in order to understand if there exists a common pattern with Spain.

As Figure 9 shows, in Portugal, two recession periods are common to those observed for the Spanish case: 1995-97 and 2009-11. However, and as happened for the majority of countries, the period 2003-2005 is also a recession period in Portugal.

Figure 9: Recessions, Gini Coefficient, S80/20 ratio, inflation and unemployment - Portugal, 1995-2011

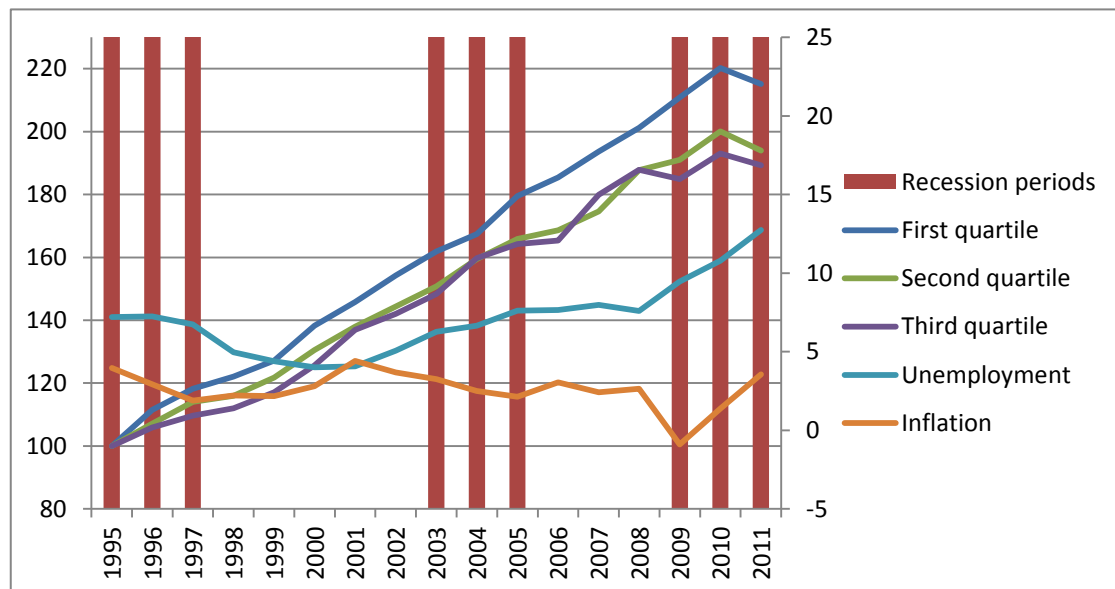


Source: Recession periods are identified from the IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013. Gini Index and S80/20 were taken from SILC-ECHP, accessed in 27/02/2013 (left-hand scale). Unemployment and inflation rates are from IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013 (right-hand scale).

We have two opposite pieces of evidence on inequality/recession during the analyzed period: in the recession 2003-05, the Gini coefficient increased from 36 in 2003 to 38 in 2005, but in the period 2009-11, the same indicator shows a decrease from 2009 to 2010 and an increase in 2011. The S80/20 ratio shows a similar evolution (Figure 9).

From Figure 9 it is clearly visible that unemployment rate has increased in 2003-05 and in 2009-11, being the rise even more pronounced in the second recession period. We may argue that government policies did not mitigate the effect of recession in inequality in this country since it is rather significant the increase in inequality measures during the 2003-05 recession period. Nevertheless, between 2009 and 2011, unemployment increase was highly pronounced (accompanied with a rise in inflation) and the Gini coefficient decreased. This evolution may suggest that the government could have been more effective in locking the transmission of the increase in both unemployment and inflation to inequality levels in this last recession period. This seems plausible as, in-between 2005 and 2008, both inequality measures substantially decreased even though unemployment and inflation remained rather stable at the levels of the previous recession; this seems to support that some structural shift occurred regarding the mechanisms to smooth the impacts of recessions on inequality. We will try to confirm if this is true further on, by comparing the average and median values of disposable income before and after taxes. Anyway, for Portugal, the evolution of the S80/20 ratio is not as close to the Gini coefficient as it happens for Spain.

Figure 10: Recessions, quartiles of disposable income, unemployment and inflation - Portugal, 1995-2011



Source: Recession periods are identified from the IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013. Quartiles of disposable income were taken from SILC-ECHP, accessed in

27/02/2013 (left-handscale). Unemployment and inflation rates are from IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013 (right-handscale).

Concerning the evolution of distribution of income by quartiles, this was rather similar to what was observed for Spain during 1995-2011, with the disposable income increasing for the whole period. Once again, as common to most of the countries in previous analyses, we highlight that the differential between quartiles of income is perceptible during the whole analyzed period: income for the first quartile is increasing relatively more when compared with the other income layers. In fact, this quartile remains above the others for all the analyzed period. This may happen because Portugal is a country in which social transfers have increased throughout these years.⁴With the exception of the 2003-05 period and contrary to what happened in Spain, a smaller dispersion between quartiles is obvious in recession periods, especially in the last period from 2009 to 2011 during which the low-income layers keep on rising while the third quartile shows reductions in 2009 and 2011 (Figure 10).

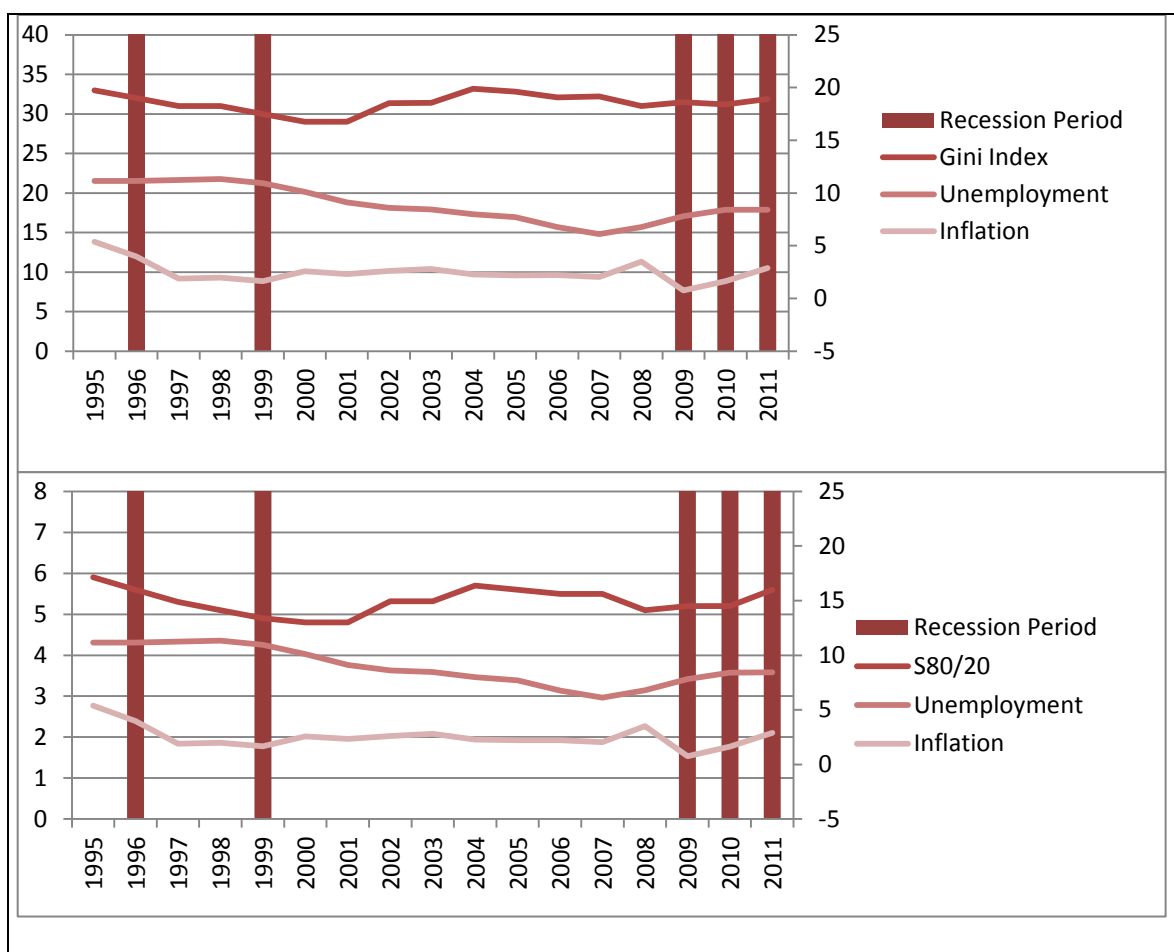
As intermediate cases, we have selected, on the one hand, Belgium and the United Kingdom (UK), respectively with low and high than EU average Gini coefficient and, on the other hand, countries that exhibit Gini coefficient closer to the EU average – *e.g.*, Italy and Germany.

Italy and Germany are close to EU average in terms of Gini coefficient. Italy is a Mediterranean country, but it evidences smaller inequality indicators and a behavior in terms of inequality path very different from Portugal and Spain since there seems to be no direct correlation between recession periods and the evolution of Gini coefficient or the S80/20 ratio. This indicator reaches its highest level (33) in 2004, which is an expansionary year. Hence, in opposition to what happens in the two other Mediterranean countries of our sample, Portugal and Spain, in Italy the increase in both inequality measures does not seem to be related with recessions but, instead, with expansions (similar to that occurring in the Netherlands and Finland). In particular, other determinants than (decreasing) unemployment or (stable) inflation must be related to the higher income dispersion observed from 2002-07. Only for the last recession

⁴Source: Social Security Spending as a percentage of GDP in Portugal, INE-BP, IGFSS/MSSS, PORDATA. (<http://www.pordata.pt/Portugal/> accessed in 25/06/2013).

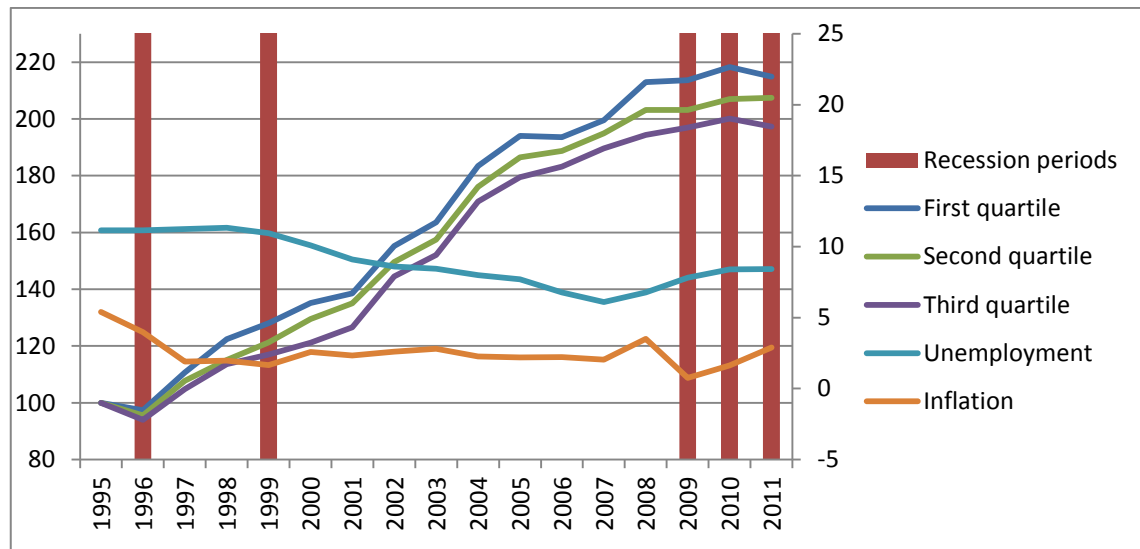
period, 2009-11, the behavior is similar to what happens in Portugal: both Gini coefficient and the S80/20 ratio decrease in 2009-2010, while from 2010 to 2011 they increase again. However, when we look to the behavior of quartiles of disposable income of households, a similar conclusion emerges: in Italy, like in Portugal and Spain, the disposable income increased in the whole period, but the dispersion between quartiles increased during an expansionary period and, slightly in 2009-11. For Italy, there was also an overall reduction in income dispersion as, for the whole period, the first quartile kept always rising above the second and third quartiles (see Figure 12).

