Essays on Modelling Inequality and Interdependencies

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To my grandmother, Nihal Cokcoskun.

Essays on Modelling Inequality, Poverty and Interdependencies

by

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Abstract

In an attempt to include missing dimensions of well-being, Chapter 1 builds on the literature by proposing a novel multidimensional poverty measure building on Alkire-Foster methodology. Compatibility of the novel indicator is illustrated, by using a degree of overlap analysis between existing poverty indicators. I find that, the new method is highly consistent with the conventional measures of deprivation, and multidimensional poverty has been seen to decrease during the period of examination. Main determinants of hardship conditions and the severity of deprivation have also been identified in Chapter 1. Chapter 2 identifies similarities and consequential heterogeneities between OECD regions, in relation to the impacts of financial disturbances on their economies. This chapter is a joint work with my co-author Edgar Flores. The features and pass-through effects of macroeconomic and financial shocks across regions are examined through a novel multi-country weighting scheme proposed in Chapter 3, the results obtained by redefined linkages provide a comprehensive description of inter-regional interactions in OECD countries. Chapter 3 suggests a shift towards a meticulous definition of inequality that allows for the widening of the evaluative space via taking into consideration the redistributive role played by government through provision of public services by building upon the work of Malul et al. 2013. Another contribution of this Chapter is its proposed methodology; European interlinkages are redefined to cover not only the trade channel, but also financial exchanges, geographical proximities and bilateral migration flows, in an attempt to capture fully the depth and complexity of cross-country dynamics.The findings relate to the EU 2020 headline targets by displaying the short and long-term dynamics of income disparities, and they also provide further evidence of how heterogeneous the magnitude of poverty responses to such inequality developments is across European economies.

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'*Read [O Muhammad!] in the name of your Lord who created. He created man from a clot. Read, and your Lord is the Most Honourable who taught with the pen, taught man what he did not know.* '

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The final version of Chapter 1, entitled A novel look at multidimensional poor in the United Kingdom: How poor is poor? has been presented at the following conferences:

- 49^{th} Annual Conference of the Canadian Economic Association, Ryerson University, Toronto, Canada, May 2015.
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- 64^{th} Annual Meeting of the French Economic Association, Rennes, France, June 2015.
- Scottish Economic Society Annual Conference, Perth, Scotland, April 2015.
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Chapter 2 is a joint work with my colleague Edgar Flores.

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Chapter 1

Introduction

First Chapter aims at providing an in-depth analysis of deprivation in the UK, it adds to previous contributions mainly by suggesting a shift towards a novel definition of poverty that allows for the widening of the evaluative space by incorporating socially inclusive human aspects by building upon the work of Alkire and Foster (2010). More specifically, it consists of fourteen indicators that are taken from EU Statistics on Income and Living Conditions (EU-SILC), which in combination, represent the multidimensional well-being of the individuals: three each for health, and income, two for housing and six for the living standards. A broad set of measures is estimated, ranging from raw headcount ratios by indicator and the multidimensional headcount ratio with different deprivation cut-offs in an attempt to allow policy makers to identify economically weak households more accurately. To disentangle how multidimensional inequality indicator differs from the conventional measures further, households are disaggregated by respective cut-offs to examine the degree of overlap. Finally, by estimating probit regressions with a series of socio-economic characteristics of individuals, the main determinants of hardship conditions and the severity of multidimensional deprivation have been identified. I find that further education, owner occupancy, and being married are associated with lower probabilities of being deprived in multiple life domains, whilst unemployment and being female increases the probability of being multidimensionally unequal.

Chapter 2 analyses how regions formed by different OECD member states react to various exogenous shocks. This Chapter is a joint work with Edgar M. Flores and takes a broader view of international linkages, whereas the subsequent Chapter takes a European perspective and extend the framework to analyse inequality linkages. Findings show that Southern European country group (Greece, Italy, Portugal and Spain) display a high degree of vulnerability in relation to shocks to its financial variables. On the other hand, The Euro-A region (Austria, Belgium, Finland, France, Germany, Ireland and Netherlands) is far less sensitive to own and inter-regional shocks when compared to Southern European group. Results also suggest that Asia- Pacific region appears to be less exposed to regional financial spill-overs, whereas the NAFTA region (Canada, Mexico and the United States) is capable of generating synchronous and generalised responses in the other regions in such a way that these could be seen as responses to global disturbances.

Chapter 3 suggests a shift towards a meticulous inequality measurement that takes the redistributive role played by the government through provision of public services. Another distinctive feature of this Chapter is its proposed methodology; interdependencies between European countries are defined through a multidimensional link matrix which consists of trade, financial and migratory exchanges in addition to geographical proximities in an attempt to fully capture the depth and complexity of cross-country dynamics. In consideration of EU 2020 headline targets, findings display short and long-term dynamics of income disparities, and also provide further evidence on the heterogeneous magnitude of poverty responses to such inequality developments across European economies. The results also seem to suggest that the transmission of a change in Eurozone economic performances to the extent of income inequality is statistically significant. The evidence found in Chapter 3 also confirms that, for the majority of the European countries, changes in income distribution have clearly been large enough to create a substantial impact on poverty. To the best of my knowledge, neither modified income quintile measure, nor multidimensional linkages have been used in the literature yet.

Chapter 2

A novel look at multidimensional poverty: How poor is *poor* in the United Kingdom?

Chapter Abstract

By building upon the work of Alkire and Foster (2011) a multidimensional poverty measure (MPI), which includes missing dimensions, closely related to the well-being of individuals is constructed in this paper. Using data from the EU Statistics on Income and Living Condition, this paper provides a fresh insight into the analysis of multidimensional poverty in the United Kingdom. Another distinctive feature of the study is the use of polychoric factor loadings to estimate dimensional weights of the MPI, in addition to more arbitrary weighting schemes. Findings indicate that, MPI is highly consistent with the conventional measures of poverty, and multidimensional poverty has been seen to decrease during the period of examination. Results also suggest that further education, home ownership, and being married are associated with lower probabilities of being deprived on multiple life domains, whilst larger households, unemployment and being female increases the probability of experiencing multidimensional poverty.

2.1 Introduction

As Sen puts it, 'the role of income and wealth has to be integrated into a broader and fuller picture of success and deprivation' (Sen, 1976). With this in mind, in an attempt to demonstrate how the non-monetary dimensions can explain the extent of poverty in the United Kingdom, this study sets up a poverty analysis which incorporates Sen's view of poverty as capability deprivation and builds on the multidimensional poverty measure (MPI) introduced by Alkire and Foster (AF) (2011). The United Kingdom has seen a significant rise in material deprivation rates, between 2008 and 2011, almost 33 per cent of Britons experienced poverty at least once (Office for National Statistics, 2015). Determining who the most deprived social groups are and in which life domains they are experiencing deprivation is vital to generate a more efficient, holistic poverty reduction plan. Few available studies have focused on measuring poverty in the UK from a multidimensional perspective, nevertheless, they either give a national average (e.g., Whelan *et al.*, 2014; Alkire *et al.* 2014) or restrict their analysis to measuring multiple deprivations (e.g., Noble *et al.*, 2006; Whelan *et al.*, 2002) with an emphasis on health outcomes

(e.g., Jordan *et al.*, 2004; Adams and White, 2006; Walsh *et al.*, 2014).

This paper makes three major contributions to poverty analysis in the United Kingdom.

First, the paper focuses on examining the level of multidimensional poverty in the UK by incorporating a socio-economic dimension into poverty measurement *per se*. This study, to the best of our knowledge, is the first to estimate multidimensional poverty in the United Kingdom by applying the Alkire-Foster methodology to the EU-Statistics on Income and Living Conditions (EU-SILC) providing a detailed reflection of various socio-demographic characteristics of the households living in the UK.

Secondly, in addition to equal and nested equal weights, the study employs a data-driven approach, using polychoric factor loadings to estimate dimensional weights for the MPI is preferable to the common practice of using more arbitrary (e.g., equal or nested equal) weights.

Thirdly, the study analyses the potential advantages of a multidimensional approach to poverty measurement relative to a unidimensional point of view and to the EU's material deprivation measure, and the extent to which the multi-dimensionality of poverty is captured by these traditional measures. The divergence between unidimensional poverty and multidimensional notions of poverty has been noted by several authors (e.g., Costa, 2003; Hulme and McKay, 2007). The key aims that such an exercise would like to address are the extent of overlap between these measures as well as a comparison of multidimensional and objective methods of measuring poverty.

This paper is divided into the following five sections: The subsequent section outlines the current situation in the UK, and provides a detailed presentation on the set of indicators and data that are used to reflect dimensions of multidimensional deprivation in the UK. Section 3 explains: (1) Alkire and Foster's methodology (2) the methods used to find numerical weights for dimensions of poverty and discusses how polychoric weights can enhance existing methodologies by offering a clear specification of the weighting scheme through reflecting the intensity of multidimensional deprivation. Overlaps with the EU material deprivation and unidimensional poverty are presented in Section 4.1. Section 4.2 presents the headcount poverty ratios to provide a stark picture of multidimensional poverty in the UK. Section 4.3 reports the results of a substantive empirical application in the United Kingdom that seeks to explain multidimensional poverty by socio-demographic characteristics. Finally, concluding comments and policy implications are given in Section 5.

2.2 Selecting dimensions, indicators: Data and the English context

The first step of the multidimensional approach begins with the selection of various dimensions. Plausible dimensions that are a measure of multiple deprivations are quite abundant and should consist of empowerment, health, education, standard of living, work, and environment among the rest (Alkire and Santos, 2010). However, formulating a multifaceted phenomenon encompassing deprivations among multiple life domains clashes with disagreement (Alkire and Santos, 2010). To find the set of indicators and dimensions, which would be best suited for the UK as a first cut, the study utilizes existing evidence to guide the preliminary choice of indicators. It is noteworthy to mention that, this paper does not intend to describe a list of indicators that should constitute a multidimensional well-being measure.[1] The empirical analysis presented in this study is based on data from the 2008/9 wave of the European Union Statistics on Income and Living Conditions Survey (EU-SILC), a household survey, aimed at collecting timely and comparable cross-sectional and longitudinal multidimensional microdata on income, poverty, social exclusion and living conditions (EUROSTAT definition). The EU-SILC has been chosen as the relevant dataset because of the comparative wealth of material it covers on multiple dimensions of deprivation, which are crucial for the present analysis, as well as on low income and material deprivation. The data are weighted using the sampling weights supplied with the EU-SILC.

This paper particularly seeks to focus on three overlapping methods as a step towards choosing life domains and dimensions as a first cut: normative assumptions; data availability and builds upon the structured evidence-based literature -namely empirical evidence- regarding multi-faceted and inter-linked nature of deprivation in the UK. In particular, to sharpen the focus of the MPI for the UK, this study concentrates on life domains that: a) are considered to be important for the British society b) are an applicable spotlight aspire for public policy, and c) enable empirical explorations (Alkire and Santos, 2010). Second cut is to measure the importance of validity and reliability of the selected indicators and dimensions -namely internal consistency- with Cronbach's alpha. Selected dimensions are characterized by the high levels of the Cronbach's alpha reliability index, which is based on the average correlation between the component items. The results have been found to be satisfactorily high and indicate high reliability as well as internal consistency.[2] The four dimensions of multidimensional poverty available in the EU-SILC, which correspond to the concept of poverty as outlined in the study are: (i) general health, (ii) living standards, (iii) housing deprivation, and (iv) financial deprivation; three indicators each for health, and income, two indicators for housing and six indicators

[1] Further work with major contributions on the indicators that a well-being measure should take into consideration, see among others: Arrow *et al.* (2006), and Eid *et al.* (2008), Alkire and Santos (2010), and Alkire *et al.* (2014).

[2] See Cronbach (1951) and Appendix A, Table A.2.1 for further details.

for living standards (see Appendix A, Table A.1.1).

The first set of indicators deals with *living standards* and draws on 5 indicators reflecting the capabilities of possessing adequate resources across the life course to enjoy a decent standard of living. These needs are: consumption of meat or proteins at least every other day, ability to provide adequate heating of dwelling, ability to spend a week long holiday away from home at least once a year, quality of the environment and problems with the dwelling. Dietary requirements are taken as the first indicator within the living standards dimension. Table 2.2.1 examines the deprivation ratio in each dimension and shows that a minimally acceptable diet is a normal element for many households. The next indicator in the same dimension is *leisure activities* while the other set (6^{th} and 7^{th}) of indicators draws on top necessities relating to whether the respondent's accommodation has: adequate heating; and adequate housing conditions (i.e. a leaky roof; damp walls, floors or other; and rot in the windows or floors). In terms of leisure activities, as far as economically weak households are concerned, many of them *could not afford a one-week holiday away from home* in 2008. The third and fourth set of items are related to multiple exposures to risk factors in the neighbourhood, with the assumption that households wish to avoid: a) *crime, and vandalism* and b) *pollution, grime or other environmental problems.* As shown in Table 2.2.1, crime and environmental pollution are identified as one of the most serious problems associated with respondents' neighbourhood.

Financial deprivation, being central for almost every form of subjective poverty, is included as a dimension itself. Three main indicators jointly provide a balanced assessment of capabilities: capability to face unexpected expenses (i.e. EU-SILC definition: a required expense could be surgery, funeral, major repair in the house, or replacement of durables), arrears on hire purchase instalments or other loan payments (i.e. whether the household has been in arrears in the last 12 months that is, unable to pay as scheduled repayments for hire purchase or other non-housing loans. Other loans include all type of commercial credits) and ability to make ends meet (the objective is to assess the respondent's feeling about the level of difficulty experienced by the household in making ends meet, EUROSTAT). Next set reflects the household's capability of paying its rent, mortgage, other loans and utility bills of the dwelling and is related to financial stress of the housing facilities: *financial burden of the total housing cost* and *arrears on mortgage or rent payments.* As shown in Table 2.2.1, housing cost was generally the most progressively growing category in this deprivation segment. Health constitutes the final dimension and it consists of three main indicators, that reflects a more holistic picture of the health outcomes, although related, depart significantly from standard health indicators: two each for presenting a balanced assessment of *access to health services* in the household and one draws on health-driven limitations associated with financial difficulties that limit day to day activities. The third indicator uses data on the persons' self-assessment of whether they are *hampered in their usual activity*, as activities people usually do, by any ongoing physical or mental health problem, illness or disability linked to financial challenges.

Table 2.2.1: Deprivation in each indicator

Indicator	**2008**	**2009**
Capacity to afford a meal with meat, chicken, fish every second day	5.28	4.92
Ability to keep home adequately warm	6.87	6.78
Leaking roof, damp walls/floors/foundation, or rot in window frames or floor	14.00	13.74
Capacity to afford paying for one week annual holiday away from home	22.42	24.84
Pollution, grime or other environmental problems	12.38	12.08
Crime violence or vandalism in the area	24.45	24.70
Capacity to face unexpected financial expenses	27.00	28.00
Arrears on hire purchase instalments or other loan payments	5.95	6.75
Ability to make ends meet	43.54	42.32
Unmet need for medical examination or treatment	4.30	4.32
Unmet need for dental examination or treatment	6.03	6.69
Limitation in activities because of health problems	20.55	22.05
Arrears on mortgage or rent payments	5.55	7.34
Financial burden of the total housing cost	73.30	70.02

2.3 Methods

2.3.1 Alkire-Foster multidimensional poverty measures

Multidimensional poverty approach has been extensively researched by a substantial body of literature (see among others, Alkire and Santos, 2010; Alkire and Foster, 2011; Alkire *et al.*, 2015; Trani *et al.*, 2016; Mitra *et al.*, 2013; Mitra, 2016) owing to its multiple advantages (Trani et al. 2016). However, a single measure that is constructed to illustrate the multidimensional nature of poverty brings along some limitations that require cautious attention (Trani et al. 2016). Several strands of literature have discussed the weaknesses associated with the constituents of poverty, selection of dimensions and correlations among them, ranking and translation of ranking into weights, as well as the selection of the cut-off for each of those dimensions (Ravaillion, 2011). Numerous studies have discussed the challenges of employing a dual cut-off method as well as the weighing scheme within the selected dimensions (Ravallion, 2011; 2012; Silber, 2011; Chakravarty and DAmbrosio, 2006; Jayaraj and Subramanian, 2010; Rippin, 2010; 2011).

Rest of the multidimensional poverty methodology used in the paper comes from the properties presented by Alkire and Foster (AF, 2011): $\Delta(Y) : M^n \longrightarrow \Re^j_+$ is a real valued function that comprises of a categorical selection of dimensions, indicators, and weights that compute

deprivation in d dimensions among n individuals. Consider a population of n individuals, indexed by $i = 1, ..., n$ with $n \geq 2$. Each individual is allotted with j strictly positive attributes of well-being whose quantities are measured in a mutual comparable way. All the possible distributions of attributes can be associated with j-dimensional deprivation index that belongs to the set $\Re_+$ of real numbers greater than or equal to zero.

Let $y = [y_{ij}]_{n \times d}$ present the non-negative attainments for individual i across j dimensions, and let $y_i = [y_{i1}, ..., y_{ij}]$ summarize these attainments where $y_i \in \Re_+$. Thus, each row vector $y_i = [y_{i1}, ..., y_{id}]$ corresponds to individual i's attainment given the entire attributes of well-being. Whereas, each column vector $y_{.j} = [y_{1j}, y_{2j}, ..., y_{nj}]$ collects distributions of attainments in dimension j of the n individuals in the society. Achievement vectors across n individuals are collected by the distribution matrix Y with M^n the set of all $n \times j$ matrices with strictly positive elements (Alkire and Foster, 2011).

$$Y := \begin{bmatrix} y_{11} & y_{12} & y_{13} & \dots y_{1j} \\ y_{21} & y_{22} & y_{23} & \dots y_{2j} \\ \vdots & \vdots & \ddots & \vdots \\ y_{n1} & y_{n2} & y_{n3} & \dots y_{nj} \end{bmatrix}_{i \times j} \qquad \in M^n$$

Individual achievements are then combined through a social welfare function that assigns a welfare level for each distribution of attributes across individuals. Particularly, M_0, j dimensional poverty index, corresponds to a real valued function $W(Y) : M^n \to \Re_+$ underlying the derivation of $\Delta(Y)$, and it allows weighting each dimension of well-being differently. Let $w^0 = W(Y)$, be the level of welfare attained by Y, then if W(.) satisfies the standard axioms of anonymity, continuity, monotonicity and equity preference, a weighting vector w can be defined such that w_j is the weight applied to dimension j (Alkire and Foster, 2011).

2.3.2 Weighting dimensions: equal and polychoric weighting schemes

A plethora of weighting approaches have already been discussed in the literature with respect to the selection of weights for multidimensional measure of poverty or well-being to examine the significance of each dimension and whether how to aggregate them (e.g., Deutsch and Silber, 2005; Krishnakumar, 2007; Decancq and Lugo, 2013; Maasoumi and Xu, 2015). Decancq and Lugo (2012) provide an overview of three different methodologies, which are also employed within literature to set the weights in empirical applications of multidimensional measures of wellbeing and each is more convenient for a particular purpose: (i) normative (ii) data driven and (iii) hybrid. Within the category of normative weights two kinds of weighting approaches are analysed, Decancq and Lugo (2012) : equal/arbitrary and expert-based approaches.[3] Normative weights are determined on value judgements of a specific panel of researchers or the

[3]For a more detailed comparison and classification of these approaches, refer to (Decancq and Lugo, 2013).

wider participant group in the study. The most commonly used approach to weighting in multidimensional measures of well-being is to assume an equal value for each dimension, in which the relevant dimensions are weighted equally. This approach assumes the trade-off across the dimensions to be constant at all the levels of achievements, and this is mainly driven by the idea of an equivalent importance of dimensions and indicators within each dimension. Well known examples of such weighting scheme include leading aggregate indices like UNDP's Human Development Index (HDI) (Anand and Sen, 1997), the Human Poverty Index (UNDP, 2013) and the Multidimensional Poverty Index (MPI) by Oxford University (Alkire and Foster, 2011). However, this approach has often been defended for its agnostic viewpoint (Decanq and Lugo, 2012), attributed to its simplicity or from the acknowledgement that every indicator is just as equally important. One of the most influential proponents of this weighting scheme, Atkinson *et al.* (2002) argued in favour of a balanced portfolio of indicators across different dimensions of proportionate weights across indicators.