Figure 11: Recessions, Gini coefficient, S80/20 ratio, unemployment and inflation - Italy, 1995-2011



Source: Recession periods are identified from the IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013. Gini Index and S80/20 were taken from SILC-ECHP, accessed in 27/02/2013 (left-hand scale). Unemployment and inflation rates are from IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013 (right-hand scale).

Figure 12: Recessions, quartiles of disposable income, unemployment and inflation - Italy, 1995-2011

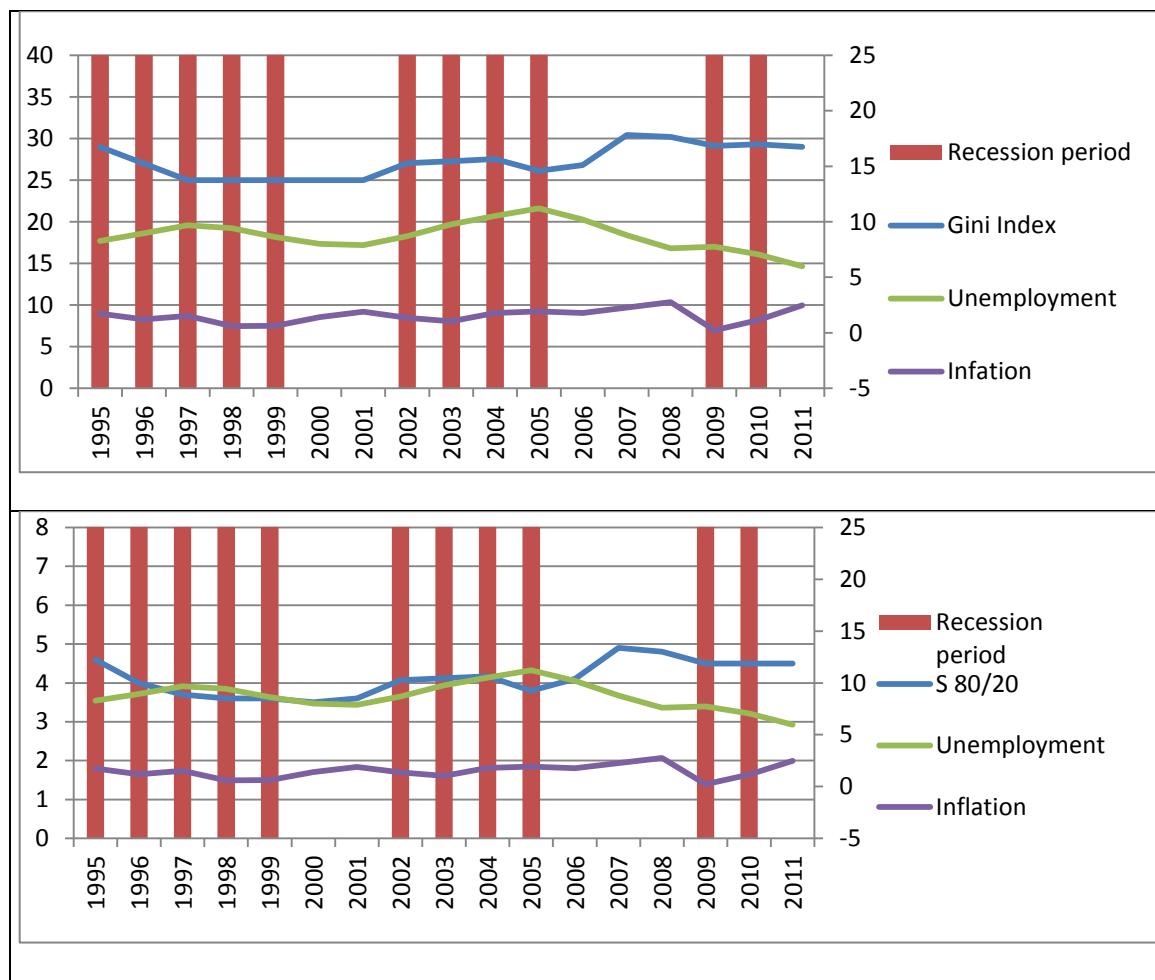


Source: Recession periods are identified from the IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013. Quartiles of disposable income were taken from SILC-ECHP, accessed in 27/02/2013 (left-handscale). Unemployment and inflation rates are from IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013 (right-handscale).

Regarding Germany, Fuchs-Schündeln *et al.* (2010) identify and study the recession associated with the reunification of Germany in 1990. This recession caused an increase in inequality, which was rather stable until the reunification. The wage inequality rose substantially but, thanks to government tax and transfer system, income inequality did not.

Our analysis allows concluding that, after 1995, inequality coefficients do not show significant variations (Figure 13).

Figure 13: Recession, Gini coefficient, S80/20 ratio, unemployment and inflation - Germany, 1995-2011



Source: Recession periods are identified from the IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013. Gini Index and S80/20 were taken from SILC-ECHP, accessed in 27/02/2013 (left-handscale). Unemployment and inflation rates are from IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013 (right-handscale).

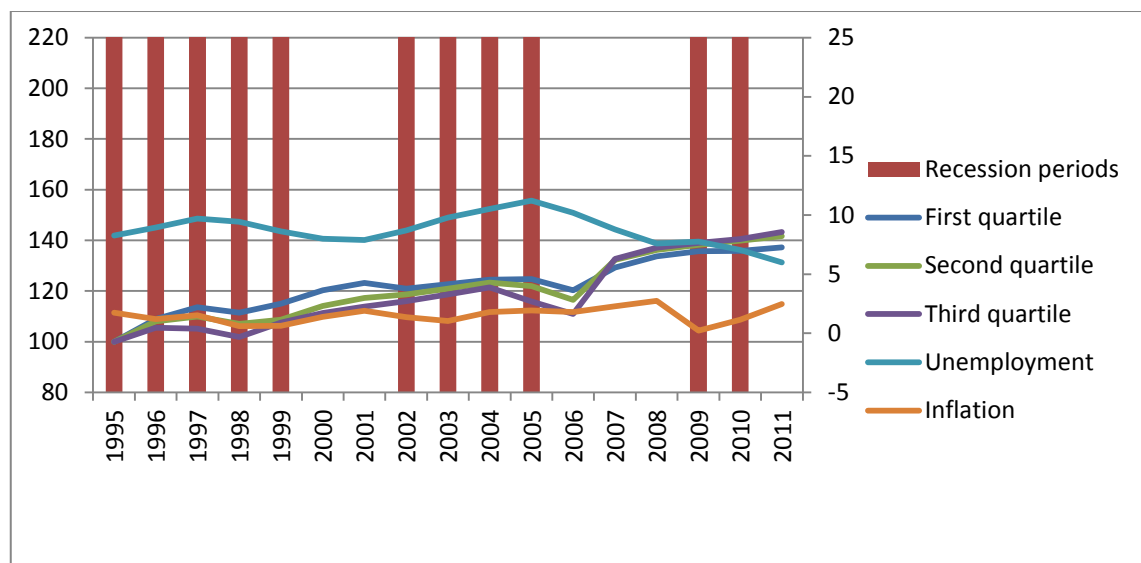
Looking with more detail to the information for Germany, we may confirm that unemployment has an expected evolution during the two first recession periods, and a more unexpected behavior during the last one (2009-10) since it registers a clear reduction. The Gini coefficient and the S80/20 ratio do not suffer significant variations in the first recession periods, as we would expect, as a result in form increasing unemployment. In fact, and curiously, both increase during an expansionary period, when unemployment is decreasing.

Nevertheless, in second recession period there is an increase in inequality. *“From 2000 to 2006, Germany experienced an unprecedented rise in net equivalized income inequality*

and poverty” (Biewen and Juhasz, 2010) which is due, according to this authors, essentially to changes in unemployment outcomes, in market returns and in tax system.

Regarding inflation, it registers a variation between 0% and 2% for the period in study, and reaches its lowest value in 2009. There is no apparent relation with inequality measures.

Figure 14: Recession, Quartiles of disposable income, unemployment and inflation - Germany, 1995-2011

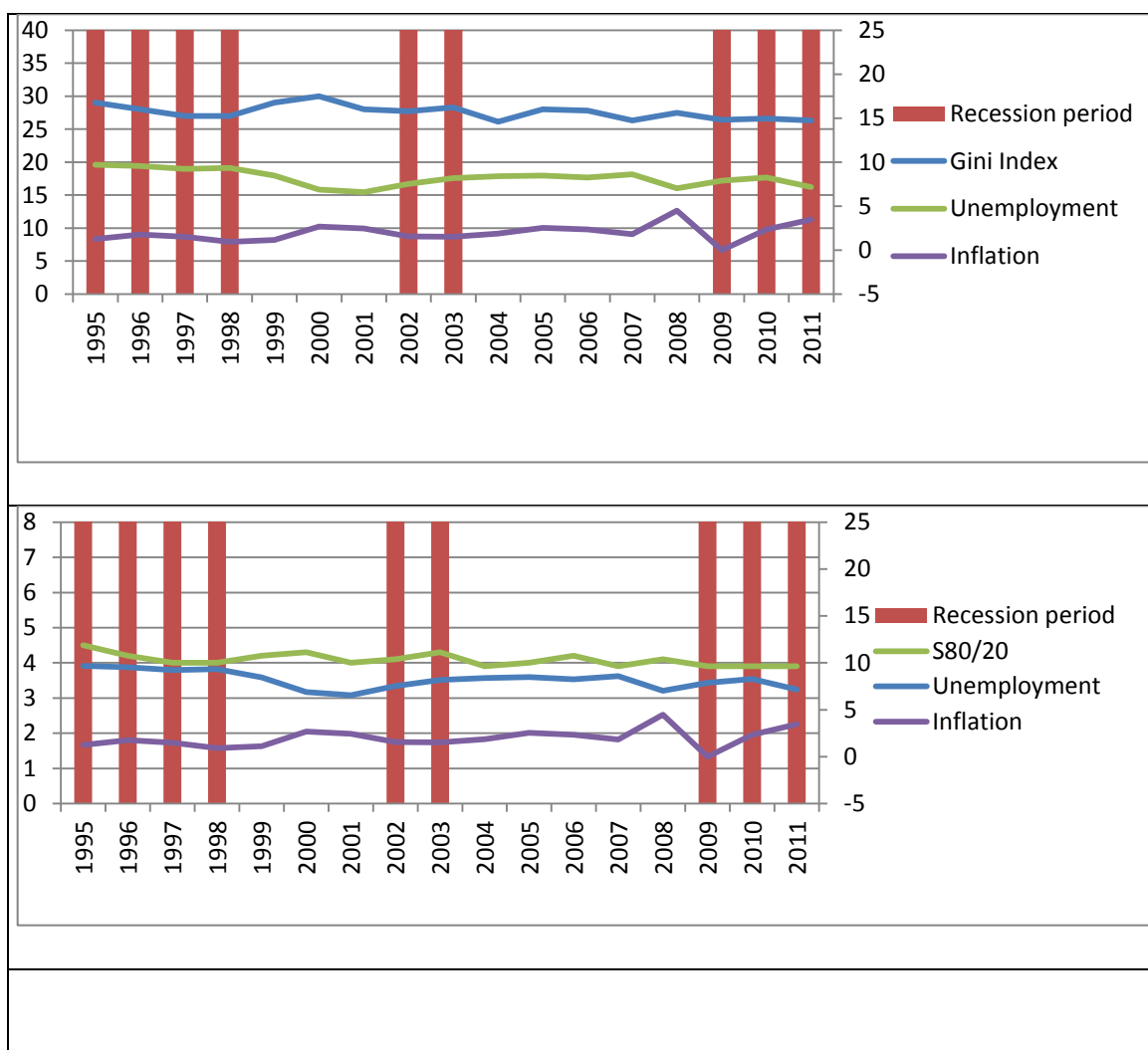


Source: Recession periods are identified from the IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013. Quartiles of disposable income were taken from SILC-ECHP, accessed in 27/02/2013 (left-handscale). Unemployment and inflation rates are from IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013 (right-handscale).