Decancq and Lugo (2012) present multivariate statistical weighting techniques, and the first descriptive approach within the context of well-being and poverty indices is factor analysis, mainly known as latent variable models (e.g., Schokkaert and Van Ootegem, 1990; Krishnakumar and Nadar, 2008). The second approach, principal component analysis (PCA) is the most commonly used descriptive technique in the welfare indices development that aggregates several dimensions into a single wellbeing measure (Maasoumi, 1986; Klasen, 2000; Noorbaksh, 1998; Vyas and Kumaranyake, 2006; Howe *et al.*, 2008). Even though multivariate statistical approaches are regarded as a more objective way of determining weights (Boelhouwer, 2010), some conceptual issues come up with the use of these approaches: First, most of these methods generally assume a linear form although some of the techniques could overcome this problem (Decancq and Lugo, 2013). Second, provided that aggregation and weights are data-specific they can differ from one point in time to the next, and from country to country (Decanq and Lugo, 2013). Here, it is noteworthy to mention that, Alkire and Foster utilize equal weights in the empirical illustration of their measure; however the measure they propose in the theoretical part of the paper is much more flexible than this and does not necessarily require equal weights, which enables the application of polychoric PCA weights (Alkire and Foster, 2010). Also, in a recent paper, Alkire *et al.* reflect on the robustness of MPI rankings in the particular selection of weights and poverty cutoffs (Alkire *et al.*, 2010).

Polychoric correlations are particularly formulated for categorical variables.[4] For generating the data-driven weights, polychoric principal component analysis is applied to the raw dataset and the factor loadings of the first component are subsequently used to estimate the score for each individual within the household sample (Kolenikov and Angeles, 2008): First, the set of initial indicators within each dimension of well-being is transformed into an equal number of

[4]For further work with major contributions, see Pearson and Pearson (1922) and Olsson (1979) who introduced concepts of polychoric and polyserial correlations.

mutually uncorrelated linear combinations of indicators. Then, the proportion of the variance as explained by each of these linear combinations is computed, and the weights are obtained from the linear combination that explains the largest proportion of the variance.[5] Another significant advantage comes from polychroic PCA's use of ordinal data, which becomes even clearer when moving from theory to practice (Kolenikov and Angeles, 2004). For instance, as far as the economically weak households are concerned, researches are likely to judge 'accessing daily basic needs' to be more important than 'going for a holiday'. Another important advantage of the polychoric approach is that it computes the coefficients of both owning and not owning an asset (Kolenikov and Angeles, 2004). Results of the computations based on polychoric and equal weighting schemes are shown in Table 2.3.1.

Table 2.3.1: Dimensions and Weights

Indicator	**Equal weights**	**Polychoric weights**
Capacity to afford a meal with meat, chicken, fish every second day	0.04	0.3892
Ability to keep home adequately warm	0.04	0.3451
Leaking roof, damp walls/floors/foundation, or rot in window frames or floor	0.04	0.2966
Capacity to afford paying for one week annual holiday away from home	0.04	0.3671
Pollution, grime or other environmental problems	0.04	0.4138
Crime violence or vandalism in the area	0.04	0.3826
Capacity to face unexpected financial expenses	0.08	0.3785
Arrears on hire purchase instalments or other loan payments	0.08	0.3174
Ability to make ends meet	0.08	0.3509
Unmet need for medical examination or treatment	0.08	0.5036
Unmet need for dental examination or treatment	0.08	0.4795
Limitation in activities because of health problems	0.08	0.4314
Arrears on mortgage or rent payments	0.125	0.3145
Financial burden of the total housing cost	0.125	0.3461

However, before applying polychoric analysis, the appropriateness of this method should be checked in relation to the data. Cronbach's alpha is a commonly used analysis of internal consistency that measures the suitability of the indicators included in the composite index to answer the question of multidimensional well-being and capabilities (Cronbach, 1951). The maximum possible value of the coefficient is one, and a Cronbach's alpha of 0.6 or higher is accepted as sufficient enough to justify the application of polychoric PCA (Nguefack-Tsaegue *et al.*, 2011). Test results suggest that internal consistency ranges between 0.72 and 0.78. As it is, the procedure output has an overall raw alpha of .78 (rounded from .7817 from the test scale) which is good considering that Nunnaly (1978), the most authoritative work of its kind, has indicated 0.7 to be an acceptable reliability coefficient.

Polychoric weighting approach consists a maximum likelihood estimation to derive factor

[5]See Kolenikov and Angeles (2008) for further details on socioeconomic status measurement with discrete proxy variables.

loadings from polychoric analysis. Let the reported attainment of well-being y_i is ordinal with categories 1,...,d_j, then it is assumed that they are calculated by discretizing the underlying y^*_{ij} according to the set of thresholds $\alpha_{i1}, ..., \alpha_{i,dj-1}$ (Kolenikov and Angeles, 2009).

$$Y_i = r \qquad if \qquad \alpha_{i,r-1} < Y^*_i < \alpha_{i,r} \tag{2.3.1}$$

where

$$\alpha_{i,0} = -\infty, \qquad \alpha_{i,0} = \infty \tag{2.3.2}$$

As outlined in Kolenikov and Angeles (2009), derivation of factor loadings from polychoric analysis consist of maximum likelihood estimation, and it is possible to recover the correlation between the starred variables. Thus, according to the set of thresholds $\alpha_{i1}, ..., \alpha_{i,dj-1}$ the study calculates the underlying reported attainment of well-being y^*_{ij}. Define two variables, y^*_{11}, y^*_{12} with distribution:

$$\begin{pmatrix} y^*_{11} \\ y^*_{12} \end{pmatrix} \sim N\left(0, \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix}\right) \quad , -1 \leq p \leq 1 \tag{2.3.3}$$

Thresholds for the variables are obtained by (Kolenikov and Angeles, 2009):

$$\alpha_{1,0} = -\infty < \alpha_{1,1} < ... < \alpha_{1,d_1-1} < \alpha_1, d_1 = \infty \tag{2.3.4}$$

$$\alpha_{2,0} = -\infty < \alpha_{2,1} < ... < \alpha_{2,d_2-1} < \alpha_2, d_2 = \infty \tag{2.3.5}$$

Maximizing over ρ and α, we obtain the polychoric correlation of y_{11} and y_{21}. The maximum likelihood estimate of ρ is obtained by maximizing:[6]

$$logL(\rho, \alpha; y) = \Sigma^n_{i=1} log\Pi(y_{11}, y_{12}; \rho, \alpha) \tag{2.3.6}$$

2.3.3 Dual cut-off method: classifying who is deprived

For the remainder of this section, I follow AF methodology (Alkire and Foster, 2011). Next stage defined by AF methodology consists of a two-step procedure *(dual cut-off method)* which uses two different types of cut-offs to classify who is deprived among the households (Alkire and Foster, 2011): Households who are deprived in any well-being dimension are identified in the first step. Let z be the vector of deprivation lines for each of well-being dimensions, such that

[6]See Kolenikov and Angeles (2009) for a detailed mathematical derivation of polychoric estimates.

$z_j > 0$ represents the deprivation cut-off in dimension j. A matrix of deprivations $g^0 = [g^0_{ij}]$ is then defined, where a typical element is g^0_{ij} defined by $g^0_{ij} = w_j$ when $z_j > y_{ij}$. That is, ij^{th} entry of the matrix is equivalent to the dimensional weight, w_j when person i is deprived in dimension j (Alkire and Foster, 2011). *Vice versa*, if individuals i's achievement in dimension j is greater then the deprivation cut off in dimension j, that person is not considered as deprived and ij^{th} element takes the value of zero:

$$g^0_{ij} = w_j \qquad if \quad z_j > y_{ij} \tag{2.3.7}$$

$$g^0_{ij} = 0 \qquad if \quad y_{ij} > z_j \tag{2.3.8}$$

From the matrix of deprivations, g^0, a column vector c that represents the deprivation counts is constructed whose i^{th} entry $c_i = \Sigma^d_{j=1} g^0_{ij}$ represents the sum of weighted deprivations suffered by person i (Alkire and Foster, 2011).

$$c = \begin{bmatrix} c_1 \\ c_2 \\ . \\ . \\ . \\ c_n \end{bmatrix} \tag{2.3.9}$$

Cross dimensional cut-off, represented by $k > 0$ is the sum of weighted indicators in which a household must be deprived to be identified as multidimensionally poor, and is applied across this column vector c. k, in other words, is a policy variable that governs the range of simultaneous deprivations, each deprived household necessarily must have. As k goes up, the number of households who will be considered as deprived goes down, while the intensity of deprivations goes up. In a more conventional notation (Alkire and Foster, 2011):

Let ρ_k, $\rho : \Re^d_+ \times \Re^d_{++} \to (0, 1)$ be the identification function that maps from person i's achievement vector $y_i \in R^d_{++}$ and cut off vector z in $\Re^d_{++}$ to an indicator variable. Note that, $\rho_k(y_i, z)$ takes a value of 1 (if individual's weighted deprivation count is greater than or equal to k) or 0 depending on the vectors of achievements and deprivation cut-offs to finalize the identification process of the deprived households by counting the number of indicators a person is deprived in (Alkire and Foster, 2011, p.478).

$$\rho_k(y_i, z) = 1 \qquad c_i \geq k \tag{2.3.10}$$

$$\rho_k(y_i, z) = 0 \qquad c_i < k \tag{2.3.11}$$

Finally, the information about deprived individuals are aggregated into the population-wide measure MPI by censoring their deprivations. For this, a censored matrix that counts zero deprivations for those which are not identified as multidimensionally poor is used. In other words, a censored matrix counts $c(k) \rightarrow c_i(k) = c_i\rho(y_i, z)$ for $i = 1, ..., n$.[7] Thus, the average deprivation share across the deprived households can now be written as (Alkire and Foster, 2011):

$$A = \Sigma_{i=1}^{n} \frac{c_i(k)}{dq} \tag{2.3.12}$$

The average of this fraction among those who are deprived (q), is precisely A; the intensity of multidimensional deprivation. H, on the other hand, represents the incidence of multidimensional poverty such that $H = \frac{q}{n}$ is the fraction of number of deprived people (q) and the population. Moreover, MPI, M_0 can also be expressed as the product of these two intuitive measures, $H \times A$. As a consequence, M_0 not only provides information on the incidence of deprivation, but also provides further insight in terms of the intensity of deprivation. This is indeed a very important advantage over any headcount ratio, since they generally do not reflect the intensity of deprivation (Alkire and Foster, 2011).[8]

2.4 Results

2.4.1 Synergies among monetary, multidimensional and material poverty: investigating overlap of poverty indicators

EU-SILC is chosen over household surveys such as the Understanding Society to enable an analysis of a direct comparison of the poverty incidence based on relative income poverty, material deprivation and that based on the multidimensional index. One of the principal questions that such an analysis would like to point out is the overlap between the three measures. Considering the households recognised as deprived by the three measures to be similar, the study's multidimensional measure can be considered as a good proxy for capturing overall well-being. Besides, such comparison on the basis of the degrees of overlap, not only provides meaningful insights in terms of consistency for the selected indicators to capture the actual level of well-being, but also ensures compatibility, and accordingly explores how well the novel

[7] Note that, c_i/d is the share of deprivations experienced by a deprived person i and represents the fraction of weighted indicators in which the poor person i is deprived.

[8] For a more detailed mathematical derivation, see Alkire and Foster, 2011.

measure matches the existing well-being measures over the entire panel (Acar, 2014).

For the purpose of this analysis, relative income poverty is calculated for the entire sample in comparable terms that varies one-for-one with the standard of living; also the relative poverty threshold is defined as 60 per cent of the median equivalised disposable income of the entire sample. The material deprivation measure is on a nine-item deprivation index referring to a state of economic strain and durables, defined as the enforced inability (rather than the choice not to do so, EU-SILC) to pay unexpected expenses, afford a one-week annual holiday away from home, a meal involving meat, chicken or fish every second day, the adequate heating of a dwelling, durable goods like a washing machine, colour television, telephone or car, being confronted with payment arrears (mortgage or rent, utility bills, hire purchase instalments or other loan payments, EU-SILC definition). Here, the respondents have been classified as being materially deprived where they experience an enforced lack at least three deprivation items (see also Nolan and Whelan, 1996), then the study calculates material deprivation ratios for the entire sample, according to Eurostat's EU-material deprivation indicator.[9] To disentangle this further, households are disaggregated by respective cut-offs for each indicator, based to a large extent on international consensus to examine the overlap degree (Acar, 2014).

Table 2.4.1: Degree of overlap between measures (percentage, in total sample)

Weighting Scheme	**Cut-offs**	**EU Material Deprivation**	**Relative Income Poverty**
Equal weights	5 indicators	88.11	79.04
	6 indicators	86.70	80.91
	7 indicators	85.48	81.63
	8 indicators	84.76	81.22
	9 indicators	84.46	81.22
Nested equal weights	(40 percent)	86.64	78.65
	(50 percent)	85.11	80.75
	(60 percent)	87.74	81.17
Polychoric weights	(50 percent)	87.95	76.02
	(60 percent)	87.54	79.04

In a close look at the overlapping ratios between the first weighting scheme and EU material deprivation rate, Table 2.4.1 shows that in the matched data, nearly 84 per cent (ranging between 86.7 to 84.46 per cent) of those who are multi-dimensionally poor are also materially deprived. In addition, as might be expected, the degree of overlap in the second weighting scheme is similar to that observed in the first, where a significant proportion of households that are multi-dimensionally poor also have an enforced lack of three material deprivation items.

[9]see Appendix A.2 for the methodology applied for the computation of the statistical indicators pertinent to the subject area of EU Material deprivation within the overall domain of income and living conditions.

The degree of overlap between the third benchmark scheme (where indicators are weighted with the factor loadings of polychoric analysis) is also highlighted in the analysis. This finding indicates that, of those who are materially deprived on this measure, around 78 per cent are also deprived of multiple life domains.

The degree of overlap between polychoric figures and relative income poverty achieves a match ratio between 76-87 per cent, given the respective cut-offs. The overlap ratio between relative income poverty and the first two benchmark schemes is indicative of high consistency and ranges between 81-79 of the sample households. This evidences the comparability of these two indices for about 76-79 per cent of the sample, in terms of assigning a similar status to a randomly drawn household from the sample. Overall, the study results reveal that there is no significant lack of overlap between the two measures since deprived/non-deprived status match ratios range between high 0.70s to low 0.80s of the sample households. This is a promising picture in terms of consistency for the indicators selected to capture deprivation on multiple life domains.

2.4.2 Overview of multidimensional poverty

Deprivations originating in the UK appear to elicit a moderate impact, and the relevant statistics for the adjusted headcount ratios, across the study sample of UK households, have been reported in Table 2.4.2. Trends in relative income poverty show that the proportion of the households with income below the median income poverty line experienced limited change over the period of interest. Moreover, the percentage of households in poverty declined from 18.87 per cent in 2008 to 17.74 per cent in 2009 across the study sample.

As opposed to modest changes in relative income poverty, this pattern is much more pronounced for EU material deprivation rates. Around 18.58 per cent of the sample households were found to have suffered from material deprivation in 2008, which decreased further to 16.28 per cent in the following year. The pattern for multidimensional poverty is rather similar over the same period, irrespective of any cut-off used. Multidimensional poverty indicators that are weighted with the factor loadings of polychoric analysis have declined at a faster pace than the other two weighting schemes. Additionally, with the increase in the number of considered cut-offs, the proportion of the population identified as deprived normally shows a decrease. These findings indicate a change in the poverty with the use of diverse weighting schemes.

2.4.3 Empirical application and results

This section seeks to explain multidimensional poverty as well as income poverty and material deprivation by socio-economic characteristics. Findings of the existing literature on poverty in

Table 2.4.2: Deprivation headcount rates (percentage, across the sample)

Deprivation headcount rates		**2008**	**2009**
OECD Relative income poverty		18.87	17.74
EU material deprivation		18.58	16.28
Multidimensional Poverty			
Equal weights	5 indicators	9.70	9.56
	6 indicators	4.56	4.03
	7 indicators	1.97	1.48
	8 indicators	0.68	0.43
	9 indicators	0.23	0.15
Nested equal weights	40 percent	10.08	9.83
	50 percent	2.88	1.83
	60 percent	1.09	0.50
Polychoric weights	40 percent	35.81	35.19
	50 percent	18.03	17.18
	60 percent	7.68	7.53

the UK (as discussed in section 2), are of interest as they reveal that age, gender, household size, marital status may be associated with an individual's probability of facing a disadvantage in various ways. Therefore, within the UK context and given the data available for the selected sample the following categories have been taken into account: the gender, the age of the individual and its square, the level of education, the marital status, and employment status. Another set of variables, which is used to capture household characteristics includes, household size, the composition of the household and number of children. Different characteristics of households that are closely related to earning capabilities are accounted for, as dummy variables that indicate whether households are home owners or recipients of social transfers (both individual and household level benefits). Then, the severity of hardship conditions experienced by the UK society has also been analysed to explore, if some socio-economic categories exhibit higher risks of experiencing poverty in multiple life domains. For this analysis, a random effect probit model is estimated for any and all weighting schemes by all the measures at the possible cut-offs, where the dependent variable is equal to zero if the person is not deprived, and one otherwise. First set of weights has been derived from factor loadings of polychoric analysis, and for sensitivity analysis, alternative weighting schemes weight indicators and dimensions equally are represented in Appendix A, Table A.4.1 and Table A.5.1.

The probability of deprivation is dependent on many variables. Let Y_i is a binary variable equal to 1 if the i^{th} individual is deprived, and 0 otherwise. Hence, the outcomes are presented

by a binary indicator variable Y_i as follows:

$$Y_i = \begin{cases} 1 \text{ if } \quad Y_i^* & \textit{deprived in multiple life domains} \\ 0 \text{ if } \quad Y_i^* & \textit{is non-deprived} \end{cases}$$

$$Pr(Y_i = 1|X_i) \quad = \quad 1 - \Phi[-X_i'\theta], \tag{2.4.1}$$

$$Pr(Y_i = 0|X_i) \quad = \quad \Phi[-X_i'\theta], \tag{2.4.2}$$

where Y_i^* is the deprivation indicator, Pr denotes probability, Φ is the Cumulative Distribution Function and X_i denotes above mentioned exogenous socio-demographic characteristics in the model. Table 2.4.3 presents the results of a probit regression model, which estimates the probability of experiencing multidimensional poverty, income poverty, as well as material deprivation. The first column reports the indicators, while the first four columns present results for the respective deprivation cut-offs. The last two columns refer respectively to the relative income poverty indicator and the EU material deprivation. As evident, explanatory variables have generally a significant impact.

Moreover, households are partitioned akin to the marital status of the household head to document the relationship between marital status and multidimensional poverty. As regards the marital status; being single increases the probability of experiencing income poverty and material deprivation. The current study analysis also reveals a significant effect on multidimensional poverty, suggesting that being married is associated with lower probabilities of being deprived on multiple life domains. The majority of studies fail to measure this effect with much precision, yet the direction of the marital status effect in this paper is in alignment with Anyanwu (2014) who shows that monogamous marriage is negatively and significantly correlated with the probability of being deprived on life domains. This is also corroborated by Eggebeen and Litcher (1991), in their study findings that favour the married-couple families over singles, mainly because they are found to be less deprived than female-headed single parents. In the same spirit, a recent report by the Department for Work and Pensions (2017) reveal that the probability of experiencing poverty by single households are nearly twice as those in couple families. The findings do not suggest a significant linkage between household size and multidimensional poverty.

Gendered dimensions have also been taken into consideration, since one of the aims of this paper is to conceptualise poverty as multidimensional with many socio-economic contributing factors, including individual characteristics. As the analysis reveals, gender gap exerts a significant and positive impact on the probability of being income poor and materially deprived, and women have higher risks of experiencing deprivation in multiple life domains. Years of schooling appears to have significant affect on relative income poverty, as well as EU material deprivation. In fact, results provide no particular surprises in light of earlier research, (See

Raffo *et al.* 2007; Jencks, 1979; Bowles and Gintis 2002) and suggest that respondents with lower educational attainment experience greater rates of deprivation. This finding can also be potentially justified by a recent contribution by Kerr and West (2010) who show that schooling can lessen the impact of deprivation in the UK significantly. Another area of interest is to examine the distributive role played by the government through the provision of public services. At least from a static point of view, the level of government transfers to households are presumably concentrated towards the bottom of the distribution and positively associated with MPI. Nevertheless, as these benefits are targeted at poor households; this analysis claim no knowledge of the counter-factual, and it is likely that multidimensional poverty would have been higher in the absence of these government transfers.[10] According to the results, the interdependence of relative income poverty and material deprivation with unemployment over the period of interest is found to be statistically significant and positive. These empirical findings are congruent with theoretical expectations in each case, and direction of the unemployment effect shows that unemployment is positively and significantly correlated with the probability of being deprived on multiple life domains.[11]

According to the results, the interdependence of multidimensional poverty and home ownership attainment over the period of interest is statistically significant and negative. Indeed, owner occupation has been found to decrease the probability of experiencing deprivation in multiple dimensions. In contrast to the current study findings, Castles (1998) finds that well-being and home ownership do not match up perfectly.

[10]For the purpose of this analysis individual level benefits consists of: unemployment, old age benefits, survivors benefits, sickness benefits, disability benefits, education related allowances. Household benefits consists of: family children related allowances, housing allowances, social exclusion not elsewhere classified (income, other cash support, migrants, drug addicts, alcoholics).

[11]For a more comprehensive review, see Harding and Richardson (1998), Brown (1999).

Table 2.4.3: Polychoric Weighting Scheme

Indicator	Polychoric MDI	Polychoric MDI	Polychoric MDI	Polychoric MDI	EU Material Deprivation	Relative Income Poverty
Respective cut-off	0.30	0.40	0.50	0.60		
age	0.017***	0.027***	0.046***	0.058***	0.035***	-0.015***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)
age2	-0.000***	-0.000***	-0.001***	-0.001***	-0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
female	0.030*	0.050***	0.050**	0.072***	0.074***	0.055***
	(0.016)	(0.016)	(0.020)	(0.025)	(0.022)	(0.018)
marital status	-0.194***	-0.273***	-0.328***	-0.313***	-0.288***	-0.174***
	(0.019)	(0.020)	(0.023)	(0.029)	(0.026)	(0.022)
depratio	0.281***	0.013	-0.047	-0.184**	-0.034	0.983***
	(0.061)	(0.058)	(0.064)	(0.078)	(0.069)	(0.067)
education	-0.055***	-0.058***	-0.059***	-0.054***	-0.078***	-0.086***
	(0.003)	(0.003)	(0.004)	(0.005)	(0.005)	(0.004)
household size	0.012	-0.006	0.005	0.004	-0.058***	-0.016
	(0.010)	(0.009)	(0.011)	(0.013)	(0.012)	(0.011)
home ownership	-0.633***	-0.726***	-0.757***	-0.688***	-0.932***	-0.331***
	(0.022)	(0.020)	(0.022)	(0.027)	(0.024)	(0.022)
benefitrec	0.304***	0.398***	0.418***	0.511***	0.245***	0.319***
	(0.025)	(0.025)	(0.028)	(0.033)	(0.031)	(0.027)
hbenefitrec	0.270***	0.377***	0.369***	0.355***	0.527***	-0.115***
	(0.024)	(0.023)	(0.025)	(0.031)	(0.028)	(0.026)
unemploy	0.494***	0.384***	0.263***	0.157**	0.388***	1.117***
	(0.079)	(0.065)	(0.064)	(0.071)	(0.066)	(0.061)
_cons	1.014***	0.121	-0.817***	-1.704***	-0.297***	0.129
	(0.080)	(0.079)	(0.092)	(0.115)	(0.101)	(0.092)
N	40328	40328	40328	40328	40328	40328

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

2.5 Concluding Remarks

This study does account that portraying a holistic picture of deprivation using a multidimensional approach requires a great deal of acceptance, therefore, to disentangle how MPI differentiates from the conventional measures further, households are disaggregated by respective cut-offs to examine the overlap degree. From this analysis, it can be inferred that in the matched data, nearly 80 per cent of those who are income poor are also multidimensional poor. As might be expected, the degree of overlap is similar to that observed in relative income poverty, where nearly 75 per cent of those who are materially deprived are also multi-dimensionally poor. Such systematic comparisons not only ensure compatibility, but also provide a meaningful insight in terms of consistency for the selected indicators, capturing the severity of the deprivation. The outcomes of this overlapping ratio analysis are encouraging, since there is no significant lack of overlap between MPI and the existing deprivation indicators. The study also presents sensitivity and robustness tests for the cut-offs and weights, as well as comparisons with other conventional summary measures currently in use. This paper opens several lines of debate in terms of policy implications and measures to monitor well-being in the UK. The following conclusions can be drawn.

Prevalent, popular view of owner occupation is one that relates the tenure with upscale households, and findings suggest that owner occupancy is associated with lower probabilities of being deprived on multiple dimensions. Such evidence points out the reconsideration of dominant perceptions with regards to household deprivation and housing tenure. This also carries along with the need to be cautious on policies to alleviate household deprivation do not, negligently, dismiss areas of poor home ownership. Alternatively, larger household size has a positive effect on the probability of being materially deprived. However, direction of causality between multidimensional poverty and household size remains ambiguous, as it does not appear to be a elicit a significant affect on the probability of being deprived in multiple life domains. Findings also suggest attention to equity considerations, but more importantly, the extent of gendered inequality should not remain under-addressed in the United Kingdom's policy agenda. As far as marital status is concerned, results suggest that, compared to married couples, singles face higher risks of being deprived in multiple life domains. Furthermore, as far as further education is concerned, less educated households and non-working individuals, irrespective their gender and marital status, have generally a higher probability of being deprived in multiple life domains.

Chapter 3

Macroeconomic and Financial Implications of Multi-dimensional Interdependence between OECD countries

Chapter Abstract

This Chapter examines the spillovers of macro-financial shocks across OECD regions through a novel multi-country weighting scheme, using quarterly data from 1989:Q3 to 2013:Q3. In consideration of current structural changes, the OECD inter-linkages are redefined through utilization of trade weights and incorporation of the possible effects through international investments, geographical proximities and migration flows. Findings suggest that the NAFTA region is capable of generating synchronous and generalised responses in the other regions in such a way that these could be seen as responses to global disturbances. Whereas, the Euro-B region (integrated by Greece, Italy, Portugal and Spain) displays a high degree of vulnerability in relation to shocks to its financial variables as well as to the spillovers generated by shocks in other regions. At the other extreme of this spectrum, the region which appears as less exposed to regional spillovers is Asia-Pacific (Australia, Korea, and Japan).

3.1 Introduction and Background Literature

By what means macro-financial spillovers mediated? There are three main channels for international spillovers between countries: (i) trade (ii) commodity prices and (iii) financial markets. A major portion of the literature concludes that trade channel appears to be the key transmission mechanism. Using panel and VAR analysis, Arora and Vamvakidis (2006) provided evidence that trade channel is the key transmission mechanism of U.S. shocks to the rest of the world. The authors within the second strand of the literature focus on the relative importance of financial and other non-trade channels. Bayoumi and Swiston (2009) show that the significant portion of contributions to transmission of U.S. growth shocks come from financial instead of trade variables (Poirson and Weber, 2011). In particular, Bayoumi and Swiston (2009) highlight that the interest rates and financial conditions such as bond yields and equity prices account for a significant portion of the international transmission of U.S. originated spillovers (Poirson and Weber, 2011). Also, Lombardi *et al.* (2009), Bayoumi and Vitek (2013), Galesi and Sgherri (2009) and OECD (2012) provide evidence that financial variables play a significant role in terms of their contributions to international transmissions.

Within the context of contagion modelling mechanisms, a related literature builds on the generalized vector autoregressions (VARs) to examine the interdependencies across countries (Pesaran *et al.* 2004; and Dees and others, 2007). However, VARs suffer from dimensionality constraints. Poirson and Weber (2011) provide a clear summary of VAR-based techniques developed to address the dimensionality issues: (i) Bayesian VARs (e.g., Banbura *et al.*, 2007, and Canova and Ciccarelli, 2006) (ii) structural VARs (e.g., Bayoumi and Swiston, 2009; Bayumi and Bui, 2010) and (iii) global VARs. Factor model VARs, on the other hand, are the variables of inter- country interdependencies expected to affect the country-specific dynamics and merge them into common factors (e.g., Sargent and Sims, 1977; Stock and Watson, 2005). In a final approach, GVAR is a set of linked country specific models and is one of the most widely used, clearly defined, and well-validated modelling tool designed to analyse spillover dynamics. It allows rich and flexible modelling of macroeconomic interdependencies across countries, while keeping dimensionality controllable by reducing the country-specific spillovers to a weighted average of country-specific variables (Pesaran *et al.*, 2004; Pesaran and Smith, 2006; Dees *et al.* (2005); Dees *et al.*, 2007). Notably, financial linkages equally constitute factors of exposure (e.g., Diebold and Mariano, 1995; Giacomini and White, 2006; and Espinoza *et al.*, 2012). As far as financial markets are concerned, equity prices are associated with future developments of the economy, since they capture the firms' expected probability (see, among many studies, Fama, 1993; Estrella and Mishkin, 1998; Hassapis, 2003 and Panopoulou *et al.*, 2005; Lombardi *et al.*, 2009). Also, Moneta (2005) concludes that the yield spread conveys the most useful information to the aim of predicting recessions in the euro area.

This study makes two main contributions in an attempt to provide a more holistic under-

standing of cross-country dynamics. First, we exploit both the similarities as well as the consequential heterogeneities across a wide geographical area to analyse the financial and macroeconomic disturbances across countries in various regions. As an econometric strategy we have used the recently developed Global VAR (GVAR) approach (Pesaran *et al.*, 2004; Pesaran and Smith, 2006), which allow rich and flexible modelling of macroeconomic interdependencies across countries, while keeping the element of dimensionality controllable. The study, then progresses towards an empirical identification and measurement of the macroeconomic and financial spillovers between four main regions: (i) European member states (ii) NAFTA region (iii) OECD countries and (iv) Asia-Pacific region.

Second, the study explores concepts beyond the traditional linkages approach to consider a multi-dimensional link matrix towards a better understanding of cross-country dynamics. By far, the analysis of cross-country effects is solely based on either trade or financial linkages (see, among others Chudik *et al.* (2011), Bussiere *et al.* (2009) and Hiebert *et al.* (2010). The study redefines the interdependencies across the country groups by not only using trade weights but also through the incorporation of the possible effects caused by finance, geographical proximities and migration flows, which helps to fully represent cross-country dynamics. Subsequently, the paper addresses the analysis of these linkages between economies in the OECD by partitioning a list of selected economies into five regional groups with the objective of generating comparative conclusions on that basis. The approach adopted by the study in the empirical application widens the perspective of previous studies through the use of an innovative weighting scheme for a set of macroeconomic and financial variables, relevant in the analysis of the underlying factors operating in the aftermath of regional and global shocks.

As an econometric strategy, we adopt Global Vector Auto-regressive (GVAR) modelling proposed by Pesaran *et al.* (2005) since it is a useful tool for analysing the consequences of policy transmissions between OECD countries, given its recent efforts to deepen the integration level between member states. The study then addresses the analysis of trade, financial, migration linkages in addition to geographical neighbourhood between economies in the OECD by partitioning a list of selected economies into five regional groups with the objective of generating comparative conclusions on that basis. The specific choice of study variables in this aspect aims to incorporate data on key variations with domestic implications, on the one hand, and for the status of each economy in an internationally competitive market, on the other.

The remainder of this paper is organised as follows: Section 3 discusses the innovative approach as proposed in the study, to the construction of weights for multi-country data, Section 4 describes the methodological choice of the study and an account of the data used for estimations, Section 5 concentrates on analysing the results of the empirical application and Section 6 presents the conclusions.

3.2 Redefining OECD Linkages: a novel multidimensional scheme

Previous empirical applications assessing international economic interactions within the GVAR framework have repeatedly resorted to the use of trade weights as a standard practice. Examples of this are as early as Pesaran *et al.* (2000) and Dees *et al.* (2007) but are concurrently found in recent papers of Ericsson and Reisman (2012), Greenwood-Nimo et al. (2012) and Caporale and Girardi (2013). Such an approach remains incomplete, as it does not consider other channels of interactions with significant economic consequences as financial and migration exchanges between OECD countries. Therefore, it is necessary to overcome the restrictions of previous studies and gather a broader set of measurements reflecting the strength of cross-country interactions in terms of trade, finance, and migration for the purpose of integrating them into the model's international weights. Acknowledging the specified channels of interaction that operate in the map of exchanges between OECD economies, different weights have been assigned to their respective indexes. There are three important contributions regarding the choice of weight matrices in a GVAR context. First, Eickmeier and Ng (2014) look at a range of various connectivity matrices. Second, Feldkircher and Huber (2016) analyse weight schemes that allow for different weights for different foreign variables in the system. Particularly, they evaluate different weight schemes according to the likelihood of the GVAR model. Last, Gross (2013) proposes estimating weights as opposed to choosing them exogenously for the model. Therefore, further justification of the weighting scheme is provided considering these well-renowned papers' suggestions.

Being at the core of the OECD's interests, the exchange of goods and services between national economies is a crucial element. Previous studies such as Beetsma and Giuliodori (2011), and Inklaar (2008) focus on analysing the important role trade channels play within the context of contagion mechanisms. In addition to its crucial role, the international trade literature also focuses on the importance of geographical trade clusters (Cheewatrakoolpong and Manprasert, 2014). In fact, the likelihood of suffering severe effects of the crisis is higher for countries that are situated at the core-central trade clusters (Kali and Reyes, 2005).

Identifying the relative degree of vulnerability towards a specific economy has been calculated through the use of an indicator of trade-openness by using total trade volume in terms of exports and imports to reflect importance of country i in country j, and defined as:[1] as outlined by Pesaran *et al.* (2005):

$$T_{i,j} = \frac{\overline{X}_{i,j} + \overline{M}_{i,j}}{\sum_{j=1}^{N-1} \overline{X}_{i,j} + \sum_{j=1}^{N-1} \overline{M}_{i,j}} \tag{3.2.1}$$

[1]See, for example, Chudik *et al.* (2011) for a detailed explanation on trade weights to construct foreign variables.

with $i \neq j$ and where $\overline{X}_{i,j}$ and $\overline{M}_{i,j}$ represent, respectively, the mean of exports and imports between country i and country j during a given time horizon. Given the significant strides of OECD countries towards a common market, trade linkages are assigned 0.35 whilst forming composite index.

Another important transmission mechanism is found in the exchange of financial resources (Akbar, 2014; Faini, 2016; Guesmi, 2013 and Tudor, 2011). The next part of the multi-dimensional interdependency matrix focuses on the increased role of external financing as a source of funding; and analyses potential channels of contagion through financial exchanges. Given the non-negligible exposures among the OECD countries; financial exchanges are allocated a weight of 0.35 (See equation 3.4). In this case, an index of the international exchange of direct investments has been calculated as:

$$F_{i,j} = \frac{\overline{out}_{i,j} + \overline{inw}_{i,j}}{\sum_{j=1}^{N-1} \overline{out}_{i,j} + \sum_{j=1}^{N-1} \overline{inw}_{i,j}} \tag{3.2.2}$$

with $i \neq j$ and where $\overline{out}_{i,j}$ and $\overline{inw}_{i,j}$ stand, respectively, for the means of total outflows and inflows of direct investments between country i and country j during a lapse of time.

In addition to trade and financial interdependencies between OECD countries, the study takes into consideration migration exchanges as their economic implications for origin and destination countries may have substantial implications on labour markets. Migratory exchanges between OECD countries have been acknowledged as a crucial interdependency channel that has strong macroeconomic impacts by Salt (1992), Dumont (2005) and Pedersen *et al.* (2008). Total bi-lateral stocks of migration, $Migr$, in 1990 and 2000 have been taken to formulate a normalised index of the relative position between countries in the form of:[2]

$$Migr_{i,j} = \frac{0.3 * Migr_{i,j,1990} + 0.7 * Migr_{i,j,2000}}{0.3 * \sum_{j=1}^{N-1} Migr_{i,j,1990} + 0.7 * \sum_{j=1}^{N-1} Migr_{i,j,2000}}$$

This representation is based on the World Banks' definition of bilateral migration flows and intended to privilege recent data and, with it, the most up-to-date features of these exchanges for which information is currently available.

Geographical proximity constitutes the final dimension. Within the context of economic geography, Krugman (1991) emphasizes the importance of locational decisions. Inverse-distance weights have been evidenced to be commonly used in basic configurations of spatial econometrics involving disperse units in a geographical space (LeSage and Pace, 2009). In this study, using geographic information from the World Bank's Indicators API, an index with the inverse of distances between capital cities, has been calculated, $dist$, which therefore gives a higher weight

[2]These years are chosen to construct migratory exchanges due to data availability.

to closer neighbourhoods. It is noteworthy to mention that the importance of geographical neighbourhood is very small in comparison with other acknowledged dimensions in the era of globalization, therefore 0.05 is assigned for the neighbourhood entity.

$$W_{i,j} = \frac{1}{(dist_{i,j})} \tag{3.2.3}$$

Finally, acknowledging that the channels of interaction selected in the study operate with distinctive strength in the net of exchanges between economies, different weights have been assigned to their respective indexes, which leads to a more sensible composite weight matrix reflecting the relative importance each individual economy represents towards each other in the study sample. This composite matrix **Z** is constructed from the corresponding entries in each of the previous matrices as:

$$\begin{aligned} Z_{i,j} &= 0.05W_{i,j} + 0.35T_{i,j} + 0.35F_{i,j} + 0.25Migr_{i,j} \\ &\Rightarrow \mathbf{Z} = [0.05\mathbf{W} + 0.35\mathbf{T} + 0.35\mathbf{F} + 0.25\mathbf{M}] \end{aligned} \tag{3.2.4}$$

with $Z_{i,i} = 0$ being a result of the null diagonals in all of the constituent matrices. For the purposes of estimations these weights have been column-normalised.[3]

3.3 Data and the model

For the purpose of empirical analysis, the study utilizes Global Vector Auto-regressive (GVAR) methodology, which was first presented by Pesaran *et al.* (2004) and extended in Dées *et al.* (2007), in order to exploit its capabilities for the analysis of economic and financial phenomena in the presence of interdependence between the units in a global system and, additionally, due to its flexibility for the study of regional clusters, which are likely to operate in reality between OECD economies. For a detailed derivation of the GVAR model, please see Chapter 3, Section 4.

This study sample consists of 24 selected OECD countries'[4] quarterly data between 1989Q4 and 2013Q3 (N=24, T=96) comprising of geographic data, macroeconomic aggregates, financial indicators as well as migration and key open-economy variables.