Concerning the dispersion between quartiles, and taking as reference the year 1995, the dispersion in the first years shows a clear reduction. It is possible to note that this dispersion increased in the first recession period and then, especially for the last recession, the relative distance is much reduced: during the second recession period, income growth for the third quartile was higher than that of the first and second quartiles, becoming even larger from 2007 onwards.

Finally, Belgium and the United Kingdom are chosen as intermediate cases, respective with lower and higher than EU-average disposable income inequality while higher and lower inequality relatively to the northern and the southern countries, respectively.

Figure 15: Recessions, Gini coefficient, S80/20 ratio, unemployment and inflation - Belgium, 1995-2011



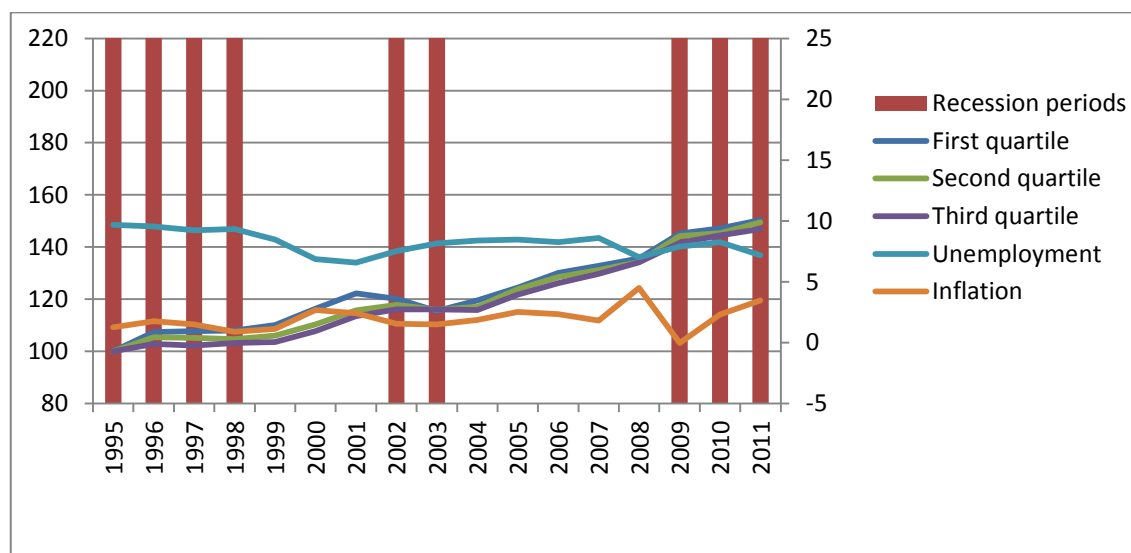
Source: Recession periods are identified from the IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013. Gini Index and S80/20 were taken from SILC-ECHP, accessed in 27/02/2013 (left-handscale). Unemployment and inflation rates are from IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013 (right-handscale).

In Belgium, during recession periods, there is an increase in unemployment and an inverse behavior of inflation, which seems to suggest recessions in this 1995-2011 period are mostly due to demand shocks.

Similarly to Northern countries, the Gini coefficient and the S80/20 ratio remained rather stable during recessions (see Figure 15). The analysis using quartiles shows a fall in the income of the first quartile in 2003 and 2008 relatively to the other income layers. Afterwards, inequality remained quite stable. While in 2003, the fall in the income of bottom - 25% was, apparently due to a rise in unemployment, the reduction operating in

2008 is apparently related with an increase in the inflation rate (and lower unemployment – positive demand-side shock).

Figure 16: Recessions, Quartiles of disposable income, unemployment and inflation - Belgium, 1995-2011



Source: Recession periods are identified from the IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013. Quartiles of disposable income were taken from SILC-ECHP, accessed in 27/02/2013 (left-handscale). Unemployment and inflation rates are from IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013 (right-handscale).

Finally, we will analyze the UK case, one of the largest European countries. This case is also characterized by an evolution that does not follow the expected behavior. From Figure 17, inequality in the UK was higher during the identified expansionary periods (low unemployment and rising inflation) than during recessions. An unexpected outcome emerges since, for the expansion period between 1998 and 2008, unemployment decreases and the Gini coefficient reaches the highest values. The S80/20 ratio remains more stable than Gini coefficient but the highest level is also observed in 2005, an expansion year and also featured by low unemployment levels. These results seem to be similar to the case of Northern countries, in which the behavior of inequality measures does not seem to follow any clear relationship with recession periods.

In the last recession, with rising unemployment and inflation, characterizing a negative supply-side shock, the Gini coefficient and the S80/20 ratio remain rather stable; from Figure 18, while the incomes for the first quartile increase substantially more than for

the other layers, incomes for the top 25% increase by more than those for the second quartile. In spite of rising unemployment, income of the lowest quartile increases at a higher path than that of the other layers; the rise in unemployment seems to have affected more significantly the second quartile of the distribution.

This country seems to be in line with the increase in inequality that has been lately registered in Europe, as early referred. As Blundell and Etheridge (2010) show, inequality (measured as the Gini coefficient of equalized income) increased in the country since 1978. The authors also stress that the recession periods of 1980 and 1990 were both featured by an increase in unemployment, which could explain the observed fall in the lower quintiles of the income distribution. Moreover, inequality in gross income is higher in these two periods or in the years immediately after. However, this increase was not present in net income, meaning that taxes and government transfers have an important role in mitigating the impact of a recession (Blundell and Etheridge, 2010).

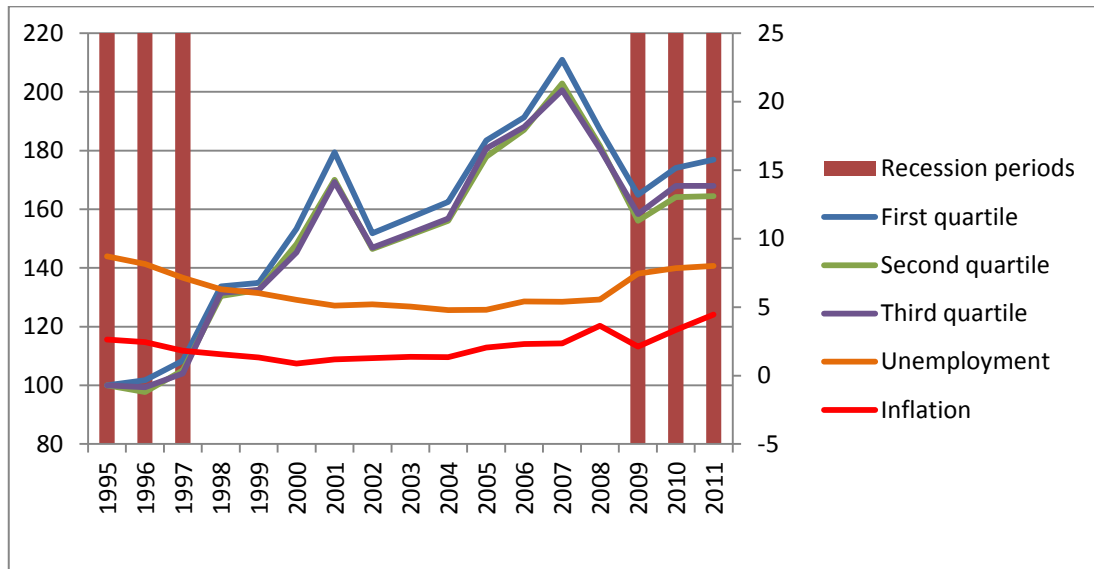
Figure 17: Recessions, Gini coefficient, S80/20 ratio, inflation and unemployment - UK, 1995 - 2011



Source: Recession periods are identified from the IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013. Gini Index and S80/20 were taken from SILC-ECHP, accessed in 27/02/2013 (left-handscale). Unemployment and inflation rates are from IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013 (right-handscale).

So, it is reasonable to wonder what specific reason has motivated this evolution for UK, since recession does not seem to be a determinant in this setting.

Figure 18: Recession periods, quartiles of disposable income, unemployment and inflation in United Kingdom, 1995-2011



Source: Recession periods are identified from the IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013. Quartiles of disposable income were taken from SILC-ECHP, accessed in 27/02/2013 (left-handscale). Unemployment and inflation rates are from IMF, *World Economic Outlook Database*, October 2012 – Economic Outlook, accessed in 28/02/2013 (right-handscale).

To conclude this section on the descriptive analysis of recessions and inequality in Europe, we decided to use SILC - ECHP disposable data on mean and median of disposable income before and after taxes and transfers in order to get more insights about the potential role of government in controlling for inequality, particularly during recessions.

The median-to-mean income ratio gives insights on the distribution of income. The closer the median value is to the mean of the distribution, the lower inequality is; on the contrary, if the median value is below the mean value this indicates that the large part of households receives small incomes and that a small portion receives high incomes. We aim, by comparing the ratio between median and mean income values after and before taxes and transfers, to understand if the role of government is relevant or not in terms of smoothing the impact of recessions on inequality. We face, however, some limitations in terms of data since mean and median incomes before taxes and transfers are only

available from 2004 onwards; in many countries this limitation implies that we are only able to analyze one recession period.

Table 2 shows the median/mean income ratio before taxes and transfers for the selected countries between 2004 and 2011. Shaded areas refer to recession years.

Table 2: Ratio median/mean income before taxes and transfers (pensions excluded)

Country	Year							
	2004	2005	2006	2007	2008	2009	2010	2011
Sweden	95,62%	93,57%	95,59%	93,71%	94,61%	94,94%	95,41%	94,65%
Netherlands		92,36%	91,13%	89,21%	89,41%	90,21%	91,84%	92,28%
Finland	91,01%	90,24%	90,87%	90,90%	90,95%	91,83%	91,89%	91,72%
United Kingdom		83,16%	87,21%	86,29%	84,94%	85,58%	86,19%	84,09%
Spain	89,22%	86,72%	87,98%	87,88%	88,61%	88,52%	87,89%	87,36%
Portugal	76,92%	75,40%	75,03%	75,40%	78,88%	79,28%	81,51%	80,32%
Italy	85,77%	85,84%	87,37%	86,96%	87,77%	86,60%	87,47%	88,13%
Germany (until 1990 former territory of the FRG)		91,57%	93,32%	88,92%	88,43%	89,24%	89,90%	90,45%
Belgium	94,98%	90,69%	92,55%	93,81%	91,91%	94,01%	92,76%	93,98%

Source: Recession periods as in IMF, World Economic Outlook Database, October 2012 – Economic Outlook, accessed in 28/02/2013; mean and median income before taxes and transfers were extracted from SILC – ECHP, accessed in 04/06/2013.

In all cases the ratio is below 100%. However, for some countries – Sweden, Belgium and the Netherlands – the ratio is close to 100%, evidencing small income disparities even before taxes and transfers. In other countries, instead, the ratio is closer to 80%, as in Portugal or the UK.

Table 3 shows the median/mean income ratio after taxes and transfers.

Table 3: Ratio median/mean income after taxes and transfers

Country	Year							
	2004	2005	2006	2007	2008	2009	2010	2011
Sweden	94,22%	92,24%	94,75%	93,39%	94,35%	93,91%	94,26%	94,29%
Netherlands		89,94%	88,90%	87,67%	87,53%	88,44%	89,42%	90,04%
Finland	89,77%	89,49%	90,50%	89,97%	89,94%	90,67%	90,74%	90,38%
United Kingdom		82,33%	85,58%	85,18%	82,98%	83,86%	83,26%	82,33%
Spain	89,20%	87,06%	88,81%	88,16%	88,80%	88,98%	88,36%	87,81%
Portugal	78,00%	76,61%	76,52%	76,27%	79,15%	79,69%	82,33%	80,81%
Italy	85,59%	86,09%	87,24%	87,17%	88,19%	87,05%	87,87%	88,46%
Germany (until 1990 former territory of the FRG)		90,00%	90,63%	87,70%	86,83%	87,57%	87,55%	88,37%
Belgium	92,52%	89,42%	90,54%	91,76%	89,99%	91,96%	91,15%	92,51%

Source: Recession periods from IMF, World Economic Outlook Database, October 2012 – Economic Outlook, accessed in 28/02/2013, mean and median after taxes and transfers from SILC – ECHP, accessed in 04/06/2013.