- Geo-localisation data, coordinates of capital cities from the World Bank's online database's

[3]The composite weight matrix used for this study is presented in Appendix B.

[4]Austria, Australia, Belgium, Canada, Switzerland, Chile, Germany, Denmark, Greece, Spain, Finland, France, Ireland, Italy, Japan, Korea, Mexico, Netherlands, Norway, Portugal, Sweden, Turkey, United Kingdom and United States.

API[5]. Geographic distances were calculated using James P. LeSage's econometric toolbox[6].

- Total imports and Total exports, bi-lateral trade data, millions US dollars (IMF DTS).
- Foreign direct investment positions (inward plus outward) bi-lateral totals, normalised with respect to each country's total in relation to the other economies in the sample. Calculated with data from IMF's Coordinated Direct Investment Survey.
- Bi-lateral migration, total stocks 1990 and 2000, weighted average calculated with data from the World Bank's Global Bilateral Migration Database.
- GDP, (yearly) US dollars, current prices, current PPPs, millions (OECD Stat).
- Real output (*lgdp*), logarithm of GDP volume index series (2005=100), seasonally adjusted, (OECD QNA, OxEc).
- Real effective exchange rate index (rfx) (OxEc). Homologated to a 2010-base year for Germany and Turkey.
- Interest rate spread (*spread*), calculated as the difference between each country's lending rate (IMF IFS/OECD MEI/OxEc/BCL/BANXICO) and the United States' 3-month Treasury Bill (FRED).
- Lending rate (*lrate*), quarterly percent (IMF IFS/OECD MEI/OxEc/BCL/BANXICO).
- Corporate borrowing rate (*corprate*), quarterly average (OxEc).
- Share price index (*shprind*), quarterly average (OxEc).
- Unemployment rate (*unempr*), percentage (OxEc).
- Oil prices, nominal price (*poil*), US dollars, (GVARdb, updated with own calculations on Bloomberg data between 2012Q2 and 2013Q3).

3.4 Empirical GVAR application

The study conducts an estimation of the GVAR model on the selected variables for 24 OECD economies with a panel from 1989Q4 to 2013Q3[7]. The variables are categorised according to the previous argumentation into three main groups: a) macroeconomic aggregates (including

[5]http://api.worldbank.org/countries

[6]Available to download from http://www.spatial-econometrics.com/

[7]Few series were discarded after finding that their order of integration was not either I(0) or I(1) as was the case for Spain's log-GDP and Japan's lending rate series.

public finance), b) macroeconomic-relevant financial indicators and c) open economy variables, by these means the study aims to gather a well-targeted and holistic portrayal of the macroeconomic, financial and external situations in an economy.

Table 3.4.1: Variable classification

Macroeconomic aggregates	**Macro-relevant financial indicators**	**Open economy variables**
Real output	Int. rate spread	Current account
Lending rate	Real exchange rate	
Unemployment rate	Corporate borrowing rate	Oil price
Government balance	Share price index	
Government debt (1st diff.)		

Due to its position as a global reference, the exchange rate and interest rate spread variables are removed from the United States individual model as domestic variables while, in turn, their foreign representations are treated as weakly exogenous only in this specific model. The oil price has been included as an endogenous variable in the US model. As a result of the considerations stated in Section 3, a composite weight matrix $\mathbf{Z}$ is used in the construction of country-specific foreign variables. The resulting matrix is included in Appendix B.2.

For comparative purposes, five regions are defined with the countries in the sample.[8] These regions, shown in Table 3.4.2, constitute the main basis of empirical analysis and are intended to reflect the heterogeneities across OECD economies in relation to their responses to shocks in the variables. From this perspective, a comparative analysis of the inter-regional effects of the modelled shocks can be additionally developed. In relation to intra-regional weightings, $w_{i,\ell}$, country-specific averages were calculated from yearly GDP series (US Dollars, current PPP) between 1995 and 2013 (see Appendix B.3.).

3.4.1 Contemporaneous effects of foreign variables on their domestic counterparts

The cross-country impact elasticities from changes in foreign variables provide a crucial source of information in relation to the interactions and potential spillovers between economies. The complete table of elasticities is included in Appendix B.4. along with their corresponding Newey-West t-ratios. From them, the following substantial findings should be highlighted: Sweden, Portugal, Germany, Norway, Japan, and Italy (in that order) present the largest elasticities to foreign developments in GDP. Although this may not be surprising for the smaller economies in this list, it is particularly relevant in the case of Germany and Japan, given the

[8] With only two exemptions: Chile and Turkey which are not assigned to any region but, nevertheless, were kept in the model during all estimations.

Table 3.4.2: Regional classification

Eurozone A	**Eurozone B**	**Other European**
Austria	Greece	Denmark
Belgium	Italy	Norway
Finland	Portugal	Sweden
France	Spain	Switzerland
Germany		United Kingdom
Ireland		
Netherlands		
NAFTA	**Asia-Pacific**	
United States	Australia	
Canada	Japan	
Mexico	Korea	

Chile and Turkey were not assigned to a region.

relative size of their economies, since it reflects their degree of exposure to global levels of activity. Contrastingly, the elasticity in the case of the US economy is among the lowest. This indicates that even with the considerable size of the international exchanges it has with the world, the US domestic economy provides it with a high degree of resilience against the external variations in economic activity.

Large elasticities to global developments in lending rates are present in Austria, Canada, Netherlands and Finland, most of them larger than one, revealing their exposure to the patterns of financial exchanges. The relative size of their involvement in foreign financial exchanges as compared to the size of their own economies (notably in the case of the Netherlands) appears to be an important factor of this sensitivity, particularly when compared to cases like Germany with a larger domestic economy and, then, a much lower elasticity to global variations in this aspect. A consequential finding in terms of elasticities to global variations is the one that shows a high degree of responsiveness of share prices. Ten of the economies in the study sample display elasticities close to one or even considerably larger, no other variable displays the same levels of sensitivity to foreign developments. This feature is shared indistinctively among the economies with diverse sizes and global roles as Greece, Ireland, Finland, Italy, Germany, Japan, France, Portugal, Spain, and Sweden; all at the top of this scale.

3.4.2 Dynamic analysis

This section addresses the analysis of the model's dynamics through a number of shocks intended to reveal two main features: a) the heterogeneous response to homologous disturbances

across regions and b) the impact and persistence of spillovers between regions. The study uses Generalised Impulse-response Functions (GIRF's),[9] taking advantage of their independence of the ordering of the variables and, crucially, of their ability to disclose the features of the propagation mechanisms of the modelled disturbances.[10] This analysis has been primarily carried out at the regional level except for the shock to the oil price, which is considered a global variable although, for computation purposes, it is assigned as endogenous to the US economy. Due to space considerations most interesting findings are reported. Shocks to other variables are not shown in this Chapter but are available upon request.

3.4.3 Shocks to the interest rate spread

In Figure 3.1 the effects of a shock to the interest rate spread against the US Treasury Bonds rate are summarised by the region of origin.[11] The shock to this spread in the Euro-A region has an immediate effect of nearly 23 basis points but, perhaps, more importantly, it continues to display a persistent upward trend during the following two-quarters until it reaches a much higher level (of 39 basis points) by the fourth quarter when it starts to decline until it stabilises in a rate which is 33.7 basis points higher than the pre-shock level. The spillovers to the Euro-B and Other European regions follow a similar pattern, although the former displays a synchronous adjustment until the second quarter when that spillover starts rapidly to decline and disappears almost at the same time as it does in all the regions (around 19 quarters after the impact). When the shock is originated in the Other European region, it generates a more complex set of outcomes. First, the own-region effect is considered to be large (up to 74.9 basis points at its peak) and follows a gradual process before dissipating. The spillovers to Euro-A and Euro-B regions mimic the same pattern almost synchronously with lower levels (maxima around 20 basis points) and, interestingly, they lead to negative spreads for these two regions implying a lower risk level when compared to the US.

The Other European region presents a mimicking effect to the original shock, but with a lower magnitude (11.6 basis points on impact and a maximum of 26.6 basis points in quarter 6) and in a lagged fashion (around two to three quarters behind the original shock). Here it seems that in particular advanced economies' the interest rates have become significantly more responsive to the regional shocks, consistent with the empirical findings of Chudik and Fratzscher (2011). This could be partially explained by safe markets mechanisms, as given stronger macro-financial positionings of advanced economies such as Norway and Sweden, Other European group may have taken over as safe markets.

Asia-Pacific region experiences a considerable effect from the shock generated in Euro-

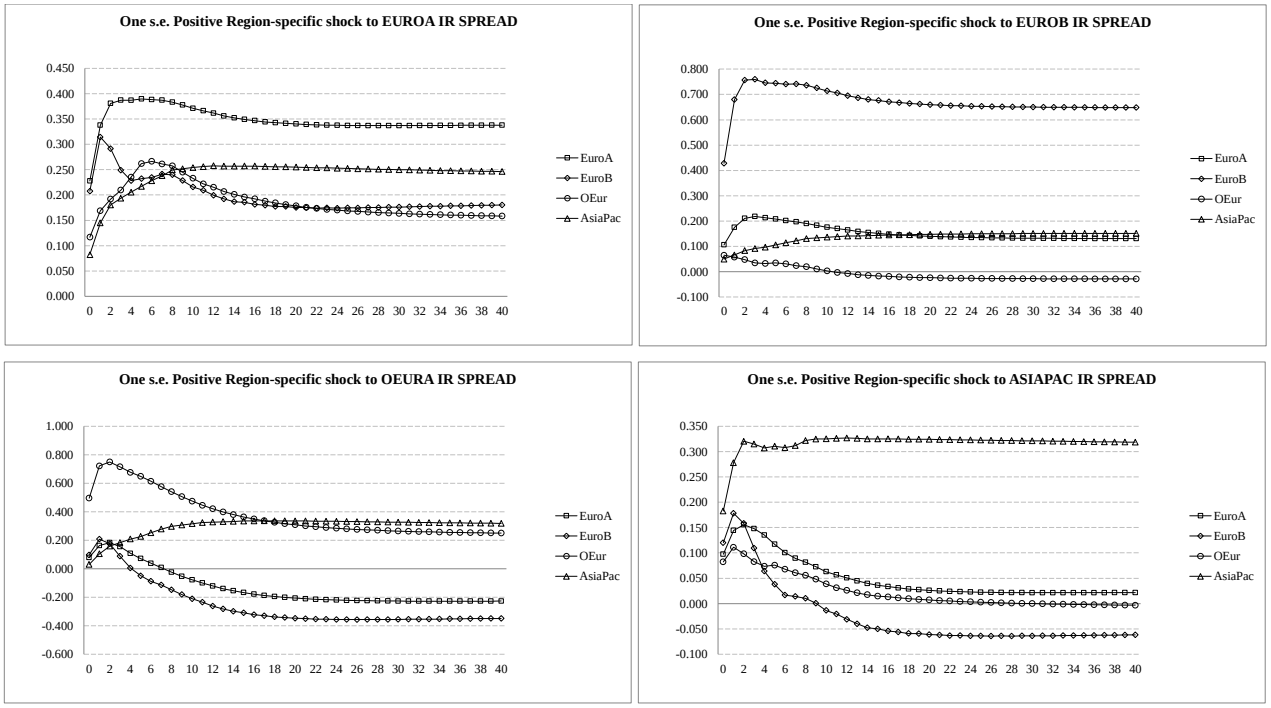
[9] As introduced in Koop *et al.* (1996) and adapted to the VAR context in Pesaran and Shin (1998).

[10] One standard error shocks are applied in all cases.

[11] Due to the preponderance of the US on the NAFTA region and the fact that this variable has been excluded from the US model, the responses of the NAFTA region are not displayed.

A, resulting in a spillover, which is larger than those registered in the other two European regions (increasing the spread by 25 basis points). In turn, the shock to the Euro-B countries almost doubles in magnitude the previous one which is consistent with the comparative levels of volatility within involved markets. The Asia-Pacific region also displays a certain vulnerability to the Euro-B region in this respect since its spread starts displacing after the shock until it reaches a new level 15 basis points higher than its initial record. The Other European region shows more resilience to this shock, with only a minor increase in the spread (6.5 basis points) which reduces to 52 percent of its initial size by quarter 3 and gradually fades away in quarter 10. Turning to a shock originating in the Asia-Pacific region, the study reveals that it leads to a lower disturbance in the series (less than half the magnitude of the impacts of comparable shocks in the other regions) pushing towards a fast adjustment, which reaches most of its impact on quarter 2 and, after a very minor oscillation stabilises around that level (32 basis points up). Its spillovers are also smaller and comparatively fast in their reversion to lower spreads. On these spillovers, Euro-A countries find themselves with a slightly higher spread, Other European countries with the same spread as before the shock and Euro-B countries even experience a final reduction in their spread.

Figure 3.1: Shocks to the interest rate spread.

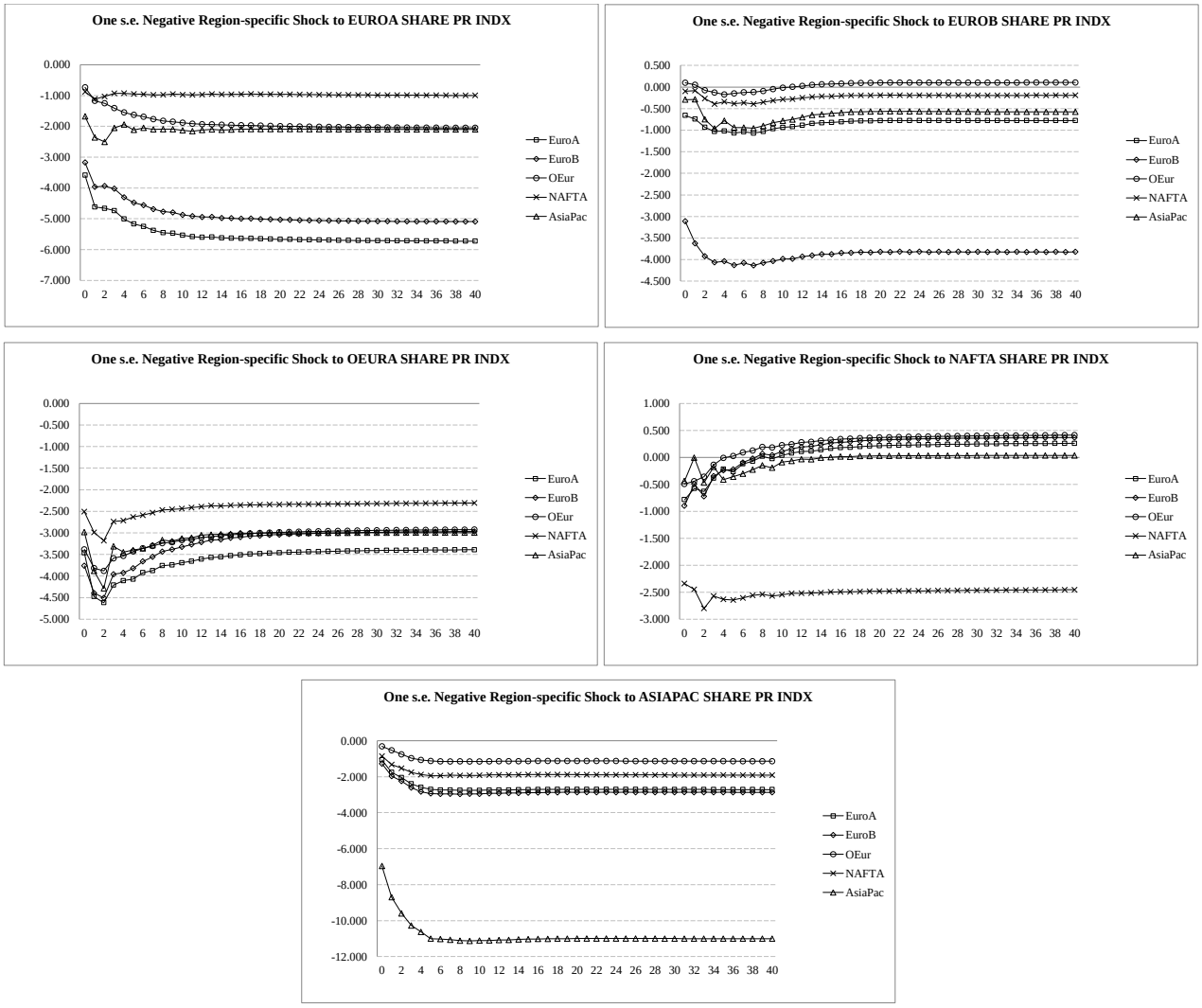


3.4.4 Shocks to the share price index

The response to a negative shock to this index in the Euro-A region starts with an immediate reduction of 3.58 points and subsequently follows a further gradual decline. The same pattern is followed by the Euro-B region, which exhibits a large spillover to this shock, gradually leading it to a final reduction of 5 points. Smaller spillovers are registered in the remaining regions with Other European closely following the original response's pattern by Euro-A in comparison to NAFTA and Asia-Pacific, which follow smaller U-shaped variations before stabilising.

It is certainly worth noticing, on the one hand, the relative unresponsiveness of the NAFTA region to this European shock while, on the other, that all the regions are affected in very similar terms when the same shock originates in North America instead. Turning attention to a shock in the Euro-B region, the study observes an initial impact of the same magnitude of the spillover it received from the Euro-A shock but with lower persistence, which even allows for a minor recovery after 11 periods. This shock generates only modest variations in the other regions, the largest being Euro-A's response. Next, the study evaluates a shock to the Other European region's share price index and remarks the synchronicity of the responses across regions varying only in terms of magnitude which, in turn, is interesting in itself because the inter-regional spillovers to Euro-A and Euro-B turn out to be larger than the own-region effect of the shock. Undoubtedly, the largest adjustment occurs in the Asia-Pacific region. The response to this shock reaches its maximum strength after five quarters without further significant developments from then on.

Figure 3.2: Shocks to the share price index.



3.4.5 Shock to the oil price

Focussing on the effect of a positive shock to oil prices, it is possible to obtain substantial information on the differences and similarities between the responses of the regions in the current study framework. It is notorious, first, the presence of a counter-cyclical element in the responses of Asia-Pacific to oil price shocks on output, unemployment and government accounts, contrasting with the relative deterioration the other regions experience under such conditions as in the case of the marked increase in unemployment for the Euro-B region and the worsening in governmental finance for the Other European region. This heterogeneity marks an important difference across variables since, the responses of the share price indexes display a very homogeneous pattern after this shock, varying only in terms of size. Euro-B and Asia Pacific are the markets most affected by the shock.

Within a certain range, this shock pushes up the global prices with stronger effects on the NAFTA economies. It also generates pressure to the increase in interest rates, especially in Europe, and a lagged decline in real output, which is notoriously accentuated in Euro-countries. The deterioration of overall macroeconomic conditions arising from this shock (lower output, higher prices and interest rates, share prices in decline), places it as a critical component of the global economic performance, also displaying impacts on the unemployment rate so that the Euro-B region suffers the largest increase followed, in latter periods, by that of Euro-A and NAFTA.

Particularly, the Other European economies show a higher degree of resilience against this shock, specifically in relation to the response they have in output, unemployment and share prices. Unlike NAFTA and Asia-Pacific, interest rates and spreads in Europe adjust upwards, particularly in the case of the Euro-B region reflecting a distinct scenario of increased macroeconomic and financial risks for its member economies.

Global balancing forces also operate after this shock, expressed by the increase in Asia-Pacific's current account deficit.[12] The European economies and the NAFTA region experience a fast recovery in their current accounts after this shock, but for Asia-Pacific and Other European regions, the displacement (each in opposite direction) is quasi-permanent.

[12] i.e. in contrast to the improvement experienced by the Other European economies.

Figure 3.3: Shock to the oil price.