The first conclusion is that, in general, the ratio is lower after taxes and transfers. This means that taxes and transfers (excluding pensions) exacerbate gross income inequality in most of the countries under analysis. Apparently, taxes and transfers correct inequality only in Spain, Portugal and Italy. Nevertheless, we proceed with the analysis

by checking if taxes and transfers have contributed to smooth the impacts on inequality across time, namely during recessions.

Table 4 A: Changes in the ratio Median/Mean before taxes and transfers

Country	2005	2006	2007	2008	2009	2010	2011
Sweden	-2,14%	2,16%	-1,97%	0,96%	0,35%	0,50%	-0,79%
Netherlands		-1,32%	-2,11%	0,22%	0,89%	1,81%	0,48%
Finland	-0,85%	0,70%	0,04%	0,05%	0,97%	0,06%	-0,18%
United Kingdom		4,88%	-1,06%	-1,57%	0,75%	0,72%	-2,44%
Spain	-2,80%	1,46%	-0,11%	0,82%	-0,10%	-0,72%	-0,60%
Portugal	-1,97%	-0,49%	0,50%	4,63%	0,50%	2,82%	-1,46%
Italy	0,08%	1,79%	-0,48%	0,94%	-1,34%	1,02%	0,75%
Germany (until 1990 former territory of the FRG)		1,91%	-4,71%	-0,55%	0,92%	0,75%	0,61%
Belgium	-4,51%	2,05%	1,36%	-2,02%	2,28%	-1,33%	1,32%

Table 4 B: Changes in the ratio Median/Mean after taxes and transfers

Country	2005	2006	2007	2008	2009	2010	2011
Sweden	-2,10%	2,72%	-1,43%	1,02%	-0,47%	0,37%	0,04%
Netherlands		-1,16%	-1,38%	-0,16%	1,04%	1,11%	0,69%
Finland	-0,32%	1,14%	-0,58%	-0,04%	0,81%	0,08%	-0,40%
United Kingdom		3,95%	-0,47%	-2,58%	1,07%	-0,72%	-1,11%
Spain	-2,41%	2,02%	-0,73%	0,72%	0,19%	-0,69%	-0,62%
Portugal	-1,78%	-0,11%	-0,33%	3,77%	0,68%	3,32%	-1,85%
Italy	0,59%	1,34%	-0,08%	1,16%	-1,29%	0,95%	0,66%
Germany (until 1990 former territory of the FRG)		0,69%	-3,23%	-0,99%	0,86%	-0,03%	0,94%
Belgium	-3,35%	1,25%	1,35%	-1,93%	2,19%	-0,87%	1,49%

Source: Recession periods from IMF, World Economic Outlook Database, October 2012 – Economic Outlook, accessed in 28/02/2013; mean and median before taxes and transfers from SILC – EHCP, accessed in 04/06/2013 and Mean and median after taxes and transfers from SILC – EHCP, accessed in 12/05/2013.

Table 4 compares the changes in the median/mean ratio across time; shaded areas refer to recession periods. Overall, taxes and transfers have improved (worsened) inequality by more (less) during recessions (in most of the cases changes in Table 4B are more positive/less negative when compared to those in Table 4A). Exceptions arise in 2011 when most of the countries experienced an increase in inequality (the ratio median/mean decreased) but, still, for some countries (namely, Portugal, Spain and Finland) the after - tax and transfer ratio decreased even by more. At least for Portugal and Spain, this may be due to fiscal consolidation efforts.

We now proceed with a more detailed country analysis. Starting with Sweden, this country presents the highest (and closest to 100%) value for the ratio median/mean of income, but these values are lower after taxes and transfers than before. Looking at the change in of the ratios during recession periods, we conclude that gross income inequality decreased in 2009 and 2010, while net income inequality increased in 2009 and decreased by less in 2010. Apparently, this evidence contradicts the idea that public expenditure is prone in smoothing inequality effects in Sweden. However, the increase

in gross income inequality is visible only in 2011, with an observed reduction in after-tax and transfer income inequality.

In the Netherlands, for all of the recession years (2009 to 2011) there is an increase in the median/mean ratio, evidencing an improvement in inequality, both in income before and after taxes and transfers. Reduction in inequality is more pronounced after taxes and transfers in 2009 and 2011, while the reverse occurs in 2010.

In the last Northern country, Finland, the ratio decreases in recession years of 2005 and 2011; while in 2005 taxes and transfers smoothed the increase in inequality, in 2011 they amplify it relatively to gross income inequality.

For the UK, for the recession period 2009-2011, inequality in gross income increased in 2011, albeit net income inequality increased proportionately less. Evidence of positive effects of transfers and taxes is also found in 2009, with a stronger correction of net income compared with that of the gross income.

Looking now at the Mediterranean countries, and beginning with Spain, gross income inequality increased in 2009-2011 (the change in the median/mean ratio is negative in recession years); except for 2011, for which both pre-tax and transfer and net income inequality increased in a similar way, taxes and transfers reduced net income inequality in 2009 and increased by less net income inequality when compared to gross income inequality.

Similarly, for Portugal, in 2009 and 2010, the median/mean ratio has increased by more after taxes and transfers, while it fall by more in 2011, possibly due to fiscal consolidation efforts. Also in 2005, inequality increased more strongly before than after taxes and transfers (the reduction in the median/mean ratio is more accentuated before than after taxes and transfers in 2005).

Positive influences from taxes during recessions are also found in Belgium: in 2010, the increase in inequality was stronger before taxes and less after. Also, in the recession year of 2011, the reduction in inequality was stronger in after tax and transfer incomes.

Conversely, in Germany, gross income inequality has decreased during recession years, 2009 and 2010, decreasing by less or even increasing after taxes and transfers. In the same situation is Italy, with a rather neutral effect of taxes and transfers in smoothing a

rise in inequality in 2009 and in promoting a weaker improvement in inequality in 2010 and 2011 when compared to that occurring in gross income.

After this detailed analysis by each country in our sample, we will now summarize the main results in a table in order to better identify (dis) similar behaviors between countries (Table 5), supporting, or not, the results found in the literature. For each country, we register the number of recession years occurred in our analyzed period (1995-2011) and the associated average of the Gini coefficient for the same period. This is a rather simple and immediate way to check, at a first glance, if there is a connection between the number of recessions and the level of Gini coefficient in each country. We also include the variance of the Gini coefficient, as a measure of the degree of instability and/or dispersion of inequality. We do the same for the S80/20 ratio. The columns “Behavior” record how the inequality measures performed during the identified recession periods.

Besides that we include the average of ratio median/mean of income before and after taxes and transfers across recession periods, as summary of our previous analysis in what we conclude, in general, that taxes and transfers tends to improve inequality in recession periods, visible with a more pronounced increase/less pronounced decreased in the ratio, in recession periods.¹

In table we will shaded the countries that reveal as outlier behavior, according to our conclusions.

¹ Note that information for Gini coefficient and S80/20 contemplate the period 1995-2011, but information for ratio median/mean of income is only available for period since 2004 to 2011.

Table 5: Recessions and inequality measures – summary

Country	Number of recession years	Gini Coefficient			S80/20 Ratio			Ratio Median/Mean (average across recessions)		
		Mean	Variance	Behavior	Mean	Variance	Behavior	Before Taxes	After Taxes	Behavior
Sweden	7	23.03	1.28	Stable	3.3	0.05	Stable	95,32%	94,13%	Decrease
Netherlands	9	27	1.43	Stable/ Decrease	3.9	0.04	Increase/Stable/ Decrease	91,67%	89,46%	Decrease
Finland	12	25	2.79	Stable/ Increase/ Decrease	3.5	0.07	Increase/Decrease	91,34%	90,21%	Decrease
United Kingdom	6	32.9	1.68	Stable/ Decrease	5.3	0.06	Decrease/Stable	85,28%	83,15%	Decrease
Spain	6	32.56	1.92	Increase	5.73	0.32	Increase	87,92%	88,38%	Increase
Portugal	9	36	1.36	Decrease/ Increase	6.6	0.29	Decrease/ Stable	78,68%	79,49%	Increase
Italy	5	31.39	1.47	Decrease/ Increase	5.32	0.1	Decrease/ Increase	87,40%	87,79%	Increase
Germany	11	27.28	3.71	Stable/ Decrease	4.12	0.2	Stable/ Decrease	90,24%	88,38%	Decrease
Belgium	9	27.6	1.22	Stable	4.1	0.03	Stable	93,58%	91,87%	Decrease
Mean of the countries of sample	9.25	32.85	2.11		5.23	0.15		89,05%	88,10%	

Based on Table 5 and beginning with the Northern countries, we confirm that they exhibit values for the Gini coefficient and the S80/20 below those of the sample average. In particular, Sweden shows the lowest average values both the Gini coefficient and the S80/20 ratio.

During the analyzed period of the last seventeen years, Sweden registered 7 years of recession and, during these recession years, inequality measures remained rather stable. However, considering all period of analysis, Sweden exhibits an increase in the inequality levels (see Figure 2, above), in accordance with Krueger *et al.* (2010: 1): “Most, but not all, countries experienced substantial increases in wages and earnings inequality, over the last three decades”.

In the Netherlands and Finland inequality measures do not behave as stable during recessions. These countries observe more recession years than Sweden, with higher mean values for both the Gini and the S80/20 ratios. However, while the Netherlands exhibits a rather stable behavior in both inequality measures for the all period of analysis (1995-2011), Finland records a worsening in inequality (see Figures 3 and 5, above) as claimed by Krueger *et al.* (2010) and Franzini (2009).

To conclude, evidence from the Northern European countries seems to contradict the result expected from the literature that recession periods often induce an increase in disposable income inequality, and by other side that after taxes and transfers the impacts under inequality are less pronounced. This seems not happen, once that average of ratio is inferior after than before taxes across latest recession years.

Regarding the countries in the South of Europe, we observe, in general, an increase in the levels of inequality at least in one of the selected periods of recession. Starting with Spain, the country facing highest levels of unemployment during recessions, the reaction of both inequality measures is always an increase, which is in line with the most commonly result put forward by the related literature. In this country the average of the ratio median/mean income is more positive after taxes and transfers than before. In fact as we see before, with exception of 2011, the impacts in inequality are more pronounced before taxes and transfers than after.

The same happens for Portugal. This country registers nine years of recession, showing higher values for inequality measures, although the associated variance is lower than in Spain. In Portugal, inequality does not react to recessions as consistently as in Spain, since there was an increase in Gini coefficient from 2003 to 2005, but a decrease was observed from 2009 to 2010. The S80/20 ratio remains stable or decreases, which may be explained by intervention of government in mitigating recession effects on the lowest layers of income (shaded country in table). Apparently, for the whole period of analysis, inequality in Spain increased while it decreased in Portugal (see Figures 7 and 9, above).

In Portugal, while inequality decreased during the first period of recession, it increased in the second period. Overall, however, the S80/20 has a more stable behavior and Italy exhibits a rather stable behavior in both inequality measures (see Figure 11, above).

For the UK, Germany and Belgium, clearly the inequality measures improved or remained stable during the recession periods. The UK recorded 6 years of recession against 9 in Belgium and 11 in Germany. Still, these countries are very different regarding inequality: while the UK shows high average values in inequality measures, Germany and Belgium record values in-between those observed in the Southern and in the Northern countries; in turn, Germany exhibits a high volatility in the inequality

measures. For the whole period the UK records, as in Spain, a slight increase in inequality levels (recall Figure 17, above). Conversely, inequality decreased in Belgium when considering the whole period of analysis (see Figure 16, above).

Finally, it appears to be a relationship between the number of years under recession and the overall inequality performance in the last seventeen years. Germany and Finland clearly reveal a worsening in inequality and have experienced a larger number of recession years, 11 and 12, respectively.