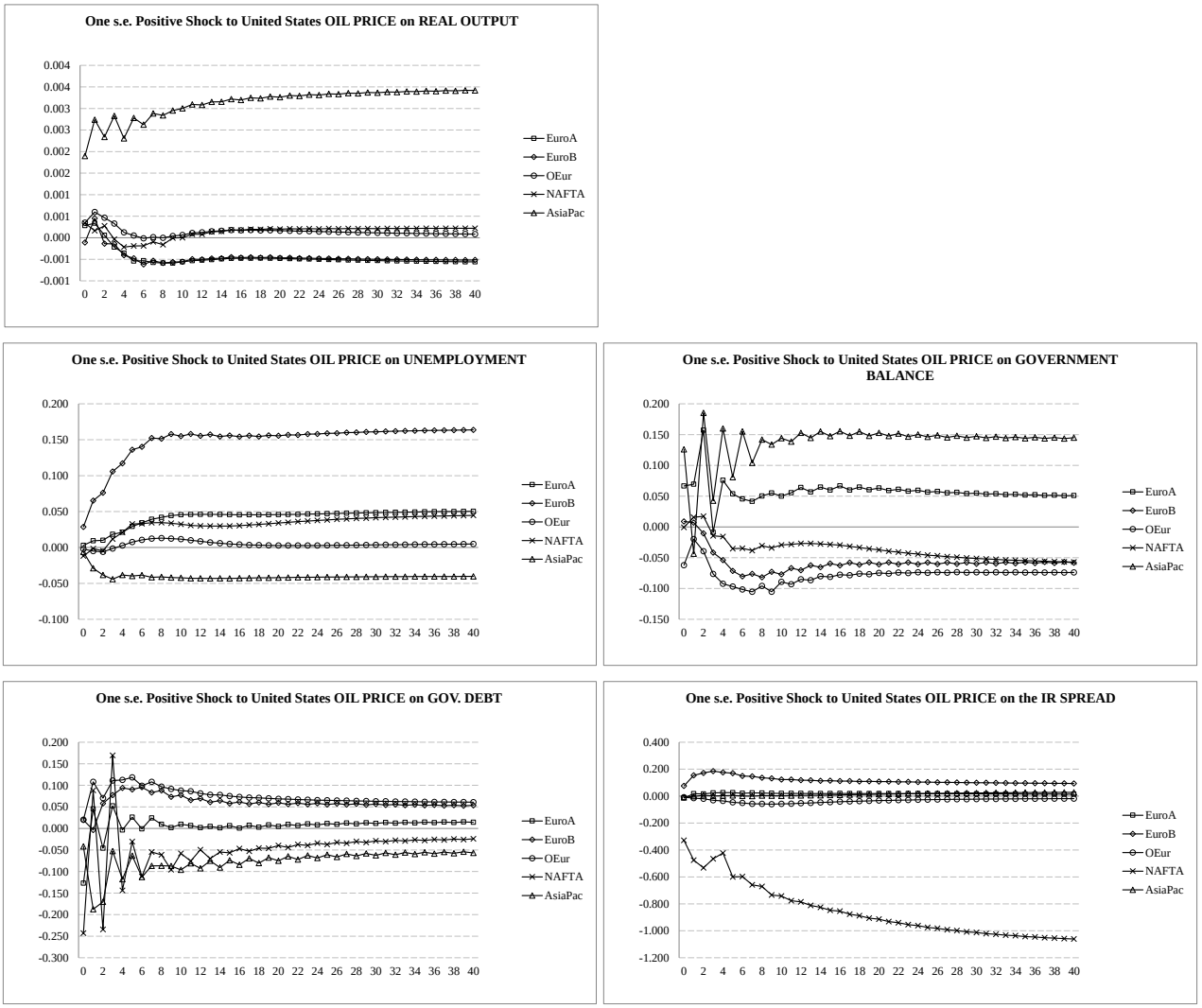
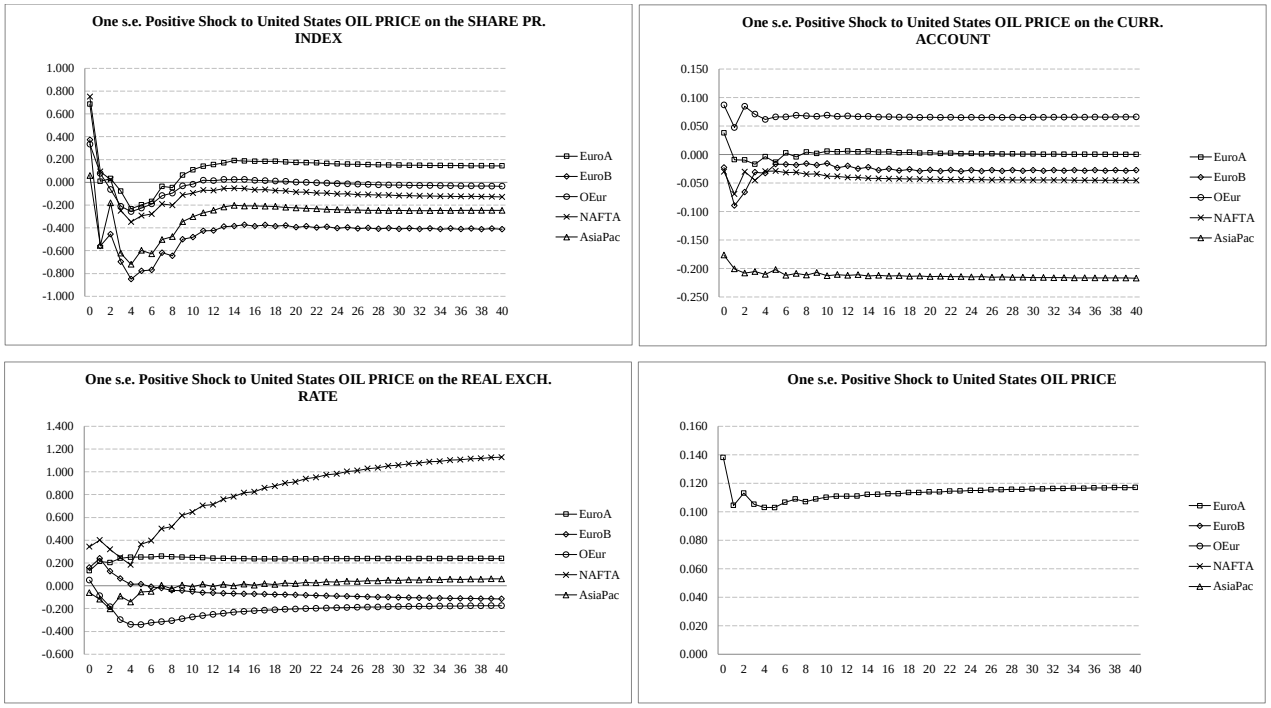


Figure 3.4: Shock to the oil price (cont'd.).



3.5 Conclusions

This paper has described both similarities and heterogeneities between OECD regions, in relation to the impacts of financial disturbances on their economies. Another distinctive feature of the paper is, its methodology; as the OECD inter-linkages are redefined through not only the use of trade weights but also through incorporating the possible effects caused by finance, geographical proximities and migration flows, which aids in the advancement of an in-depth understanding of cross-country dynamics. Redefined linkages are able to supplement, adding as yet little explored nuances and meanings to possible interdependencies among OECD countries. Such link matrix, not only aids to sharpen the focus of interactions, but also helps to fully capture the cross-country dynamics. Any effective set of policy measures must reflect these dimensions emanating from quite distinct dysfunctions occurring within each of the dominant welfare clusters in OECD.

The study confirms and measures the international components of crucial variables such as interest rates and shares prices and compares them by region of origin of the corresponding disturbances. A number of regional findings revealed by this study are summarised as follows:

- The Euro-B region (integrated by Greece, Italy, Portugal and Spain) displays a high degree of vulnerability in relation to shocks to its financial variables as well as to the spillovers generated by shocks in other regions. This is particularly accentuated in the case of the interest rates included in the model, herein.

- At the other extreme of this spectrum, the region which appears as less exposed to regional spillovers is Asia-Pacific (Australia, Korea, and Japan). Based on this information it can be argued that its structural linkages with the other regions are at the lower end within the scope of this study.

- The NAFTA region (Canada, Mexico and the United States) is capable of generating synchronous and generalised responses in the other regions in such a way that these could be seen as responses to global disturbances.

- The Euro-A region (Austria, Belgium, Finland, France, Germany, Ireland, and Netherlands) is far less sensitive to own and inter-regional shocks when compared to the Euro-B region, however, it consistently displays a contagion effect from variations in the latter, which implies that it is subject to the effects of *imported variability*.

To be sure this model can be modified and extended further. But it is hoped that the present version takes a further step towards the development of a more holistic framework to exploit temporal and spatial interdependencies across the OECD economies.

Chapter 4

Europe 2020 targets: Redefining linkages and a modified inequality indicator

Chapter Abstract

This Chapter's distinctive feature is a shift towards a novel definition of a measure of inequality by building upon the work of Malul et al. 2013, widening the evaluation by combining socially inclusive aspects with wellbeing. Another aspect is the proposed methodology; European interlinkages are redefined to cover not only the trade channel, but also financial exchanges, geographical proximities and bilateral migration flows. The findings relate to the EU 2020 headline targets by displaying the short and long-term dynamics of income disparities providing further evidence of how heterogeneous the magnitude of poverty responses to such inequality developments is across European economies.

4.1 Introduction

> "*This is how the other half live, I would like to get one of these people and just say 'Look, this is how the other half live.' I don't think they would last a day. They don't realise what is happening in the real world. They are in a little world of their own.* Unemployed man, London, 2013[1]"

The issue of inequality is one of the major continuing problems facing developmental economics. A debate on the importance of directing attention to the problem of inequality has been fuelled by recent publications, such as the World Bank (2016), Atkinson (2015), and Piketty (2013), and by the two headline targets identified in the EU's 2020 strategy to combat inequality and lift 20 million people out of poverty (European Commission). Reducing the growing income gap between the rich and poor regions is vital if poverty is to be reduced faster (World Bank,2016). To prioritise interventions and develop a more effective strategy for reducing inequality and poverty, it is necessary to exploit the multifaceted channels in Europe to analyse how income inequality has been shared among countries over time, and how macro

[1]Lansley and Mack, *Breadline Britain*, 2015, p.175

policies have affected growing disparities between member states. There are major methodological challenges in evaluating income inequality in the European Union, since much of the existing literature focuses only on national trends, excluding the redistributive role played by central governments.[2] However, European countries differ significantly in the mixture and size of benefits they provide. Thus, analysis should take account of how social transfers alleviate inequality in different member states. With this in mind, this study proposes a new approach that can improve the accuracy of inequality measurement by incorporating benefits in-kind (denoted here as MQ) by building on the work of Malul *et al.* (2013). This paper uses a rich multi-country dataset to examine empirically the combined effect of multiple channels operating in the EU. It also analyses modified income inequality by highlighting the outcomes of economic integration for labour, finance, and trade, and looks at geographical proximities for different welfare clusters.

As an econometric strategy, current study uses the recently developed Global VAR (GVAR) approach (Pesaran *et al.* 2004; Pesaran and Smith, 2006), which allows rich and flexible modelling of macroeconomic interdependencies across countries, while keeping dimensionality controllable. The novelty in linking countries is achieved by including trade weights while also accounting for the impact generated through bilateral migration flows, geographical proximities and financial linkages. Our dataset comprises quarterly macroeconomic, financial and welfare variables from 18 developed and developing European economies over the period $1996Q1 : 2012Q1$, covering, where available, for each country GDP, short term interest rates, at risk poverty and social exclusion rates, and our newly developed modified inequality indicator. Each country-specific model is linked by foreign variables that are the weighted averages of the variables of all the other countries. The weights are determined by the bilateral exposures of each country to the other countries through trade, migration and financial linkages as well as geographical proximities.

This study makes four main contributions. First, it adds to the empirical literature on income inequality spillovers. This paper is the first of its kind to address the transition in developments in inequality. The study measures *income inequality interdependencies* between European countries in a way that addresses the limitations of the uni-dimensional interdependency approach by providing an in-depth analysis of multifaceted interdependencies across member states. To the best of our knowledge no other scholars have measured cross-border income disparities in this way.

Second, to improve the accuracy of the measurement of inequality, a comprehensive definition of inequality that allows the evaluative space to be widened by the inclusion of in-kind benefits is developed by building upon the work of Malul et al. 2013. Although the size of in-kind redistributions can vary greatly across countries and might have substantial implications

[2]See, for example, Forster *et al.* (2005), and Beckfield (2006).

for inequality (Malul *et al.*, 2013), this factor is largely neglected by the ordinary inequality metrics that overlook the redistributive role played by central governments. This is believed to be the first paper to use a modified quintile share ratio to investigate the dynamics driving up inequalities.

Third, the study experiments with inter-country links using a range of different country weighting schemes, combining bilateral trade exposures, financial exposures, geographical proximity and bilateral migration flows in various ways. This paper proposes a new, multidimensional weighting approach that is intended to provide an in-depth analysis of multifaceted interdependencies across member states. This goes beyond most previous studies that have identified international transmission mechanisms in multi-country models, but have failed to address multidimensional exposures across economies. Recent GVAR studies of international dynamics only capture cross country dynamics through trade weights (e.g. Des *et al.*, 2007), or through weights constructed from asset-side exposures alone (e.g. Beaton and Desroches, 2011; Chen *et al.*, 2010). Other GVAR studies rarely test alternative schemes that include both trade and financial weights (e.g. Eickmeiner and Ng 2015).

Fourth, the study adds to the empirical literature on the impact of income inequality on poverty. The current literature on European economies is limited and is focused on a small number of countries or regions with no attention paid to potential contagion mechanisms. This paper demonstrates that, for the majority of European countries, poverty and income distribution are intrinsically linked and increases in income inequality can greatly exacerbate the growth of poverty. This paper is divided into five sections. The subsequent section outlines a detailed presentation of the modified inequality measure. The next section explains: (1) the model (2) rationale for developing multidimensional interlinkages and (3) GVAR outputs. Section 4 presents the results from the dynamic analysis. Finally, concluding comments and policy implications are given in Section 5.

4.2 Measuring inequality using Modified Inequality Ratio

As Sen advocated nearly 40 years ago in his pioneering contribution to measuring inequality, underlying any wellbeing measure is an ample perception of social welfare that should be of interest to scholars.[3] Studies that have explored at the broader redistributive impact of transfers have arrived at similar conclusions. Another important finding in comparative inequality comes from Heady et al. (2001), who demonstrate that the distributional effect of social transfers is greater in the EU member states that spend a higher proportion of their GDP on them. In

[3]See Sen (1977) for a more detailed discussion on weights and measures in social welfare analysis.

a similar vein, Aaberge et al. (2010) analyse the distributional impact of public services in European countries and find that increasing levels of non-cash benefits to households help to reduce inequality by a substantial amount. There are several transfers that can affect income inequality, while others deliver benefits more progressively. For example, cash allowances for children appear to be more effective in combating child poverty if they are accompanied by in-kind child support (Daria, 2014; World Bank, 2016). Only a handful of the dozens of successful examples of well targeted benefits in kind need be cited (World Bank, 2016).[4] Although the size of in-kind redistributions may have considerable consequences for inequality, it is largely neglected by income inequality metrics such as the Gini index and the income quintiles. Furthermore, omitting in-kind benefits weakens both cross country comparisons and comparisons at the country level (Malul et al. 2013).

An example provided by Malul et al. (2013) can clarify this. Take a simple case where countries have nearly identical Gini coefficients and assume that the government of the first country is much more efficient at providing in-kind benefits than the government of the other country. The actual level of inequality will be lower in the first economy as the distribution of in-kind transfers is generally targeted at low income groups. However, the Gini coefficient or the s80/s20 income quintile measures, does not account for the redistribution generated by government, and so it will be biased towards the upper quintile of the income distribution (Malul et al. 2013). For the reasons outlined above, the redistribution generated by social transfers should not be seen as a separate issue from the broader problem of inequality. The methodology used in this paper takes these criticisms into account and formulates an intermediate approach that advances the work of Malul *et al.* (2013) by using the S80/S20 income quintile share ratio to examine distributional issues in the European Union accurately.[5] An intermediate approach in this context is an approach departing from the traditional literature by including the redistributive impact created through benefits-in-kind. It is worth highlighting that our proposed approach builds upon the methods of Malul's modified Gini index by using the income quintile share ratio to measure the actual depth of distributional interdependencies in the European Union for two reasons. First, the s80/s20 ratio methodology is a widely accepted way of measuring inequality in European countries and is in line with the official statistics from Eurostat. Second, the Gini index has been criticised on many grounds, though space limitations prevent us discussing these arguments further.[6] All incomes are compiled as equalised disposable incomes that include all market and non-market income.

[4]See among others: Kazianga, 2015; Fizsbein and Schady; 2009, Maluccio and Flores, 2005; Heady *et al.* 2001; Wang *et al.*, 2011

[5]The income quintile share ratio (Langel and Tille 2011) is defined as $1L(0.80)/L(0.20)$, or the ratio of the total income of the 20 per cent of households with the highest values relative to the median and the 20 per cent with the lowest values, and the ratio curve $\frac{1-L(0.80)}{L(0.20)}$., EUROSTAT definition.

[6]See Wade (2014), Ravaillion and Chen (1997) for a review of the problems related to the composition and explanatory power of the Gini index.