The conclusion of which countries have experienced a worsening of the levels of inequality from 1995 to 2011 is important and reveals curious results. As we referred earlier, some authors like Franzini (2009) and Krueger *et al.* (2010) argue that Europe has faced an increase in the inequality levels. However, this is not the pattern observed in the last seventeen years. On the one hand, the countries in which inequality measures exhibited more volatility in recessions, the Mediterranean countries, the level of the Gini coefficient in 2011 was similar or decreased relatively to that registered in 1995. On the other hand, countries, like Sweden or Germany, that present more stable or a reduction in inequality measures in recessions, show a higher level of inequality in 2011 than in 1995. Besides that, we also see that the levels of inequality have not been worse, in the latest seventeen years, for all countries in our sample. The more interesting fact is that some of these countries where we did not observe, in a long term, an increase in inequality levels are those which were expected to be more sensitive to recessions.

Another curious result is that it is important the starting point of each country, but it is interesting to see that countries with highest number of recession periods do not exhibit, necessarily, the highest levels of Gini coefficient what is due, probably, to the way how government can smooth the effect of recessions on inequality indexes.

We see, that there is, in fact, a different behavior in face of recession by Northern and Mediterranean countries and that, in what regards the role of government we do not observe the expected results. In a first approach Northern countries are less sensitive to recessions, while Mediterranean countries exhibit more volatility in inequality measures; besides that, Northern countries are associated to a more effective role of the government and capable of smooth effectiveness the impact of a recession and

Mediterranean are not. But, even belonging to one of these groups, each country presents a very different performance when facing a recessive environment.

The last point of our analysis aims at assessing the importance of the role of the government in each country; specially faced with a recession context. Concerning this, for these results, we see better average values for the ratios median and mean income (that are more positive as closest of 100%) after than before taxes and transfers essentially for Mediterranean Countries (Spain, Italy and Portugal). This result captures specially the behavior in the latest recessions,² but with the exception of these three countries, the others have more positive values for ratio median/mean income before taxes and transfers.

In fact, it seems that countries with high levels of inequality are those that are capable of maintaining the increase in the levels of inequality more controlled: countries in which there is not an increase (a fall) in the ratio median/mean after taxes and transfers larger (as large) than before taxes and transfers are precisely Spain, Portugal and Italy (see Table 3). Another country that seems to have a positive response from government to recessions is Belgium.

In the next section, we proceed with a more refined analysis to test the role of recessions in affecting the inequality dynamics, in order to identify the potential mechanisms that may have led to the different performances of inequality measures during recession periods, for European countries.

² The period of analysis of the ratio is reduced.

4. Recessions and inequality in Europe: a panel data approach

4.1. Methodology

In order to assess the individual effect of main macroeconomic mechanisms operating during recessions, we propose to regress several inequality measures on the main variables capturing these mechanisms and on several other control variables. Due to lack of data, we propose a panel regression across several European countries, covering the period from 1995 to 2011.

When we refer to European countries we are contemplating only thirteen countries for which we are able to collect more complete set of information: Belgium, Germany, Ireland, Greece, Spain, France, Italy, Luxembourg, Netherlands, Austria, Portugal, Finland and United Kingdom. These countries are very representative of the entire sample, but since Luxembourg is a country in which a large part of the labor force is migrant, the evolution of its Gini coefficient fails to capture signs due to cycle fluctuations. For this reason we think that this fact can bias our results and we exclude this country in our estimations.

Once defined the sample we proceed describing according the literature and previous sections the variables that we will use in our model and which are, according previous literature, the expected signs of the coefficients attached to each explanatory variable (notation used in regressions):

- Real GDP *per capita* ($GDPPC$)

Levels of inequality are function of the real GDP in each country. Nerveless, we should use the quadratic form of the variable once that “*According to the Kuznets hypothesis, income inequality increases with economic development at early stages and declines as the economy advances*” (Kim *et al.*, 2011: 252).

Taking this hypothesis into account the expected signs are, positive for the coefficients of $GDPPC$ and negative to $GDPPC^2$.

- Unemployment rate (*Unemployment*)

According to the literature, unemployment is a variable that captures the cycle; during recessions, unemployment tends to increase and an increase in inequality is likely to occur.

But, although being a variable that captures the cycle, we are not evaluating what are the periods of recession ; instead, we are capturing the effects of a cycle variable on inequality even if the variable is increasing or decreasing during periods of expansion/recession as measured by the traditional definition.¹

Thus, the sign of the regressor of this explanatory variable should be positive. It is important to remember that, in our statistical analysis, the positive relation between unemployment and inequality is not clear for some countries, namely the Northern countries.

- Output gap (*Output gap*)

Output gap is the difference between the effective gross domestic product and the potential gross domestic product. In our case, we use already computed values for this variable taken from the IMF and the OECD. It is important to note that the output gap is incorporated in the model alternatively to unemployment, in order to capture the effect of this cyclical variable on inequality indexes.² In previous analysis, this variable was simply used as an indicator of recession periods.

- Inflation (*Inflation*)

According to the literature, a lower inflation tends to increase inequality through a transfer of wealth operating from debtors to creditors. We should stress that inflation may not be relevant for changes in inequality, once that, in Europe inflation is rather stable.

¹ For instance, the definition of recessions after two or more consecutive quarters of negative growth in GDP or employment or that when the output gap is negative.

² *Idem.*

- Credit constraints (*Financial depth*)

We have chosen a variable that refers to the domestic credit provided by the banking sector; according to the literature, the expected sign on inequality is negative as an increase in the domestic credit tends to reduce inequality (Agnello and Sousa, 2012). However, some authors, as Iacovello (2008), defend that there is not a clear relationship between both variables.

- Government intervention (*Government transfers, Income taxes and Consumption Taxes*)

The inclusion of these variables in our regressions intends to capture if it is important and what is the impact of the intervention of government on inequality indexes. Given the scope of our analysis, we find important to understand if that intervention is capable of smoothing the potential negative effect of cyclical variables during recession periods; for that, we will use these variables to weight the impact of cyclical variables in inequality.

Apparently, and from previous empirical results, government intervention has a negative impact on inequality once that the ratio median/mean of income is worse after taxes and transfers for most of the countries in our sample. However, in most of the cases, this ratio worsens by less after taxes and transfers during recessions.

- Educational variable (*Educational*)

Measured by the expected years of education, it is expected from the literature that higher educational levels are associated with lower levels of inequality (Chu et al., 2000). So, accordingly, the sign of the regressor on this variable is expected to be negative.

We present these variables in Table 6; for each variable we also show some relevant descriptive statistics as well as the corresponding sources for our data.

Concerning the dependent variable of the regression, we will test, conditional on the available data and on the mechanism in focus, two inequality indicators: for instance, while the Gini coefficient is a measure of average inequality, the S80/20 ratio measures the “distance” between tails of income layers as it “*is a measure of the inequality of income distribution calculated as the ratio of total income received by the 20% of the*

population with the highest income (the top quintile) to that received by the 20% of the population with the lowest income (the bottom quintile).”

(http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:S80/S20_ratio, accessed in 13/08/2013). These are the dependent variables that we will use.

Table 6: Selected variables to explain inequality dynamics

	Variable	Ave.	St.Dev.	Max.	Min.	Number of observations	Source
Unemployment (cycle)	Unemployment rate.	7,9	3,527624	21,7	1,9	218	Eurostat. (24/06/2013)
Output gap (cycle)	Output gap in percent of potential GDP.	0,49219951	2,86170324	10,2727988	13,8	179	OECD. (06/06/2013)
Inflation (cycle)	Annual average index.	97,37	10,26614	121,35	72,68	192	Eurostat. (24/06/2013)
Credit constraints (cycle)	Domestic credit provided by the banking sector in percentage of GDP.	128,91	40,24	234,44	55,03	215	World Bank. (24/06/2013)
Government intervention (cycle)	Total government expenditures,% of GDP.	46,8	5,844837	66,1	31,2	221	Eurostat. (23/06/2013)
	Taxes on labour,% of GDP.	18,3	4,848094	26	9,7	221	Eurostat. (24/06/2013)
	Taxes on consumption,% of GDP.	11,4	1,13748	14,5	7,3	221	Eurostat., (24/06/2013)
Educational variable (Structure)	Life expectancy of education	17,20	1,50149571	20,6	13,8	179	Pordata. (23/07/2013)
Kuznets effect	Real GDP per capita.	27.994	11176,18	70.400	12.000	221	Eurostat. (09/07/2013)

Despite our intention of using all these variables as independent variables to explain either the Gini coefficient or the S80/20 ratio (<http://epp.eurostat.ec.europa.eu>, accessed in 12/02/2013), caution is in order because, naturally, it is not reasonable to use some of

them simultaneously. *Output gap* and *unemployment*, for instance, are alternative measures to capture the economic cycle.

We run the correlation matrix of independent variables to check for strong correlation between them. We set the value of 0.6 as benchmark (see Table 1 in Annex).

From this analysis, we see that only the correlation between *government transfers* and *income taxes* lays above 0.6 and thus, we should not include both variables, simultaneously, as regressors. Besides that, even with a correlation below 0.6 but high enough, *unemployment* and *output gap* are used separately as alternative measures for the business cycle.

Thus, panel data estimation seems an adequate methodology as it is capable of removing any bias resulting from probable correlation of countries' specificities with the explanatory variables. Moreover, a simple cross-sectional set of information would not allow for a comparative analysis of the importance of the mechanisms across different business cycle phases. Finally, it enables a larger observation sample, given the scarce availability of time series data.

The advantages of using panel data estimation over cross-section are that panel data gives more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency.

We decided to follow the assumption previously cited in this work and present, in line with Bulir (2001), that the current levels of income inequality are affected by past inflation and, giving our conviction that the effects in inequality may be deferred in time, we extend this assumption to almost all explanatory variables used in our model (the exception will be *financial depth*). Moreover, and since inequality is a persistent phenomenon (as referred, among others, by Franzini, 2009), the independent variables will also be used as regressors in the lagged form.

According to this, the model will follow the specification:

$$Y_{i,t} = \alpha_i + \beta_t + \beta X_{i,t-1} + Y_{i,t-1} + \mu_{it}, \quad i=1\dots 13 \text{ and } t=1\dots 17 \quad (4.0)$$

Were:

- $Y_{i,t}$: refers alternatively, to the Gini coefficient and the S80/20 ratio, for country i at year t ;
- $\alpha_i + \beta_t$: Period or Cross – section effect;
- β : Vector of coefficients of explanatory variables. In this case, the coefficients associated to variables that represent the mechanism.
- X_{it} : Independent explanatory variables for country i at year t ; Independent variables are presented in Table 6, below;
- μ_{it} : Random term for country i at year t ;
- i : Country index= 1,....., 13.
- t : Period index, 1995 < t < 2011.

The assumption of the model is that slope coefficients are constant but the intercept varies across countries. As Gujarati and Porter (2009) explain the intercept may differ across individuals (in our case, we have 13 countries), each country intercept does not vary over time.

There is another aspect to take into account in panel data estimation: the type of panel. There are two panel types: balanced panel and unbalanced panel. Citing Gujarati and Porter (2009) “*if each cross-sectional unit has the same number of time series observations*” we have a balanced panel, whereas “*if the number of observations differs among panel members*” we are in the presence of an unbalanced panel. Clearly, our panel fits in the latter case (see Table 6).

A problem, which is frequent in panel data estimation, is related with the difficult choice of model: fixed effects (FEM) or random Effects (REM). Following observations that are exposed in Gujarati and Porter (2009), we have that if the number of cross sectional units (N) is small and the number of time series data is large (T) it is preferable to the use fixed effects method; this results from computational convenience, once that the difference between the values of parameters estimated is, in this case, rather small.

Besides that, the crucial factor for the choice between the two models is the assumption about the correlation between the error component (ε_i) and the regressors (X). In this case, if we assume that they are uncorrelated – we should use random effects model, but if we assume that they are correlated – we should use fixed-effects model.