In a similar vein with Malul et al. (2013), in the figure below modified inequality rankings that results from the proposed modification in addition to the traditional interquintile ratio for the European countries are presented.[7] For instance, in 2001, it can be observed that Austria, Italy, Bulgaria and Romania moved up in the income distribution. In 2011, we can see that the rankings of Spain, France and Bulgaria improve significantly because these countries provide a considerably larger quantity of in-kind benefits to the public. According to the modified inequality ratio, Germany is the country with the lowest inequality in income distribution throughout the time horizon, whereas according to the standard interquintile ratio Denmark appears as the most egalitarian state. Although the level of income inequality is moderately high, provision of benefits in kind considerably help to decrease the inequality. Similar results appear in the cases of France, Portugal, Germany, and Austria in 2001 and in Spain, Sweden and Hungary in 2006. For the remainder of this section, this paper utilises the properties proposed by Malul *et al.* (2013): Consider $y(\theta_y)$ as the accumulated income of the θ percentile, while and the percentile of the households with income less than the income (I) of the k_{th} household is represented by $\theta_k = \frac{k}{N}$ where N is the total number of households. In that case s80/s20 interquintintile share ratio, the upper bound value of the eight decile to that of the second decile would be $1 - \int_{0.2}^{0.8} y(\theta) d\theta$ where $y(\theta_y)$ is a function for the Lorenz curve, which follows

$$y(\theta_y) = \frac{\sum_{i=1}^{y} I_i}{\sum_{i=1}^{N} I_i} \tag{4.2.1}$$

Modifying this function to include in-kind benefits provided by the government, the value of total income increases by $\frac{G}{N}$ to $\hat{I}_i = I_i + (\frac{G}{N})$, $\forall$ i ϵ natural numbers ; i $\leq$ N, where G is the total government expenditure, results in the modified Lorenz curve (Malul et al., 2013).

$$\hat{y}(\theta_y) = \frac{\sum_{i=1}^{y} \left(I_i + \frac{G}{N}\right)}{\sum_{i=1}^{N} I_i + G} = \frac{y(\theta_y) + \frac{y \times G}{N \times \sum_{i=1}^{N} I_i}}{1 + \frac{G}{\sum_{i=1}^{N} I_i}} = \frac{y(\theta_y) + \theta_y \frac{G}{\sum_{i=1}^{N} I_i}}{1 + \frac{G}{\sum_{i=1}^{N} I_i}}$$

$$\hat{y}(\theta_y) = \frac{y(\theta_y) + \theta_y SG}{1 + SG}$$

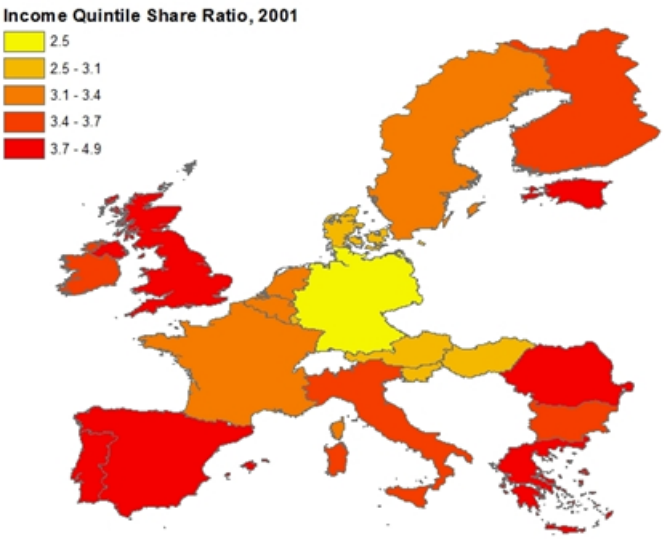
where $SG = \frac{G}{\sum_{i=1}^{N} I_i}$ represents the services that the government provides as a share of the total net income of the economy. To modify the interquintile share ratio, the share of government in-kind benefits has to be evaluated (Malul et al., 2013): First, transfer payments have to be deducted from tax to calculate total disposable income. Then total taxes out of

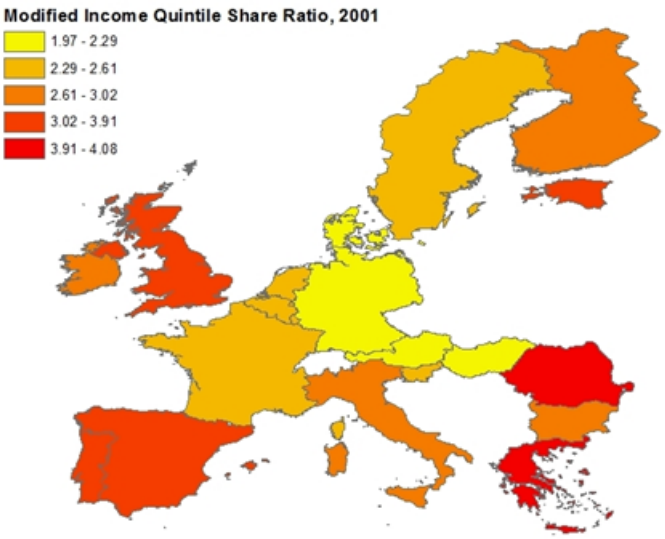
[7]'Using geographic information system (GIS), natural breaks (jenks) categories are built on natural groupings inherent in the data. Class breaks are identified that best grouping similar values and that maximize the dissimilarities between groupings', GIS definition.

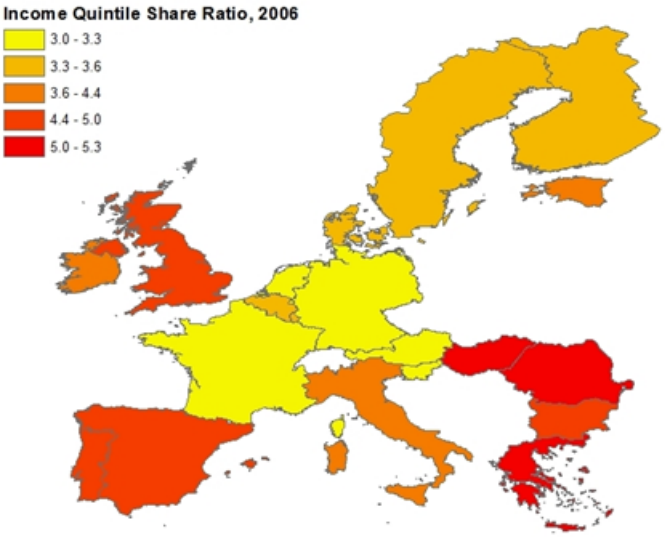
GDP is measured as the difference between total taxes and social benefits other than social transfers in kind. Three measures are used for this: Gross Domestic Product (y), government consumption expenditures (g), and total tax revenue as a percentage of GDP (t) to give the share of government consumption out of GDP (Malul et al., 2013). In a more conventional notation:

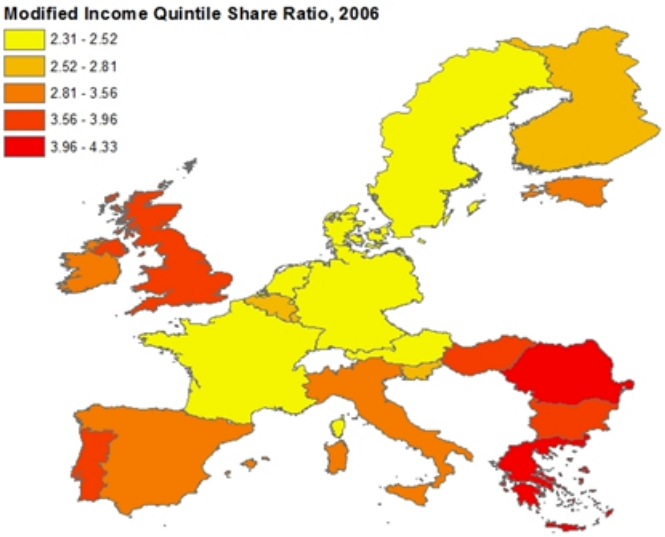
$$SG = \frac{G}{y(1-T)} \tag{4.2.2}$$

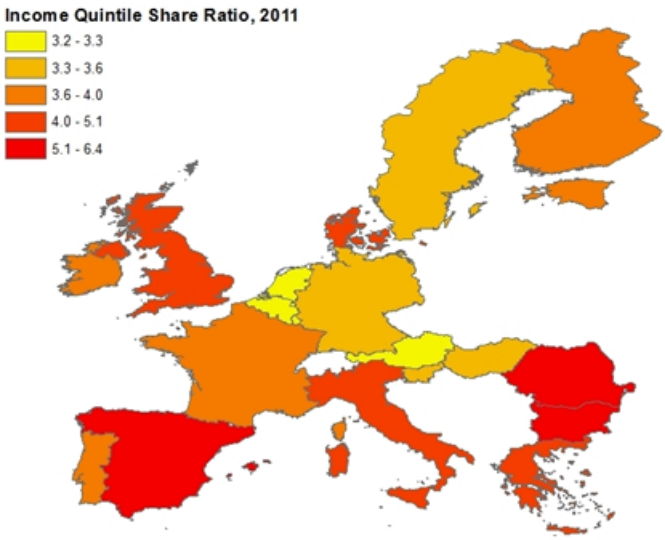
where the *y (1-T)* is a proxy for the total net income of the economy and SG represents the services that the government provides as a share of total net income of the economy. With the approximation $\sum_{i=1}^{N} I_i \approx y(1-T)$ modified interquintile share ratio equals to $\frac{s20/80\, ratio}{1+SG}$ (Malul et al., 2013).



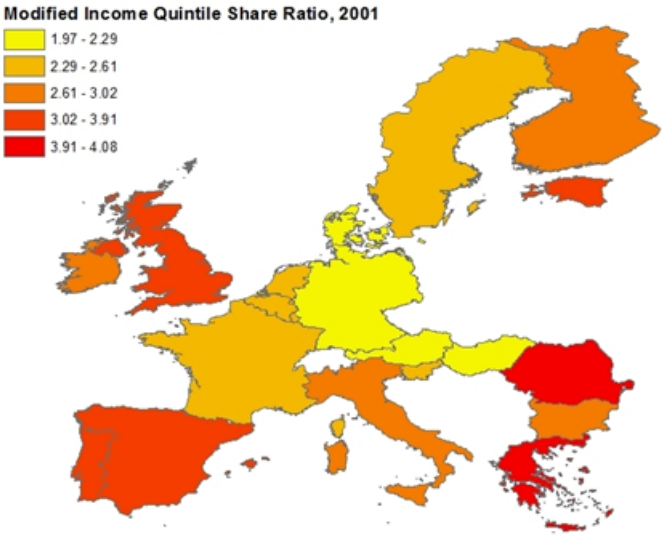








Source: Eurostat, 2011



Source: Authors' own calculation based on Eurostat, 2001

4.3 The GVAR model and identification

4.3.1 Data and VARX setups

This section describes the model specification and its properties developed by Pesaran et al., (2005). A GVAR is a set of linked country VARX models and is one of the most widely used, clearly defined, and well-validated modelling tools for analysing the dynamics of spillovers. We use and present the properties developed by Pesaran *et al.* (2005), and summarised by Bianchi et al. (2012), as they offer the most intuitive interpretation. The model consists of two stages. First, each country is modelled individually as a small open economy by estimating a country specific vector error correction model in which the domestic macroeconomic variables $\mathbf{x}_{it}$ are related to country-specific foreign variables $\mathbf{x}^*_{it}$. Second, a restricted reduced form global model is built by stacking the estimated country-specific models and linking them through a matrix of cross-country multidimensional interdependencies (Bianchi, 2012).

Table 4.3.1: Country Groups

Highly Vulnerable	**Unbalanced**	**Leading**
Hungary	France	Netherlands
Estonia	United Kingdom	Denmark
Greece	Ireland	Luxembourg
		Austria
Vulnerable	**Balanced**	
Spain	Sweden	
Portugal	Netherlands	
Italy	Finland	
	Germany	
	Belgium	

Note: Author's own classification based on GDP-PPP rankings and income quintile share ratios drawn on Eurostat tables. For further information: (i) `http://ec.europa.eu/eurostat/web/gdp-and-beyond/quality-of-life/s80s20-income-quintile` (ii) `http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tec00114&plugin=1`

The theoretical framework covers eighteen European countries, accounting for nearly 35 per cent of global output, and these countries are grouped into regions, not only for the comparative levels of inequality in each country and across the continent, but also for their GDP-PPP rankings. The emphasis on the relationship between EU integration and inequality gives this grouping a double focus. First, forming regions sharpens the focus of interactions while keeping the dimensions of the model under control.[8] Second, more importantly, this perspective lets us

[8]For alternative regional specifications see: Galesi and Sgherri (2009), Chudik and Fratzscher (2011), and Cakir and Kabundi (2013).

focus on the actual state of income disparities within similar sized economies while ensuring that there are no substantial differences within the groups (see Table 4.3.1). The groupings are as follows: the first group consists of *Highly Vulnerable* countries where there has been a significant negative impact on overall income distribution. This group contains Greece, Hungary and Estonia. The *Vulnerable* group is Portugal, Italy and Spain, three Southern European countries where a clear similar upward trend for inequalities can be observed. France, the United Kingdom and Ireland constitute the third group, the *Unbalanced European* group, since income inequality is among the highest in these developed countries. The *Balanced European* group consists of Sweden, Finland, Germany and Belgium, which have managed to maintain sustainable growth rates though their level of income inequality is higher than that of the *Leading European* group. Finally, at the most egalitarian end is the Leading European group that consists of the Netherlands, Denmark, Luxembourg and Austria.

The models are estimated over the period $1996Q1 : 2012Q1$, which takes in the *2008/09* global recession, the Eurozone collapse, and a few quarters of the global recovery. The dataset comprises quarterly macroeconomic, financial and welfare variables from eighteen developed and developing European economies, covering, where available, for each country real GDP to reflect the impact of overall economic performance, y_{it}, the rate of inflation $\Pi_{it} = ln(CPI_{it}/CPI_{it-1})$, sr_{it}, the short-term rate of interest in per cent per annum (a three-month rate) to include the impact of monetary policy, the rates of risk of poverty and social exclusion to reflect the extent of material deprivation pov_{it}, and our newly developed modified inequality indicator mq_{it} for a credible evaluation of the adjusted socially inclusive aspect. All country models cover the same set of variables where the data are available (See Appendix C.6). As a function of data availability, some components of the analysis use slightly different samples, so for example, the analyses of modified income inequality exclude Greece, Hungary and Estonia. Equally, the analysis does not extend past 1996 because there are missing data for some of the key variables. Each country-specific model is linked to foreign variables that are the weighted averages of the variables of all the other countries. The weights are determined by each country's bilateral exposures to the other countries through trade, migration and financial linkages as well as geographical proximity.[9]

4.3.2 VARX models: Country specific VAR models with weakly exogenous variables

Each country i is denoted by a vector autoregressive model for vector, here we utilise Bianchi (2012)'s definition: $\mathbf{x}_{it} = [y_{it},\ \Pi_{it},\ sr_{it},\ mq_{it},\ pov_{it}]$ augmented by a set of weakly exogenous variables $\mathbf{x}^*_{it}$. The individual country VARX$^*(p_i, q_i)$ model for the ith economy is defined as below. For $i = 1, 2, ..., 18$ where $\mathbf{x}_{it}$ is the $k_i \times 1$ vector of domestic variables, $\mathbf{x}^*_{it}$ represents

[9]For more information: Guio, 2005; Eurostat, 2015.

the $k_i^* \times 1$ vector of country specific foreign variables, where $w_{ij} = 1, , ..., 18$ are the set of multidimensional weights -as will be explained further in details- affiliated with the foreign variables (Bianchi, 2012). u_{it} is a vector of idiosyncratic country specific shocks which are serially uncorrelated with mean 0 and a non-singular covariance matrix (Pesaran et al., 2005). Main objective is to model country-specific variables for $\mathbf{x}_{it}$ vector, in course of time $t = Q_1, ..., Q_{64}$, and among all 18 countries.

$$\varphi_i(L, p_i)\mathbf{x}_{it} = \mathbf{a}_{i0} + \mathbf{a}_{i1}t + \Lambda_i(L, q_i)\mathbf{x}_{it}^* + u_{it} \tag{4.3.1}$$

$$\mathbf{x}_{it}^* = \Sigma_{j=1}^{N} w_{ij}\mathbf{x}_{jt} \tag{4.3.2}$$

Countries are notated by $i = 1, 2, ..18$. $\mathbf{a}_{i0}$ and $\mathbf{a}_{i1}t$ are, the coefficients of deterministics, respectively, intercepts and linear trends, and $\mathbf{u}_{it}$ is the idiosyncratic country specific shock. The vector of foreign country-specific variables, $\mathbf{x}_{it}^*$, plays a central role in the model (Bianchi, 2012). As will be discussed shortly, for each time t, this vector is identified as the weighted average across all corresponding $\mathbf{x}_{it}s$ in the model. Furthermore, L is the lag operator and p_i and q_i are the lag orders of the domestic and foreign variables of the i^{th} country. For estimation purposes $\varphi_i(L, p_i)$, and $\Lambda_i(L, q_i)$ can be treated as unrestricted (Pesaran et al. 2005, Bianchi, 2012). It is beyond doubt that their political and economic role gives advanced countries a considerable influence on the European region. However, it would appear somewhat artificial to assign any country a leading role in analysis of the patterns of distributional disparities in the EU, whether at the national or the regional level. So in terms of the integrated European economy, no country is considered as an origin economy and all endogenous variables remain active as domestic variables. In a more conventional form, for country i, abstracting from deterministics and high order lags, consider the VARX$^*(1, 1)$ structure (Pesaran et al. 2005, Bianchi, 2012):

$$\mathbf{x}_{it} = \mathbf{a}_{i0} + \mathbf{a}_{i1}t + \Phi_{i1}x_{i,t-1} + \Lambda_{i0}\mathbf{x}_{it}^* + \Lambda_{i1}\mathbf{x}_{i,t-1}^* + \mathbf{u}_{it} \tag{4.3.3}$$

Note that, each country model is augmented with country specific foreign variables $\mathbf{x}_{it}^*$, constructed using country specific multidimensional weights $\mathbf{w}_{ij}$, $j = 0, 1, ..., N$ that capture the importance of country j for country i's economy, and are calculated in the form of country-specific weighted averages of the corresponding variables of other European countries (Pesaran et al. 2005, Bianchi, 2012). Lag orders of domestic and country specific foreign variables VARX$^*(p_i, q_i)$, are selected based on Akaike information criterion (AIC).[10] As shown in Dees *et al.* (2007), country specific VARX models as in equation (3.1) can also be written as VECMX* in its error correction form where x_{it} and x_{it}^* are integrated of order one. The estimation procedure for these error correcting models allows for unit roots and was pioneered by Johansen (1992).

[10]Please note that, p_i, q_i do not have to be the same. The lag order of the GVAR, denoted by p, is given by $p = max(maxp_i, maxq_i)$ across all i.

The error correction form of the VARX*(2, 2) *et al.* (2005) model, is given by (Bianchi, 2012):

$$\Delta x_{it} = c_{i0} - \alpha_i \beta_i^{'}[z_{i,t-1} - \gamma_i(t-1)] + \Lambda_{i0}\Delta x_{it}^{*} + \Gamma_i \Delta z_{i,t-1} + u_{it} \tag{4.3.4}$$

where $z_{it} = [x_{it}^{'}, x_{it}^{*'}]^{'}, \alpha_i$ is a $k_i \times r_i$ matrix of rank r_i and β_i is a $(k_i + k_i^{*}) \times r_i$ of rank r_i (Pesaran et al. 2005). That is, the number of cointegration relationships in the specification, the VECMX*(1, 1).[11] model, is given by

$$\Delta x_{it} = c_{i0} - \alpha_i \beta_i^{'}[z_{i,t-1} - \gamma_i(t-1)] + \Lambda_{i0}\Delta x_{it}^{*} + \Gamma_i \Delta z_{i,t-1} + u_{it} \tag{4.3.5}$$

where $z_{it} = [x_{it}^{'}, x_{it}^{*'}]^{'}, \alpha_i$ is a $k_i \times r_i$ matrix of rank r_i and β_i is a $(k_i + k_i^{*}) \times r_i$ of rank r_i.[12]

4.3.3 Redefining European linkages: an innovative proposal

Connectedness and rationale for multi-dimensional linkages

The European economies are intensely interconnected. The trade in goods between EU Member States was 78 per cent larger in 2016 than the flow of exports leaving the EU-28 to non-member countries. Around 63.8 per cent of imports to members of the European Union came from other EU countries, and 66.7 per cent of their exports went to other EU member states (EUROSTAT Stats). Equally only 17 per cent of the debt and equity securities of the Eurozone were held by external investors in 2016 (European Central Bank, 2015). It is no coincidence that from 1999:2003, 68 per cent of the European Union's foreign direct investment flows were directed to other EU countries *(EU, 2005:Foreign Direct Investment Yearbook, p.22)*. However, most of the debates on the process of EU integration and regional development continue to be framed from a narrowly national point of view, and little attention is given to the diffusion of policies for economic welfare and the wide range of rules designed to affect market behaviour. Advanced corporatist states and regions such as Germany and the Netherlands are likely to exploit the spread of integration in various forms, leaving them with smaller spatial income disparities than those found in less advanced regions (Beckfield, 2006). Such evidence shows that the impact of economic integration on spatial income disparities should be dampened at the high levels of economic integration seen in small, open, corporatist states (Beckfield, 2006). It is therefore crucial to analyse in depth how the connectedness affects patterns of income distribution highlighting the outcomes of economic integration for labour, finance and trade for the European states.

[11] Detailed derivations are not presented here due to space considerations. For more details, see Dees *et al.* (2005).

[12] That is, the number of cointegration relationships in the system.

Bilateral migration flows

Migration of various kinds within the EU has become increasingly common, among the 3.8 million people who immigrated to one of the EU-28 Member States in 2014 were an estimated 1.6 million citizens of non-member countries, and 1.3 million people whose citizenship was from a different EU Member State from the one they immigrated to (Eurostat, migration statistics).The ongoing discussion on immigration and integration is consequently very important, as it can inform national and European policies and highlight areas of EU-wide importance, especially given the debate over the UK's membership of the European Union, in which a major point of contention has been how Brexit could affect migration levels and whether immigration has increased inequality in the UK. While intra-EU migration for EU citizens has been rationalised and justified, free movement has substantial welfare and fiscal implications.[13] For instance, qualified migration often contributes to economic resources being better employed, leading to increased production and greater well-being as the financial contributions made by immigrants help stabilise social security systems. Controversially, Obstfeld and Peri (1998) noted that an influx of unskilled EU migrants can generate problems because of unemployment, the dependants who have come with them, or the increased burden they place on public services. Some studies distinguish between skilled and unskilled migration and find conflicting evidence for its relationship to inequality. For example, Davies and Wooton (1992) find that skilled migration can reduce inequality in countries of origin but increase it in countries of destination.

Migratory exchanges in Europe can have significant impacts on economic performance, primarily through the pressure they put on labour markets. Although deeply constrained by data limitations, analysing intra-regional linkages and incorporating emigrational exchanges is an urgent and a crucial task for an integrated Europe. However, no attempt has been made in the GVAR literature to measure these cross-border externalities, and so given the role played by migration described above, total bilateral stocks of migration are used for formulating an index of the relative position between countries in the form of:[14]

$$M_{i,j} = \frac{0.3 \times M_{i,j,1990} + 0.7 \times M_{i,j,2000}}{0.3 \times \sum_{j=1}^{N-1} M_{i,j,1990} + 0.7 \times \sum_{j=1}^{N-1} M_{i,j,2000}}$$

Trade Exchanges

A substantial portion of the GVAR literature has already used trade linkages to explore propagation mechanisms, as the exchange of goods and services between economies is an indisputable

[13] Further work with major contributions of: Mau *et al.* (2009); Schierup *et al.* (2006); Geddes (2001).

[14] This representation is intended to privilege recent data and, with them, the most up-to-date features of these exchanges for which data are currently available.

element in the exposure of one economy to the variability of a foreign one. It is challenging from a distributive point of view to disentangle the impact of intra-EU trade on income disparities as the relationship depends on factor endowments and productivity variations across economies, and also on how much income individuals obtain from wages or capital. Ravallion (2004) argues that trade does not directly affect inequality but fosters economic growth, yet it remains essential to recognise the determinants of how trade flows impact income distribution. The principal theoretical references for the relation between trade and inequality come from the Heckscher-Ohlin and Stolper-Samuelson theorems (Stolper and Samuelson, 1941). Several studies, such as Costinot and Vogel (2010) and Blanchard and Willmann (2011) have concluded that international trade could potentially have mixed effects on the wage gap by raising the skill premium while also lowering the relative earnings of low income workers. As in most of the literature, the relative degree of interdependency towards a specific economy is here identified by using total trade volume measured in exports and imports to reflect the importance of country i in country j, and defined as:[15]

$$T_{i,j} = \frac{\bar{X}_{i,j} + \bar{M}_{i,j}}{\sum_{j=1}^{N-1} \bar{X}_{i,j} + \sum_{j=1}^{N-1} \bar{M}_{i,j}} \tag{4.3.6}$$

with $i \neq j$ and where $\bar{X}_{i,j}$ and $\bar{M}_{i,j}$ represent, respectively, the mean of exports and imports from country i to country j during the period under consideration.

Finance

Intra-EU FDI inflows rose by 40 per cent in 2015 and reached 365 billion (Eurostat, 2015). The tentative message of the emerging bulk of empirical research is that stronger financial links between countries can assist international distribution of capital. Conversely, increased financial flows, particularly foreign direct investment (FDI) and portfolio flows, have been shown to raise income inequality in both advanced and emerging market economies (Freeman 2010). While there is a great deal of literature on the effects of financial globalisation on the growth in volatility (Prasad *et al.*, 2007; Kose *et al.*, 2009; European Regional Economic Outlook 2009), its effects on inequality have received far less attention, even though increased financial flows have had a significant impact on income distribution (Roine et al., 2008). One possible explanation of this increase is the concentration of foreign assets and liabilities in sectors that are more skill intensive and technology intensive, which increases the demand for more highly skilled workers and also lifts their wages. In a recent paper, Chen *et al.* (2014) showed that outsourcing reduces the real wage for unskilled workers by up to 1.8 per cent while it increases the real wages for skilled workers by up to 3.3 per cent.

[15]See, for example, Chudik et al (2011) for a detailed explanation on trade weights to construct foreign variables.

Therefore the third part of the multi-dimensional interdependency matrix must focus on the increased role of external financing as a source of funding and analyse possible channels of contagion through financial exchanges. The complexity and variety of financial interactions make it necessary to focus on specific aspects that, for the purpose of this paper, reflect a more structural component that generates a strain in broader social terms rather than short-term speculative flows, because this structural component has a stronger relation with the real sector.

In this case, an index of the international exchange of direct investments is calculated as:

$$F_{i,j} = \frac{\bar{out}_{i,j} + \bar{inw}_{i,j}}{\sum_{j=1}^{N-1} \bar{out}_{i,j} + \sum_{j=1}^{N-1} \bar{inw}_{i,j}} \tag{4.3.7}$$

with $i \neq j$ and where $\bar{out}_{i,j}$ and $\bar{inw}_{i,j}$ stand, respectively, for the means of total outflows and inflows of direct investments from country i to country j.

Geographical proximities

The importance of location decisions by the centripetal forces of large markets has been emphasised by scholars such as Krugman (1991) and Pugma (2002), who have demonstrated that economic integration in Europe has been central to the concentration of economic activities. Studies at both national and international level have shown geography to have a significant impact on access to markets, which then shapes income levels. Krugman (1991) and Venables (1994) also document the economic relevance of such proximities in examining regional integration. Economic and income inequalities in the EU can partly be defined by the location of regions within the European space. In this section we concentrate on the country's location within the European space. An index of inverse distances that assigns greater weight to closer neighbourhoods is calculated using the World Bank's API.[16] This is chosen mainly because inverse-distance weights are commonly used in configurations of spatial econometrics involving units that are geographically dispersed (LeSage and Pace, 2009). Income per capita may be altered by geographic location in various ways, through the impact on flows of goods and factors of production.

$$G_{i,j} = \frac{1}{(dist_{i,j})} \tag{4.3.8}$$

It is also worth noting that there may be inequality between EU member states because levels of technology vary (Garcia-Penalosa, 2010). Income distribution in member states may be affected by both political economy equilibrium and technological progress without any casual effects being implied across countries. It still remains uncertain how much these developments

[16] Geo-localisation of capital cities.

are driven by broader economic pressures related to technology or globalisation, but as much as we would like to capture the impact created by these variables, it is not possible to do so in a GVAR setting.

4.3.4 Composite weights based on key linkages and robustness issues

This section flags the importance of specifying weights so that multidimensional interdependencies can be incorporated in GVAR models. In order to disentangle further how multidimensional weights differ from conventional weights, the empirical severity of the problem of robustness has been quantified for six different weighting schemes for any given specification of the model.[17]

Different weights are assigned to the indexes for individual channels of interaction as they operate with distinctive strength in the map of exchanges between European economies. This is achieved by constructing a sensible composite weight matrix reflecting the means of key indicators that show the relative importance of each individual economy towards each other economy in the sample. Further justification for the weighting scheme draws from the suggestions in three well-known papers. First, Eickmeier and Ng (2014) look at a range of different connectivity matrices and assess differences through a forecasting exercise. Second, Feldkircher and Huber (2015) analyse weight schemes that allow for different weights for different foreign variables in the system, specifically evaluating different weight schemes to suit the likelihoods of the GVAR model. Third, Gross (2013) proposes estimating weights rather than choosing them exogenously for the model. Also, to avoid a potential problem of endogeneity in the formulation of these weights, the study utilizes averages, formulated in a way that their outcomes are as disengaged from quarterly policy variations as possible.

In fact, evidence from European countries that are documented in the following sections also reaffirms to a considerable extent the weighted averages specified for these separate connectivity measures. Trade linkages meanwhile have always been important drivers of an increased interdependency among Eurozone economies. Given the significant strides that European countries have made towards a common market by lowering trade costs and impediments to factor mobility, trade linkages are assigned a weight of 0.35. As discussed in the previous sections, exposures are well diversified among European countries, but potential financial spillovers increase the overall exposure much more. So because the exposures between the countries are non-negligible and so the concentration of their financial exchanges is intensified, these exposures are also allocated a weight of 0.35. Bilateral mobility patterns are at least as important as the other dimensions already noted, if not more important, and so a weight of 0.25 is assigned to European migration flows in an attempt to allow a reliable hierarchy of principles for verification. Furthermore, geographical proximities are also taken into consideration in order

[17]To save space we do not elaborate here on alternative weighting schemes. Output tables showing the main results for each single matrix are available upon request.

to tackle temporal and spatial interdependencies in Europe. The geographical neighbourhood is highly relevant for common markets like Europe. However, its impact on economic entities is very small next to that of the other dimensions in the era of globalisation and web-based technologies, and so a weight of 0.05 is assigned for the neighbourhood entity. Limits on space prevent us reporting alternative weighting schemes, but the outputs of the other weighting schemes along with the dynamic analysis are available upon request.[18] Following the theoretical and empirical considerations and the relative importance of these linkages as documented in the following sections, the composite matrix **W** is constructed from the corresponding entries in each of the previous matrices as:

$$W_{i,j} = 0.05G_{i,j} + 0.35T_{i,j} + 0.35F_{i,j} + 0.25M_{i,j} \tag{4.3.9}$$

$$\Rightarrow \mathbf{W} = [0.05\mathbf{G} + 0.35\mathbf{T} + 0.35\mathbf{F} + 0.25\mathbf{M}] \tag{4.3.10}$$

with $_{i,i} = 0$ being a result of the null diagonals in all of the constituent matrices (see Appendix C.3 and C.4).[19]

4.3.5 Solution of the global system

To construct the global VAR model from the individual country specific models, domestic and foreign variables for each country are grouped together. Define:

$$z_{it} = \begin{bmatrix} x_{it} \\ x^*_{it} \end{bmatrix}_{(k_i+k^*_i)\times 1} \tag{4.3.11}$$

Given this renaming, system can be written as:

$$A_{i0}Z_{it} = a_{i0} + a_{i1}t + A_{i1}Z_{i,t-1} + u_{it} \tag{4.3.12}$$

where $A_{i0} = (I_{ki}, -\Lambda_{i0})$, $A_{i1} = (\phi_{i1}, -\phi_{i1})$.[20] To arrive at the global solution of the interconnected system, the countries are tied together via stacking the estimated individual country specific models and linking them with a matrix of multidimensional cross country linkages (Pesaran et al. 2005, Bianchi 2012). This link matrix will allow the country specific models to be written in terms of a global variable vector x_t. The identity below will be obtained by using

[18] Possible correlation between trade weights and inverse distances has also been investigated by looking at the correlation between foreign real GDP based on trade weights and foreign GDP based on distance weights. We find no evidence for a serious correlation in our series.

[19] For the purposes of estimations these weights have been column-normalised.

[20] Matrix A involves country parameter estimates of domestic and foreign variables.

multidimensional weights $Z_{it} = W_i X_t$ where $x_t = [x'_{1t}, ..., x'_{Nt}]$ is the $k \times 1$ vector which collects all the endogenous variables of the system, and W_i is a $(k_i + k_i^*) \times k$ matrix (Pesaran et al. 2005, Bianchi 2012). Given $Z_{it} = W_i X_t$, it follows that:

$$A_{i0} W_i X_t = a_{i0} + a_{i1t} t + A_{i1} W_i X_{t-1} + u_t \tag{4.3.13}$$

These individual country models are stacked to yield global solution of the interconnected system and for X_t is given by (Pesaran et al. 2005, Bianchi 2012):

$$G_0 X_t = \mathbf{a}_0 + \mathbf{a}_{1t} t + G_1 X_{t-1} + \mathbf{u}_t \tag{4.3.14}$$

$$G_1 = \begin{bmatrix} \mathbf{A}_{10}\mathbf{W}_1 \\ . \\ . \\ . \\ . \\ \mathbf{A}_N \mathbf{W}_N \end{bmatrix} \mathbf{a}_0 = \begin{bmatrix} \mathbf{a}_{00} \\ . \\ . \\ . \\ . \\ \mathbf{a}_{N0} \end{bmatrix}, \mathbf{a}_1 = \begin{bmatrix} \mathbf{a}_{11} \\ . \\ . \\ . \\ . \\ \mathbf{a}_{N1} \end{bmatrix} \mathbf{u}_t = \begin{bmatrix} \mathbf{u}_{1t} \\ . \\ . \\ . \\ . \\ \mathbf{a}_{N1} \end{bmatrix}$$

Premultiply (3.13) by $\mathbf{G}_0^{-1}$ that is a non-singular matrix that depends on the multidimensional composite weights and parameter estimates to obtain GVAR(1) model.

$$\mathbf{G}_0^{-1} G_0 X_t = \mathbf{G}_0^{-1} \mathbf{a}_0 + \mathbf{G}_0^{-1} \mathbf{a}_{1t} t + \mathbf{G}_0^{-1} G_1 X_{t-1} + \mathbf{G}_0^{-1} \mathbf{u}_t \tag{4.3.15}$$

$$X_t = \mathbf{b}_0 + \mathbf{b}_{1t} t + F_1 X_{t-1} + \varepsilon_t \tag{4.3.16}$$

where

$$\mathbf{b}_0 = \mathbf{G}_0^{-1} \mathbf{a}_0 \qquad \mathbf{b}_{1t} t = \mathbf{G}_0^{-1} \mathbf{a}_{1t} t \qquad \mathbf{F}_1 = \mathbf{G}_0^{-1} G_1 \qquad \varepsilon_t = \mathbf{G}_0^{-1} \mathbf{u}_t \tag{4.3.17}$$

Equation (3.15) is a high dimensional global model that can be solved recursively and used for dynamic analysis in the usual manner for the Europe as a whole, where domestic and foreign variables interact simultaneously. Dynamic properties of the global model are examined through Generalized Impulse Response Functions (GIRFs).

4.3.6 Selecting lag-length and cointegration rank

Country specific models are estimated based on the appropriate lag order and cointegration dynamics. The lag order of the domestic variables, p_i, is selected in agreement with Akaike criterion, and q_i is set equal to 1 in all countries. Owing to data limitations, p_{max} and q_{max}

are not allowed to be greater than 2.[21] The number of cointegration relations are reduced to address the issue of possible over-identification, as well as to assure the stability of the global model. More specifically, the following ad hoc adjustments in the number of cointegration relations are made: Austria from 4 to 3, Ireland from 2 to 1, Spain from 4 to 1, and Sweden from 4 to 3.

As mentioned earlier, a crucial condition underlying the estimation strategy is the weak exogeneity of x_{it}^{*} with respect to the long-run parameters of the conditional model.[22] Clearly, there is no single best structure to be imposed across the countries, given data constraints and different specifications of the individual country models. Overall, most of the countries have the same set of domestic variables, except for a few countries where *I(2)* variables are not included. Results suggest that for the majority of the variables being considered, weak exogenity assumptions could not be rejected.

4.3.7 Contemporaneous effects of the foreign variables on their domestic counterparts

Foreign specific variables can have contemporaneous effects on their domestic counterparts by introducing feedback between each country and the rest of the world. This means these estimates can be interpreted as impact elasticities between domestic and foreign variables that measure the contemporaneous variation of a domestic variable due to a 1 per cent change in its corresponding foreign specific counterpart (Pesaran et al. 2005, Bianchi, 2012). The results suggest that most of these elasticities are statistically significant and have a positive sign. Appendix C.1 presents the contemporaneous effects of foreign variables on their domestic counterparts for both the standard and robust t-ratios, with the latter computed using Newey-West's heteroskedasticity-consistent variance estimator. As expected, the degree of responsiveness to foreign variables varies across countries. It is most important to note however, that the highest sensitivity displayed across variables by the changes turned out to be in price levels, which are closely followed by the average sensitivity to changes in the modified inequality measure. This clearly shows there is a much stronger relation with monetary policy reactions than with variations in income distribution. From the statistically significant coefficients it can also be noted that the modified inequality measure of the *Vulnerable* region displays a large degree of sensitivity to foreign developments, even doubling those external variations as seen in Italy and Spain for this variable. The same is also true to a lesser extent for the *Balanced* region.

Focusing on the *Vulnerable* area, it can be observed that this region also has relatively large

[21] In the light of suggestions provided by Cesa-Bianchi *et al.* (2012) the orders of the VARX* models with very ragged responses are changed from VARX(2,1) to VARX(2,2) in an attempt to provide a convenient estimation procedure.

[22] In practice, the weak exogeneity assumption permits considering each country as a small open economy with respect to the rest of the world.

elasticity to foreign output.[23] Indeed, this is a clear indication of significant intra-EU economic linkages and this eventually confirms that the member states are more open to external cyclical variations. In the specific case of Portugal, the commercial channel seems to have played a central role in these interdependencies, given the high elasticity it shows to a foreign component of inflation. Notably high elasticities of the modified inequality indicator are also found in the *Balanced* region, particularly for the economies with the smaller populations. For instance, Finland and Belgium display an almost one-to-one response to the weighted variations of closely connected economies. Finland for example has noteworthy linkages with Sweden in international financial exchanges and migration flows.[24] In Italy and Spain meanwhile, temporary migration flows intervene in the responses of these economies so that foreign improvements lead the floating population to return to their original countries, alleviating by doing so the pressures on the local distribution of income.

Foreign output elasticities also yield important insights into the structural qualities of each economy. Perhaps more importantly, exposure to contemporaneous foreign variations in output has consequential implications for how well they respond to income distribution. A further example can clarify this with the cases of Luxembourg and Austria, both of which are in the *Leading* region, though Luxembourg shows a much more substantial elasticity to foreign output that is seven times larger than Austria's. In it's distinctive sensitivity to income distribution, Austria's low output exposure translates into a considerably larger resilience to external variations in income distribution. Although we observe a clear international component of inflation distributed among the regions with the most coefficients above 70 per cent, the overreaction is quite limited in size, and only marginal next to external variations in income distribution, which is particularly accentuated in the *Highly Vulnerable* region (where Hungary and Greece find there are even multiplying effects). Another interesting feature of the results is the very weak contemporaneous response that appears across modified inequality ratios and rates for being at risk of poverty and social exclusion in the United Kingdom. These rates are negatively related to foreign changes in the same variables, displaying a non-contemporaneous pattern of responses in this country towards these foreign variations.

4.3.8 Pair-wise cross-country correlations: variables and residuals

One of the key assumptions of the GVAR modelling approach is that the *idiosyncratic* shocks of the individual country models should be cross-sectionally *weakly correlated*, as otherwise they cannot be considered to be idiosyncratic. Average pair-wise cross-section correlations are computed for the levels and first differences of the endogenous variables. The tables also include the correlations between the VECMX* residuals and each variable in the model (See Appendix

[23] It is 86.5 per cent for Italy and 78.8 per cent for Portugal.

[24] As is shown by the composite weights between them.