In our case, we have a rather small sample of the periods included ($T = 17$) and cross sections included ($N = 13$). Since we will treat regressions with specific variables related with economic cycle it is likely to exist (or at least we have to test it) correlation between individual error component and one or more regressors. Hence, we will start by implementing the Hausman test and confirm what the adequate estimation for our model is. According to the test, if we reject the null hypothesis we should choose the fixed-effects model and proceed with the Redundant Fixed Effects to know if cross-section, period or both section and period fixed-effects are adequate.

We use the follow equation, to implement the Hausman test:

$$Gini_t = \beta_1 + \beta_2 GDPPC_{t-1} + \beta_3 GDPPC_{t-1}^2 + \beta_4 Government_{transfers_{t-1}} + \beta_5 Financial_{Depht_t} + \beta_6 Educational_{t-1} + \beta_7 Unemployment_{t-1} + \beta_8 Gini_{t-1} + \beta_8 Inflation_{t-1} + \mu_{i,t} \quad (4.1)$$

For this regression we compute the Hausman test,³ and obtain:

Table 7: Hausman Test result

Correlated Random Effects - Hausman Test
Equation: EQUATION_4_1
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	37.111493	8	0.0000

** WARNING: estimated cross-section random effects variance is zero.

Having found evidence in favour of the fixed effects model, we now test for the redundancy of period and cross section of fixed effects. Taking as baseline the estimation 4.1, Table 8 shows the relevant tests.

³ All estimations and tests are made using E-views.

Table 8: Tests on cross-section and period effects

Redundant Fixed Effects Tests

Equation: Untitled

Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	3.211177	(12,100)	0.0006
Cross-section Chi-square	43.350880	12	0.0000
Period F	1.038643	(12,100)	0.4203
Period Chi-square	15.622241	12	0.2092
Cross-Section/Period F	2.279664	(24,100)	0.0024
Cross-Section/Period Chi-square	58.040496	24	0.0001

Observing the results of Table 8, we can see that for *cross - section F* and *cross - section Chi - Square* the values of statistics are 3.21 and 43.35, respectively, and their *p-values* are 0.0006 and 0.0000; this means that we reject the null hypothesis of redundancy.

Instead, the *period F* and *period Chi – Square* statistics of 1.03 and 15.62, respectively, with the corresponding *p-values* of 0.4203 and 0.2092. In this case, we cannot reject the null hypothesis. So, we will consider only cross-section fixed effects.

In fact, if we use only cross-section fixed effects, we obtain an increase in individual levels of significance for each variables (see Tables 2 and 3 with results of estimation of equation 4.2 in Annex).

We are now able to estimate our regressions, which results are presented and analyzed in the next section. Of course, the specifications that we show in the next section are the result of sorting those we consider more reasonable among many other regressions.

Our estimations are made using the software E-Views and estimates are made under white – diagonal standard error correction for valid statistic inference.

Besides that, the results obtained, above in this section, with the Hausman test and the Redundant Fixed Effects tests that drive us to conclude for the choice of a cross-section fixed-effects model, are also valid for all estimations presented in the next section.

4.2. Estimation and Results

For the model that we defined, we present 5 estimations taking Gini Coefficient as dependent variable. The results are summarized in the following table:

Table 9: Estimation results - Gini Coefficient as dependent variable

Equation	4.1	4.2	4.3	4.4	4.5
<i>GDPPC</i> _{<i>t</i>-1}	0.601525** (2.326976)	0.588722** (2.201555)	0.413404 (1.607271)	0.459847*** (1.892999)	0.243045 (0.771294)
<i>GDPPC</i> ² _{<i>t</i>-1}	-0.007617** (-1.948333)	-0.007591*** (-1.871196)	-0.005399 (-1.402741)	-0.005910*** (-1.704073)	-0.003486 (-0.773503)
<i>Financial_Depth</i> _{<i>t</i>}	-6.52E-05* (-3.941806)	-7.06E-05* (-4.181420)	-6.56E-05* (-3.600093)	-7.79E-05* (-4.087968)	-0.004114 (-0.666261)
<i>Government_transfers</i> _{<i>t</i>-1}	-0.097634* (-2.755724)				
<i>Educational</i> _{<i>t</i>-1}	-0.111539 (-0.872959)	-0.092386 (-0.686947)	-0.121411 (-0.853911)	-0.077058 (-0.533516)	-0.099641 (-0.759474)
<i>Unemployment</i> _{<i>t</i>-1}	0.215482* (2.678373)	0.655878* (3.022897)			0.362467 (0.974413)
<i>Inflation</i> _{<i>t</i>-1}	-2.19E-05 (-0.703146)	-1.94E-05 (-0.651101)	-1.90E-05 (-0.559833)	-1.81E-05 (-0.544098)	1.91E-06 (0.062231)
<i>Gini</i> _{<i>t</i>-1}	0.507887* (5.940780)	0.507850* (6.136700)	0.511468* (6.4332825)	0.499736* (5.764054)	0.452909* (4.140649)
<i>Government_transfers</i> _{<i>t</i>-1} × <i>unemployment</i> _{<i>t</i>-1}		-0.009831* (-3.100258)			
<i>Government_transfers</i> _{<i>t</i>-1} × <i>output_gap</i> _{<i>t</i>-1}			0.011154 (1.217151)		
<i>Output_gap</i> _{<i>t</i>-1}			-0.564214 (-1.269034)		
<i>Government_transfers</i> _{<i>t</i>-1} × <i>output</i> _{<i>imf</i>} _{<i>t</i>-1}				0.013236*** (1.8820559)	
<i>Ouput_gap</i> _{<i>imf</i>} _{<i>t</i>-1}				-0.706038** (-2.055294)	
<i>Income_taxes</i> _{<i>t</i>-1} × <i>Unemployment</i> _{<i>t</i>-1}					0.004663 (0.271442)
<i>Consumption_taxes</i> _{<i>t</i>-1} × <i>Unemployment</i> _{<i>t</i>-1}					-0.038087* (-2.903615)
Number of countries	12	12	12	12	12
Number of observations	123	123	122	123	122
R - squared	0.928792	0.928256	0.924092	0.925468	0.927087
Adjusted R - squared	0.915656	0.915021	0.909952	0.911719	0.912649
F-Statistic	70.700825	70.13960	65.35393	67.313358	64.21093
Prob (F-Statistic)	0.000000	0.000000	0.000000	0.000000	0.000000

Note 1: Significant at 1% (*), 5% (**) and 10% (***)

Note 2: Estimations made under white – diagonal standard error correction for valid statistic inference.

For estimation 4.1, that is the first estimation that we regress, we obtain that all the variables are significant in explaining inequality with the exception of *educational (t-1)* and *inflation (t-1)*, which are the explanatory variables that are not statistically significant in any estimation presented in our table. Concerning *educational (t-1)*, measured by the expected years of education, we conclude that it is not significant in

explaining the Gini and that is one unexpected result: we would expect this variable to show significant and negative effects on inequality since a country with a higher level of education would face less inequality.

In what concerns inflation, this result may not be surprising once that in our sample of European countries inflation is low and has low volatility; but is contradictory with conclusion of Johnson and Shipp (1999) that obtained inflation as the most significant factor for income inequality. However, both variables exhibit a very low variability either across time and, especially, across countries, because country are too alike regarding both indicators.

We estimate also, the same model considering a crossing between *government transfers (t-1)* and *unemployment (t-1)* (equation 4.2 in Annex). For this estimation in what we use unemployment as proxy of the cycle, we see that at 90% confidence level all variables are significant in the explanation of Gini coefficient with the exception of *educational (t-1)* and *inflation (t-1)*. The model in global terms presents a good fit as we can see for the values presented for *R-squared* and *R-squared adjusted* that are 0.93 and 0.92, respectively.

Unemployment, as we concluded previously, is one of the most relevant variables in the transmission of recession to inequality (Perri and Steinberg, 2012) and we expect a positive sign for the associated coefficient. This is confirmed from our results once that increases (significantly) inequality as measured by the Gini coefficient.

Moreover, the impacts of unemployment on inequality are smaller the larger government transfers are (see the negative coefficient of *government transfers (t-1) × unemployment (t-1)*, line 9, in Table 9), which means that government transfers are capable of inverting the negative impact from an increase of unemployment on inequality as measured by the Gini coefficient.

Thus, government transfers are likely to reduce the negative impacts of recessions on inequality, a results in line with most of literature (Agnello and Sousa (2012), Perri and Steinberg (2012), Krueger *et al.* (2010)).

In this work we also use the *output gap* as proxy to cycle fluctuations, capturing recession periods (when the output gap is negative) and expansion periods (when the output gap is positive).

We run previous regression and substitute unemployment for the *output gap* (as measured by OECD or by IMF, respectively) as a measure of cycle fluctuations.

From Table 9, we are driven to conclude that the output gap (measured by OECD) appears as having a weak influence in the Gini coefficient. Either individual or crossed with government transfers, the output gap is not significant and worsens the performance of the other independent variables in the explanation of inequality (estimation 4.3) and the global fit of estimation is also worse compared with 4.2 using unemployment instead.

We run the same regression but using data for the *output gap* from the IMF (estimation 4.4). In this case, the results are improved and *output gap (t-1)* seems be relevant in the explanation of changes in the Gini coefficient.

For this estimation we obtain a better good fit measured by *R - squared* and *adjusted R - squared* than for the first, and the variables that appear as insignificants for a 10% level as are educational level and inflation, but the signs of the coefficients of explanatory variables are unexpected (see Table 9).

We also regress an equation in which *income taxes (t-1)* and *consumption taxes (t-1)* substitute for government transfers in capturing the smooth in behavior of the state. The goal of using these variables is understand the role of government, in recessionary context under the possible impacts on inequality.

It is important to analyze if in the presence of a recession, the role of government is capable of smoothing the impacts on inequality indexes, more than assess their individual impact on inequality. In level it is acquired and not surprising that, countries with stronger government intervention (biggest values for income taxes and consumption taxes) are countries with lowest levels of inequality. But what have interest is to know if in a recessionary environment, countries with biggest intervention are less affected in terms of inequality or not. For conclude about that we estimate equation 4.5; we see that all variables are non-significant, with the exception of $consumption_taxes_{t-1} \times unemployment_{t-1}$ and $Gini_{t-1}$. This result is of difficult explanation as indirect taxation is not redistributive as it affects all consumers in a similar way.

As we see before *income taxes and consumption taxes* are strongly correlated with government transfers and these variables were inserted in model as alternative measures of government intervention in reducing inequality. In results of estimation 4.5 we obtain that consumption taxes in periods of recession tend to decrease the values of inequality. Income taxes, that apparently are the most redistributive, are not significant. However, the overall quality of adjustment of the model becomes substantially worse.

Concerning $GDPPC (t-1)$ and $GDPPC (t - 1)^2$, that were included in the model to capture the Kuznets hypothesis, our evidence supports the hypothesis as the associated coefficients exhibit the expected signs. Inequality potentially rises as gross domestic product *per capita* increases but from a certain upward threshold onwards, society becomes more worried about income dispersion attaching than reflecting that “*intersectoral shifts which occur in the early stages of economic developmentacerbate the inequality. However, once a certain threshold level of development is reached, inequality peaks and then declines in the later stages*” (Ogwang, 1995).⁴

These explanatory variables are not statistically significant for all estimations, but in estimations 4.1, 4.2 and 4.4 which are the estimations that consider unemployment and output gap as comported by the IMF as cyclical variables, they are significant and with these signs.

To conclude, we analyse the results of two variables that present as significant for almost estimations *Gini (t-1)* and *financial depth*.

Our results for *Gini (t-1)* confirm the importance of past values for indicators of inequality (variable presents as significant to a level of 1% for all estimations). This lagged dependent variable is statistically significant for all estimations confirming the slowly changing inequality patterns.

In what concerns *financial depth*, we obtain that is significant also for all estimations (except 4.5) but with very small coefficients. This variable is to reduce inequality as it measures the domestic credit provided by the banking sector; credit relaxes liquidity

⁴ According the Kuznets assumption, it is possible to calculate the *per capita* income threshold above which an increase in *per capita* income reduces inequality. Thus, taking, for instance the estimated coefficients of equation 4.2., $\frac{\partial Gini}{\partial GDPpc} = 0 \Leftrightarrow 0.588722 \times (-2) \times 0.007591 \times GDPPC (\text{threshold}) = 0 \Leftrightarrow GDPPC (\text{threshold}) = 38.77763$. In our sample, only Ireland and Luxembourg have surpassed the threshold.

constraints and makes more easy for households with low income levels to reach higher levels of consumption and a negative sign is expected (Agnello and Sousa, 2012). This is what happens.

We will estimate the same regressions, using the same explanatory variables but using as dependent variable the S80/20 ratio.

Once again, we remember that these two measures of inequality are quite different once that one reveals the average income inequality - Gini coefficient - and the other reveals inequality between two extremes of population: that receiving top incomes and that receiving bottom incomes - S80/20 ratio.

The estimations presented in the next table, from estimation 4.6 up to estimation 4.10 are similar to those 4.1 - 4.5 presented for Gini coefficient as dependent variable in Table 9.

For this case, the first estimation contemplates the same explanatory variables that estimation 4.1 with Gini, and the results show that for this estimation all coefficients are statistically significant, even *educational (t-1)* and *financial depth (t-1)*, which did not happen with Gini coefficient.

Table 10: Estimation results - S80/20 ratio as dependent variable

Equation	4.6	4.7	4.8	4.9	4.10
<i>GDPPC</i> _{<i>t</i>-1}	0.231311* (3.115799)	0.225812* (3.043372)	0.206018* (2.993673)	0.214480* (3.321026)	0.099059 (1.498036)
<i>GDPPC</i> ² _{<i>t</i>-1}	-0.003243* (-3.061206)	-0.003198* (-2.939354)	-0.002985* (-2.860643)	-0.003058* (-3.280721)	-0.001533 (-1.4790068)
<i>Financial_Depth</i> _{<i>t</i>}	-1.77E-05* (-2.704265)	-1.83E-05* (-2.642727)	-1.79E-05*** (-2.504825)	-2.24E-05* (-2.733465)	-1.24E-05 (-1.655544)
<i>Educational</i> _{<i>t</i>-1}	-0.051796*** (2.105831)	-0.047364 (-1.379769)	-0.055386 (-1.565322)	-0.039709 (-1.095173)	-0.037173 (-1.147719)
<i>Unemployment</i> _{<i>t</i>-1}	0.046373** (1.838703)	0.123102*** (1.692506)			0.089971 (0.745252)
<i>Inflation</i> _{<i>t</i>-1}	-7.64E-06* (-2.917523)	-7.61E-06 (-0.840435)	-9.00E-06 (-0.788661)	-9.40E-06 (-0.845079)	-1.83E-06 (-0.239901)
<i>S80/20</i> _{<i>t</i>-1}	0.651220* (11.53431)	0.657352* (7.915899)	0.669571* (8.86403)	0.639995* (7.515251)	0.626054* (6.326675)
<i>Government_transfers</i> _{<i>t</i>-1}	-0.017479* (-2.727178)				
<i>Government_transfers</i> _{<i>t</i>-1} × <i>unemployment</i> _{<i>t</i>-1}		-0.001636 (-1.470020)			
<i>Government_transfers</i> _{<i>t</i>-1} × <i>output_gap</i> _{<i>t</i>-1}			0.003029 (1.367121)		
<i>Output_gap</i> _{<i>t</i>-1}			-0.157994 (-1.460579)		
<i>Government_transfers</i> _{<i>t</i>-1} × <i>output_imf</i> _{<i>t</i>-1}				0.003790** (2.086481)	
<i>Ouput_imf</i> _{<i>t</i>-1}				-0.203868** (-2.199197)	
<i>Income_taxes_GDP</i> _{<i>t</i>-1} × <i>Unemployment</i> _{<i>t</i>-1}					0.002370 (0.478095)
<i>Consumption_taxes_GDP</i> _{<i>t</i>-1} × <i>Unemployment</i> _{<i>t</i>-1}					-0.010187*** (-1.842128)
Number of countries	12	12	12	12	12
Number of observations	123	123	122	123	125
R - squared	0.9462258	0.945797	0.945279	0.946096	0.948627
Adjusted R - squared	0.936345	0.935798	0.935086	0.936152	0.938747
F-Statistic	95.45109	94.59283	92.73749	95.14738	96.01992
Prob (F-Statistic)	0.000000	0.000000	0.000000	0.000000	0.000000

Note 3: Significant at 1%(*), 5%(**) and 10%(***);

Note 4: Estimations made under white – diagonal standard error correction for valid statistic inference.

For estimation 4.7, we have results very close to those obtained with the Gini coefficient, what lends some robustness to the model. As we can see from the results, the estimation presents a global good fit and moreover the variables that capture the Kuznet's effect are significant and with the expected signs, at level of 1% and 5% of significance, for *GDPPC* and *GDPPC*², respectively.

Unemployment (t-1) and *financial depth (t-1)* are also statistically significant in the explanation of the S80/20 ratio and the same happens for the lagged dependent variable; likewise *educational (t-1)* and *inflation (t-1)* are still not statistically significant in explaining S80/20 variability (only are significant for estimation 4.6).

However the cross product between *government transfers (t-1)* and *unemployment (t-1)* is not significant. This is the major difference when comparing with the results for the Gini coefficient; apparently government transfers are important to smooth the impacts of unemployment on inequality as measured by the Gini coefficient but are rather neutral in correcting for the S80/20 inequality. A plausible explanation may be that the bulk of government transfers are unemployment benefits, eligible only for recent unemployed persons. Since the population at the bottom of the income distribution includes an important share of inactive population and of long-term unemployed, government transfers may be less efficient in smoothing the incomes.

Similar to estimation 4.3, the use of the *output gap* as computed by the OECD as cycle variable, deteriorates both global and individual significance of the variables in the model. None of the variables, except lagged dependent variables, are significant at confidence level of 99% and thus, 4.8 reveals to be a poor fit.

However, the use of *output gap* as computed by the IMF (estimation 4.9) shows a substantial improvement of the model. Except for *educational (t-1)* and *inflation (t-1)*, all variables are statistically significant at 5%, including the cross product between *output gap IMF (t-1)* and *government transfers (t-1)*, and with the expected sign: when the *output gap* decreases, inequality increases but less the larger government transfers are.

The consideration of lagged *income* and *consumption taxes* (equation 4.10) drives to the same conclusions as in the correspondent estimation for the Gini coefficient, once that, again, only *consumption taxes (t-1)* are statistically relevant in reducing inequality.

To conclude, one of the most important results from our model are that *unemployment (t-1)* is in fact a mechanism through which recession increases inequality as measured by the Gini and the S80/20 indexes and that the Kuznets hypothesis is verified.

Moreover, concerning government variables, *government transfers (t-1)* are, quite robustly, relevant in smoothing the cycle impacts on inequality; in what concerns to

income (t-1) and *consumption taxes (t-1)*, we have for both cases that *consumption taxes (t-1)* is more significant than income taxes in smoothing impacts on inequality.

Financial depth is also significant in explaining income inequality as measured by the two indexes, even with the reduced values for coefficients revealing that the impact is quite weak under inequality.

In general, *inflation (t-1)* and *educational (t-1)* do not seem to be relevant in the explanation of the inequality measures and the *output gap* as computed by the OECD appears not to be a good measure for controlling the cycle.

5. Conclusions

The awareness that economic recessions, even being cyclical phenomena, have costly consequences at several domains, motivated us to pursue a study with the aim to assess which are the impacts of their occurrence on income inequality. Being a fact that inequality in Europe has been worsening during the recent years (Franzini, 2009), it is important to understand if and to what extent the occurrence of economic recessions contributes for this evidence. According to some arguments, recessions contribute more to increase inequality, driving, due to persistency effects, a scenario of increasing inequality for longer periods.

Relying on a literature review of the mechanisms through which recessions could transmit to inequality levels, we conducted a tentative empirical analysis for some European countries, by analyzing the recent path (1995-2011) for several inequality measures (quartiles of disposable income, S80/20 ratio and Gini coefficient) during recession periods and controlling for the dynamics of macroeconomic cycle variables, such as unemployment and inflation. We also made a descriptive analysis to conclude for the role of government intervention during recessions by comparing the median/mean income ratio before taxes and transfers with that after taxes and transfers, relying on data between 2004 and 2011. Moreover, we used a panel data econometric model to assess if cyclical mechanisms, identified in literature, are relevant in the explanation of inequality dynamics. The sample is composed by a panel of 13 EU countries with observations from 1995 to 2011.

In our results we confirm that, in general, the level of inequality in Europe has been worsening in the last years in almost all countries, but the pattern it is not common during recession periods, as identified with negative output gap, neither consistent with inflation or unemployment dynamics. Clearly, Europe is divided between countries that have inequality levels above the EU mean (essentially countries in North and Central Europe) and below (Southern countries). Apparently, the countries that present high inequality levels are also those presenting more volatility in inequality along the cycle; in turn, countries with low levels of inequality tend not to exhibit a strong reaction of inequality measures during recession periods. Concerning one of the most important mechanisms in driving inequality, unemployment, it is one of the most relevant costs

recessions and affects, essentially, the bottom of income distribution. We concluded that, in general, during recession years, unemployment in fact increases (exception Finland) but not for all cases. This increase has impacts in both the Gini coefficient and the S80/20 ratio. Both indicators show very similar behaviors for each country. However, in countries like Sweden, the Netherlands, Finland and even U.K seem not to be responsive to unemployment in terms of inequality, since the inequality measures do not follow the same trend as the unemployment rate. Cycle impacts on inequality can be smooth through government intervention. To assess this, we analyze the ratio median/mean of disposable income before and after taxes and transfers both in level as in percentage change relative to previous period. Level analysis shows that, in general, taxes and transfers exacerbate gross income inequality (in most of the cases the ratio is lower after than before taxes and transfers), being the exceptions some of the countries that present more volatility from inequality measures to recessions: Spain, Portugal and Italy. Nevertheless, in recessions, taxes and transfers tend to improve by more or to worse by less the effects on inequality. The annual variation of the ratio indicates that, in recession periods, changes are more positive or less negative after taxes and transfers. To better clarify the above-mentioned results, econometric estimations reveal that unemployment is, as expected, statistically significant in explaining the inequality dynamics. The same occurs with the output gap, as computed by the IMF: an increase in the output gap has positive effects in reducing inequality.

Our estimation results also show that government transfers are negatively related with Gini and S80/20 ratios. Moreover, we confirm that transfers smooth the cycle effects on inequality: the negative effect of unemployment in increasing inequality is smaller the larger the value of government transfers on GDP. This result is robust to the estimations in which the cycle is captured by the IMF output gap and for explaining the dynamics of both Gini and the S80/S20 ratio. Results are different if taxes are used instead of transfers to capture the role of redistributive policies: only consumption taxes are statistically significant for explaining inequality. Combining this result with that we obtained from the analysis of the median/mean income ratio after - and before taxes and transfers, we conclude that government intervention through direct taxes on income apparently does not correct for inequality.

For the remaining cycle mechanisms, we found that while the availability of bank credit reduces inequality as measured by both indicators, inflation is neutral. The latter result was also expected from the descriptive analysis: as the monetary policy regime in the countries of our sample is characterized by inflation targeting, inflation is rather invariant with inequality measures.

Additionally, our results confirm evidence for the Kuznets hypothesis but education is found not to be significant to explain inequality. However, this last (rather structural) effect may be captured by cross-section dummies in the model.

We are aware, though, that this work is just a starting point for a more refined research. For instance, econometric results should be produced using more complex and time-consuming techniques, namely dynamic panel General Method of Moments (GMM), due to the presence of lagged dependent variable as a regressor. Moreover, the analysis of the role of credit constraints and of savings profiles on inequality, requires the computation of a measure of inequality in consumption, an indicator that is not of widespread availability. Finally, data availability on inequality measures comprises only very recent periods and on an annual basis: this constraints the analysis of inequality across business cycle phases; for our sample of countries we could only identify at the most, 3 recession periods.

References

- Agnello, L. and R. M. Sousa (2012), “How do banking crises impact on income inequality?” *Applied Economics Letters*, 19:15, pp. 1425-1429.
- Alvaredo, F. (2009), “Top incomes and earnings in Portugal 1936-2005”, *Explorations in Economic History*, vol. 46, pp. 404-417.
- Arestis, P., Martin, R. and Tyler, P. (2011), “The persistence of inequality?”, *Cambridge Journal of Regions, Economy and Society*, 4, pp 3- 11.
- Barlevy, G. and D. Tsiddon (2006), “Earnings inequality and the business cycle”, *European Economic Review*, 50, pp.55-89.
- Biewen, M. and Juhasz A. (2010), “Understanding rising income inequality in Germany”, *IZA DP No. 5062*.
- Blundell, R. and B. Etheridge (2010), “Consumption, income and earnings inequality in Britain”, *Review of Economic Dynamics*, 13: pp.76-102.
- Bordo, M. D. and C.M. Meisser(2012), “Does inequality lead to a financial crisis?”, *Journal of International Money and Finance*, pp.1-15.
- Bulir, A. (2001), “Income inequality: Does inflation Matter?” *International Monetary Fund Staff Papers*, vol. 48, No. 1, pp.139-159.
- Callan, T., B. Nolan, C. Keane and J. Walsh (2010), “Inequality and the crisis: The distributional impact of tax increases and welfare and public sector pay cuts”, *The Economic Social Review*, vol. 41, No. 4, pp.461-471.
- Chu, K., H. Davoodi and S. Gupta (2000), “Income Distribution and Tax and Government Social Spending Policies in developing countries”, *International Monetary Fund*, Working paper no. 62, pp. 1-47.
- Chun Zhu, S.(2004), “Trade, product cycles, and inequality within and between countries”, *Canadian Journal of Economics*, vol. 37, No. 4, pp.1042-1060.
- Claessens, S., Dell’Ariccia, G.Igan, D. and L. Laeven (2010), “Global linkages and global policies”, *Economic Policy*, vol. 62, pp. 267–93.

- Clark, B. (2011), "Inequality and The Great Recession", *Challenge*, vol.54, no.3, pp.56-79.
- Domeij, D. and M. Flodén (2010), "Inequality trends in Sweden 1978-2004", *Review of Economic Dynamics*, vol. 13, pp. 179-208.
- Feldstein, M. (1998), "Income Inequality and Poverty", *National Bureau of Economic Research*, Working Paper no. 6770, pp.1-12.
- Franzini, M. (2009), "Why Europe needs a Policy on Inequality", *Intereconomics*, November/ December, pp.328-332.
- Fuchs-Schündeln, N., D. Krueger and M. Sommer (2010), "Inequality trends for Germany in the last two decades: A tale of two countries", *Review of Economic Dynamics*, vol. 13, pp. 103-132.
- Georgopoulos, D., T. Papadogonas and G. Sfakianakis(2012), "Factors related to the depth of the latest crisis for EU-27 countries: The key role of relative inequality/poverty", *Economics Letters*, vol. 116, pp. 308-311.
- Gujarati, Damodar N. and Porter, D. C. (2009), "Basic Econometrics", Fifth edition, McGraw- Hill International Edition, Chapter 16 – Panel Data Regression Models, pp. 591-613.
- Haidar, J. I. (2012), "Sovereign Credit Risk in the Euro Zone", *World Economics*, vol. 13, No. 1, pp.1-15.
- Heathcote, J., F. Perri and G. Violante (2010), "Unequal we stand: An empirical analysis of economic inequality in the United States, 1967–2006", *Review of Economic Dynamics*, vol. 13, pp.15-51.
- Iacoviello, M. (2008), "Household Debt and Income Inequality, 1963-2003", *Journal of Money, Credit and Banking*, vol. 40, No. 5, pp.929-965.
- Johnson, D. S. and S. Shipp (1999), "Inequality and the business cycle: A consumption viewpoint", *Empirical Economics*, 24: 173-180.
- Kim, D. H. Huang and S. Lin (2011), "Kuznets hypothesis in a panel of states", *Contemporary Economic Policy*, vol. 29, No. 2, pp. 250-260.

- Krueger, D., F. Perri, L. Pistaferri, and G. Violante (2010), “Cross- Sectional Facts for macroeconomics”, *Review of Economic Dynamic*, vol. 13, pp. 1-14.
- Kuznets,S. (1955), “Economic Growth and Income Inequality”, *The American Economic Review*, vol. 45, No. 1, pp. 1-28.
- Neves, P.C. and S.T. Silva (2010), “Inequality and Growth: Uncovering the main conclusions from the empirics”, *FEP Working Paper*, No.381/2012, pp. 1-33.
- Nolan, B. (2009), “Income Inequality and Public Policy”, *The Economic and Social Review*, vol. 40, no. 4, Winter, pp.489-510.
- Ogwang, T. (1995), “The Economic Development – Income Inequality Nexus: Further evidence on Kuznets’ U- Curve Hypothesis”, *American Journal of Economics and Sociology*, vol. 54, No. 2, pp. 217-229.
- Parker, S. C. (1999), “Income inequality and the business cycle: a survey of the evidence and some new results”, *Journal of Post Keynesians Economics*, Winter 1998-1999, vol. 21, No. 2, pp. 201-225
- Pastor, J. M. and L. Serrano (2008), “Permanent income, convergence and inequality among countries”, *Review of Income and Wealth*, Series 54, No.1, pp. 105-115.
- Perri, F. and J. Steinberg (2012), “Inequality and Redistribution during the Great Recession”, *Economic Policy Paper*, No.12-1, pp. 1-15.
- Pijoan-Mas,J. and V. Sánchez-Marcos (2010), “Spain is different: Falling trends of inequality”, *Review of Economic Dynamics*, vol. 13, pp. 154:178.
- Reich, R. (2010), “Inequality in America and what to do about it”, *The Nation*, July 19/26, pp.13-15.
- Reinhart, C. M. and K. S. Rogoff (2011), “From Financial Crash to Debt Crisis,” *American Economic Review*, vol. 101, No. 5, pp. 1676-1706.
- Rodrigues, C. Farinha (2012), “Minimum Income in Portugal: changing the rules in times of crisis”, *Centre for Applied Mathematics and Economics*, Working Paper no.05/2012, pp.1-13.
- Stiglitz, J. (2009), “The global crisis, social protection and jobs”, *International Labour Review*, vol. 148, No. 1-2, pp.1-13.

Data Sources

http://www.cepr.org/press/dating_en.htm

http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database

<http://www.ine.pt>

<http://www.pordata.pt/Portugal>

<http://www.imf.org>

<http://www.worldbank.org/>

Annexes

Table 1: Matrix of correlations between variables

	GDPPC	UNEMPLOYMENT	GOVERNMENT_TRANSFERS	INCOME_TAXES_GDP	CONSUMPTION_TAXES_GDP	EDUCATIONAL	FINANCIAL_DEPTH	OUTPUT_GAP	INFLATION
GINI	-0,473	0,279	-0,344	-0,753	-0,174	-0,100	0,025	-0,003	-0,027
GDPPC	1,0	-0,475	-0,204	0,070	-0,166	-0,280	-0,053	0,130	0,050
UNEMPLOYMENT	-0,475	1	0,237	-0,092	-0,260	0,093	0,080	-0,515	-0,004
GOVERNMENT_TRANSFERS	-0,204	0,237	1	0,613	0,241	0,249	-0,117	-0,529	0,029
INCOME_TAXES_GDP	0,070	-0,092	0,613	1	0,084	0,256	-0,047	-0,162	0,008
CONSUMPTION_TAXES_GDP	-0,166	-0,260	0,241	0,084	1	0,256	-0,139	0,086	0,092
EDUCATIONAL	-0,280	0,093	0,249	0,256	0,256	1	-0,015	-0,063	-0,041
FINANCIAL_DEPTH	-0,053	0,080	-0,117	-0,047	-0,139	-0,015	1	0,001	-0,024
OUTPUT_GAP	0,130	-0,515	-0,529	-0,162	0,086	-0,063	0,001	1	-0,009
INFLATION	0,050	-0,004	0,029	0,008	0,092	-0,041	-0,024	-0,009	1

Table 2: E-views output from estimation of equation 4.1 with cross section and period fixed

Dependent Variable: GINI

Method: Panel Least Squares

Date: 09/14/13 Time: 19:06

Sample: 1995 2011 IF COUNTRY<->"luxembourg"

Periods included: 13

Cross-sections included: 13

Total panel (unbalanced) observations: 133

White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	20.84727	4.702082	4.433626	0.0000
GDPPC(-1)	0.027010	0.185925	0.145273	0.8848
GDPPC(-1)^2	-0.000270	0.001484	-0.181985	0.8560
GOVERNMENT_TRANSFERS(-...)	-0.119006	0.030531	-3.897819	0.0002
FINANCIAL_DEPTH	-4.59E-05	2.82E-05	-1.629274	0.1064
EDUCATIONAL(-1)	-0.109306	0.122833	-0.889875	0.3757
UNEMPLOYMENT(-1)	0.168931	0.080816	2.090320	0.0391
GINI(-1)	0.485436	0.080625	6.020942	0.0000
INFLATION(-1)	3.75E-05	6.31E-05	0.593924	0.5539

Effects Specification

Cross-section fixed (dummy variables)

Period fixed (dummy variables)

R-squared	0.936261	Mean dependent var	29.74962
Adjusted R-squared	0.915865	S.D. dependent var	3.408381
S.E. of regression	0.988636	Akaike info criterion	3.026080
Sum squared resid	97.74003	Schwarz criterion	3.743234
Log likelihood	-168.2343	Hannan-Quinn criter.	3.317504
F-statistic	45.90342	Durbin-Watson stat	1.811929
Prob(F-statistic)	0.000000		

Table 3: E-views output of estimation of equation 4.1 with cross section fixed

Dependent Variable: GINI
Method: Panel Least Squares
Date: 09/14/13 Time: 19:09
Sample: 1995 2011 IF COUNTRY<->"Luxembourg"
Periods included: 13
Cross-sections included: 12
Total panel (unbalanced) observations: 123
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.333424	3.526700	2.646504	0.0094
GDPPC(-1)	0.601525	0.258501	2.326976	0.0219
GDPPC(-1)^2	-0.007617	0.003909	-1.948333	0.0541
GOVERNMENT_TRANSFERS(-1)	-0.097634	0.035430	-2.755724	0.0069
FINANCIAL_DEPTH	-6.52E-05	1.65E-05	-3.941806	0.0001
EDUCATIONAL(-1)	-0.111539	0.127771	-0.872959	0.3847
UNEMPLOYMENT(-1)	0.215482	0.080453	2.678373	0.0086
GINI(-1)	0.507887	0.085492	5.940780	0.0000
INFLATION(-1)	-2.19E-05	3.12E-05	-0.703146	0.4836

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.928792	Mean dependent var	29.94715
Adjusted R-squared	0.915656	S.D. dependent var	3.461932
S.E. of regression	1.005416	Akaike info criterion	2.996427
Sum squared resid	104.1187	Schwarz criterion	3.453693
Log likelihood	-164.2803	Hannan-Quinn criter.	3.182168
F-statistic	70.70825	Durbin-Watson stat	1.825851
Prob(F-statistic)	0.000000		

Equation 4.2:

$$Gini_t = \beta_1 + \beta_2 GDPPC_{t-1} + \beta_3 GDPPC_{t-1}^2 + \beta_4 \left(Government_{transfers_{t-1}} \times Unemployment_{t-1} \right) + \beta_5 Financial_{Depth} + \beta_6 Educational_{t-1} + \beta_7 Unemployment_{t-1} + \beta_8 Gini_{t-1} + \beta_9 Inflation_{t-1} + \mu_{i,t}$$

Equation 4.3:

$$Gini_t = \beta_1 + \beta_2 GDPPC_{t-1} + \beta_3 GDPPC_{t-1}^2 + \beta_4 \left(Government_{transfers_{t-1}} \times Output_{gap_{t-1}} \right) + \beta_5 Financial_{Depht}_t + \beta_6 Educational_{t-1} + \beta_7 Output_{gap_{t-1}} + \beta_8 Gini_{t-1} + \beta_9 Inflation_{t-1} + \mu_{i,t}$$