C.2). It is quite interesting to note that the cross-sectional correlations of the residuals from the VARX* models are very small.[25] In fact, no residual series displays a correlation larger than 10 per cent with any foreign variables in levels or in first differences. In this way, these results give a promising picture and indicate that the model has indeed managed to capture the common effects driving the endogenous variables, meaning it can be considered successful at explaining cross-country interdependencies. Average cross section correlations with the domestic variables seem to be generally high, and this is a clear indication of their usefulness for modelling intra-regional interdependencies. Even the variables displaying a high degree of cross-sectional correlation such as real output, where all the available level-coefficients are larger than 0.90, display almost zero correlations with the VECMX* residuals.[26] Another variable with clearly strong international correlations is the interest rate.[27] The values for the cross-sectional correlations of the residuals from the individual country models that include the modified inequality measure, the rate for risk of poverty, and inflation appear to lie between zero and 0.10. Exceptions are noted for inflation, where the correlation of the residuals from the individual country models is slightly higher and these results suggest that the orthogonalisation noted earlier has been successfully achieved for these variables.

4.3.9 Persistent profiles and the stability of the global system

The stability of the system is analysed through persistence profiles, which are variable-specific shocks on the dynamics of the long-run relations, or the time profiles of the effects of the system: If the vector under consideration is a valid cointegrating vector, the persistence profiles should return to equilibrium at an acceptable rate, and normally in fewer than 40 periods (Pesaran et al. 2005, Bianchi 2012).[28] The model satisfies this property, and the persistence profiles of all the cointegration relations settle down reasonably well. Specifically, all the cointegrating relations return to their long-run equilibriums within ten quarters after a shock to the system. The stability of the system can also be examined by analysing the eigenvalues. Following Pesaran *et al.* (2005), the global system should have at least 48 unit roots, which is the number of domestic variables minus the number of cointegrating relations ($91 - 43 = 48$). The global system does indeed have 50 eigenvalues that fall on the unit circle, with the remaining eigenvalues having moduli that are all less than unity.

[25] Most of the residual series (12 out of 14) show correlations with the variables of 0.10 or lower.
[26] With Germany as the only exception where the correlation is larger than 10 per cent.
[27] This has a mean of 0.85 over all the available countries.
[28] See Pesaran and Shin (1996) for a discussion on the persistence profiles of the cointegrating models.

4.4 Dynamic analysis

4.4.1 Spillover of real shocks: negative global shock to economic performance

GVAR allows aggregated foreign variables to be incorporated in analysis of the spillover of shocks not only on the country-specific level, but also on a global level.[29] One place where this paper has direct policy relevance is in the potential effects of a country's economic performance on modified inequality. Figure 4.1 summarises the estimated GIRFs to a negative shock of one standard error to the European Union's overall economic performance.[30] The cyclical variation throughout the time horizon is quite similar in the *Leading European* and *Unbalanced European* countries. It is somewhat puzzling that the *Balanced* group seems to experience a small dip in the modified inequality ratio (MQ) initially, one which is originally small, but follows a decreasing trend. On impact MQ decreases by between 0.02 and 0.05 in the second year, then gradually rises so the fall is cancelled out in the subsequent quarters. In contrast, the MQ in the *Unbalanced* European group is expected to rise by 2 pp (percentage points) on impact, and over 3 pp in the second year before declining afterwards. A similar but more pronounced pattern can be observed in the Leading European group, where the impact on MQ is relatively longer lasting, as MQ in the Leading group, which contains the Netherlands, Denmark, Luxembourg and Austria, increases significantly over the first three years. The impact reaches its peak in the third year with an increase of approximately 1.2 per cent, so any future movement towards a secular stagnation (Gordon, 2012) for example, is likely to be associated with even greater inequality.

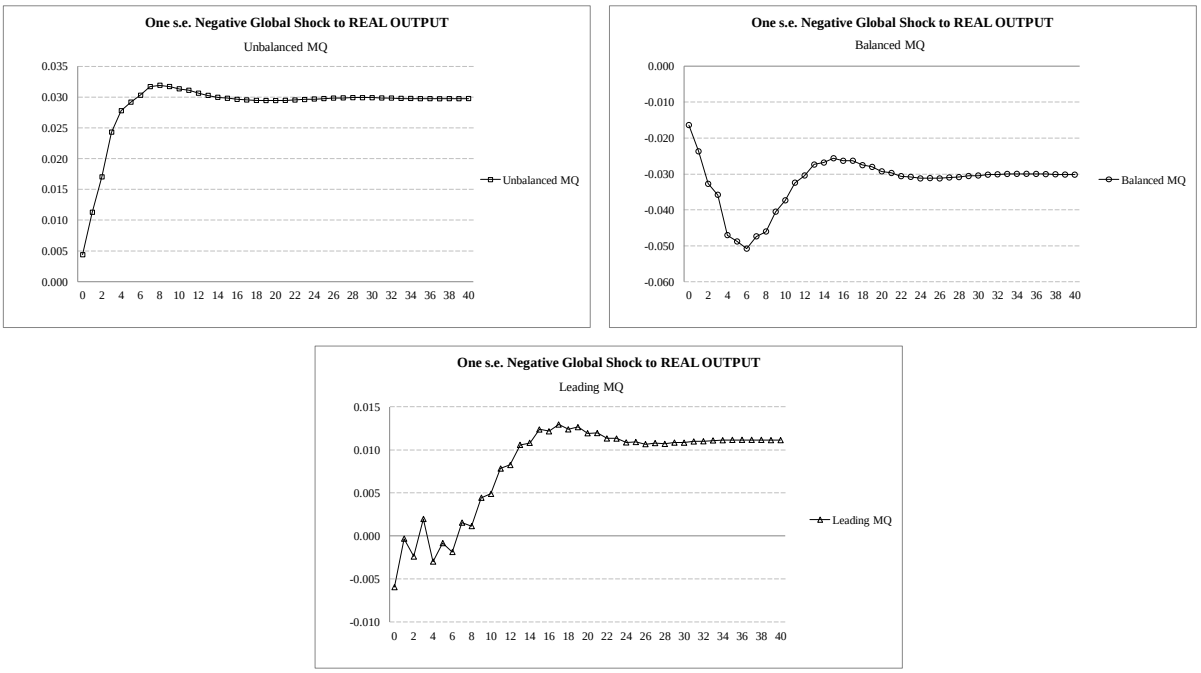
In this interpretation, globalisation has two effects. One is that it increases inequality in *Leading* and *Unbalanced* EU member states because economic growth is negative for a period, but the other is that it reduces the overall growth rate of income disparity in the *Balanced* group. More specifically, the global analysis provides further evidence that a negative shock to European economic performance does indeed exaggerate the rise in inequality in the *Leading* and the *Unbalanced* European country groups within four to twelve quarters of impact. It also seems to be the case that events pre-dominantly drive the adjustment towards a long run equilibrium or at least that global shocks are largely *absorbed* by the *Leading* and the *Unbalanced* European countries, and from there transmitted further. Indeed the weak recovery in those countries after the crisis and the relatively weak growth in their trading partners have clearly offered them no help in regaining their footing. As confirmed in this analysis, the impact of economic growth on income distribution is indisputable, which is consistent with earlier findings in the literature. Other authors, like Bourguignon and Morrisson (2002), Milanovic

[29] See Pesaran *et al.* (2004) for further technical details and other applications of this procedure.

[30] To evaluate the impact of European economic performance shock on the regional dynamics credibly, the time frame is set first to five years following the shock then up to eight.

and Yitzhaki (2002) and Sala-i-Martin (2006) present similar findings that can explain this behaviour. Piketty (2014), for example, indicates that the rise in inequality witnessed in recent decades is a direct result of the slowing down of economic growth in modern capitalist economies, and he suggests this challenge would be exacerbated if growth rates decline further.

Figure 4.1: GIRF of a global shock to Real Output



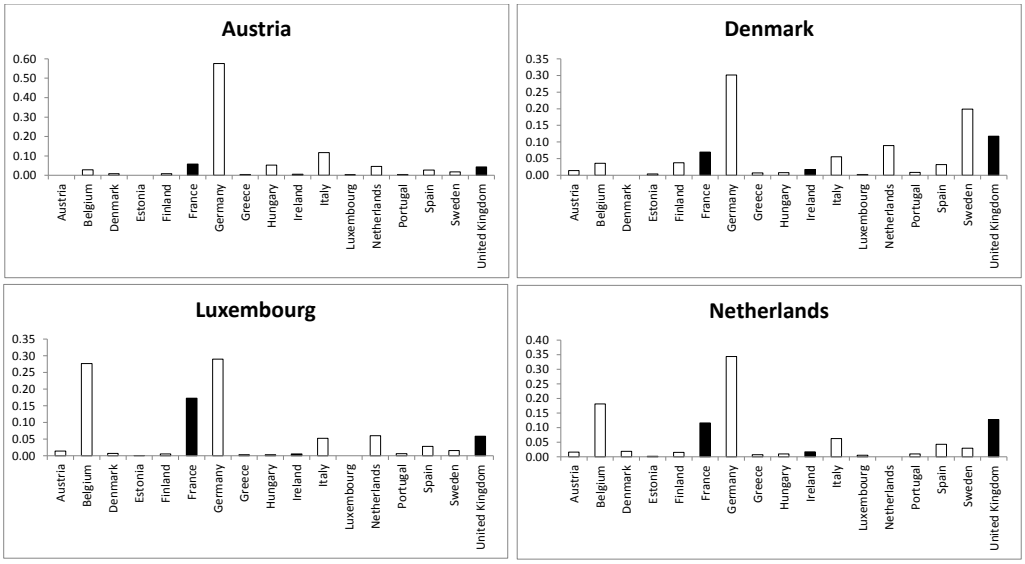
4.4.2 Spillover of distributional problems: a positive shock to Leading group's modified inequality ratio

The results of a positive one standard error shock to Leading European countries' modified inequality ratios are shown in Figure 4.2 below. Following a 1 standard error shock to modified quintile ratio, the *Leading* group's modified quintile contemporaneously increases by 2.67 p.p. displaying a smaller lagged effect in the first quarter, which then shows minor oscillations and mostly dissipates in the third quarter. A corresponding significant pass-through can be observed in the *Balanced* group, where the modified quintile initially increases by 0.85 p.p., and this effect continues operating, until around quarter 8, before it starts losing its strength and reaches a new steady state. In the *Unbalanced* group, on the other hand, the observed pattern is rather different. The shock on the *Leading* group, to start with, has a negative impact on the *Unbalanced* group's MQ with a contemporaneous decrease of 0.73 p.p. and continues pushing downwards for the following ten quarters up to a maximum decrease of 2.5 p.p. after which the shock loses most of its strength.

Overall, the dynamic analysis documents that, when there is a deterioration in relation to after-in kind benefits income inequality in the *Leading* European countries, the impact on its own region is mostly restricted to the first year. This is a clear indication of the delay with which the transmission mechanisms between these regions work and, mainly in the case of the spillover effect to the *Balanced* region, of the multiplicative effects they exhibit. Since, this indirect impact is clearly larger than the one derived from the original shock.

The specific cross-country mechanisms are of course of a more particular nature, but this exercise makes the value of employing multiple dimensions for the interrelations between economies even more evident. Interpretations based on the multidimensional link matrix can further clarify these developments. For example, as shown in Figure 4.2, there are strong commercial links between Denmark, Luxembourg and the Netherlands with the countries of the Unbalanced group. For countries like Luxembourg, the Netherlands and to a lesser extent Denmark, financial exchanges play an important role and the United Kingdom is a predominant counterpart (See Figure 4.3). Similarly, migration exchanges constitute a relevant source of interdependence between these groups which has potentially large implication in cases like Luxembourg or Denmark (See Figure 4.4). The fact that the spillover to the Unbalanced region is negative, implies that the original shock is promoting conditions that this specific group requires for the generation of improvements in terms of income inequality.

Figure 4.2: Trade weights between the Leading and the Unbalanced regions



4.4).

Figure 4.3: Financial weights between the Leading and the Unbalanced regions

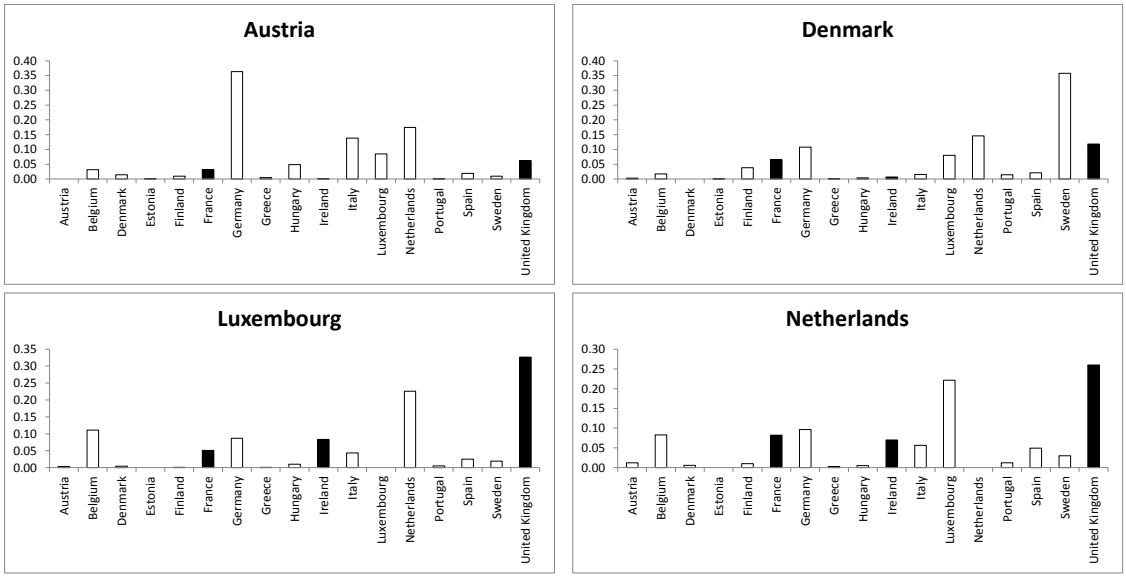


Figure 4.4: Migration weights between the Leading and the Unbalanced regions

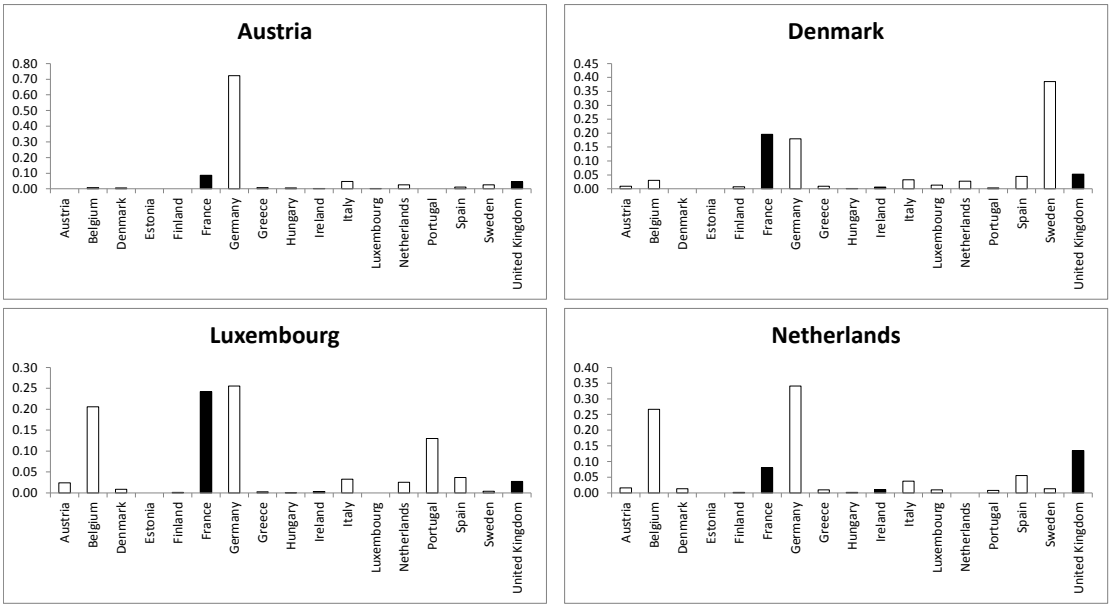
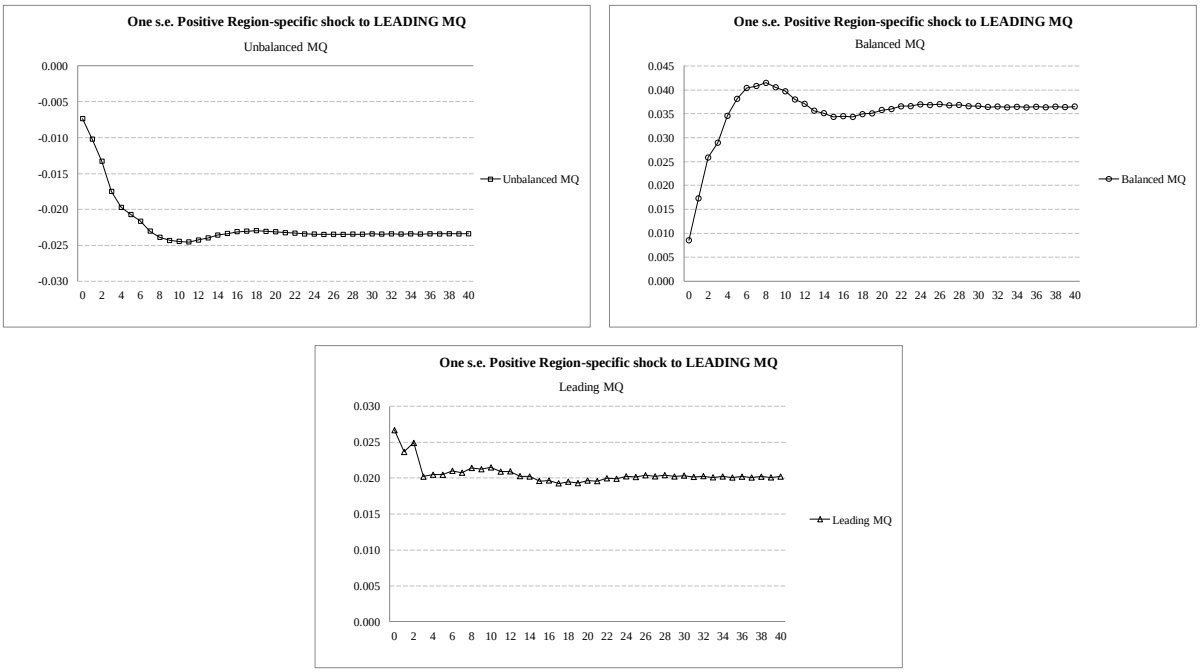


Figure 4.5: GIRF of a shock to Leading MQ



4.4.3 A positive shock to the Unbalanced country group's modified inequality ratio

The GIRFs of a one standard error positive shock to MQ display an immediate, though mostly short-lived, deterioration across the region. First there is an increase of 2.4 percentage points on impact, and this is followed by subsequent considerable increases in this indicator until it peaks in the third quarter after the shock at 4.1 percentage points. In contrast to the outcomes of the previous shock, the inter-regional responses follow a similar profile, with a lagged, sustained increase in the MQ until the spillover weakens in around quarter 10, and finally dissipates near the 20th quarter.

Although there is marked similarity in the shape of these spillovers, there is considerable difference in their size, with the response from the *Balanced* group displaying a larger multiplicative effect than that from the Leading region, and even a larger one than that from the originating region. In this sense, the Leading group displays a larger degree of resilience to shocks generated in the *Unbalanced* group, as the Balanced region is primarily exposed to shocks in the *Unbalanced* region through trade exchanges (See Figure 4.6) and, interestingly, there is a considerable contribution from inter-regional migration (See Figure 4.8). The diversification of financial exchanges out of the Balanced region and mainly into the Leading region acts as a contention barrier against the transmission of spillovers through this particular channel (See Figure 4.7). Germany is evidently a central player across this set of interactions, but Belgium also appears as a consequential counterpart within the same region.

Figure 4.6: Trade weights between the Unbalanced and the Balanced regions

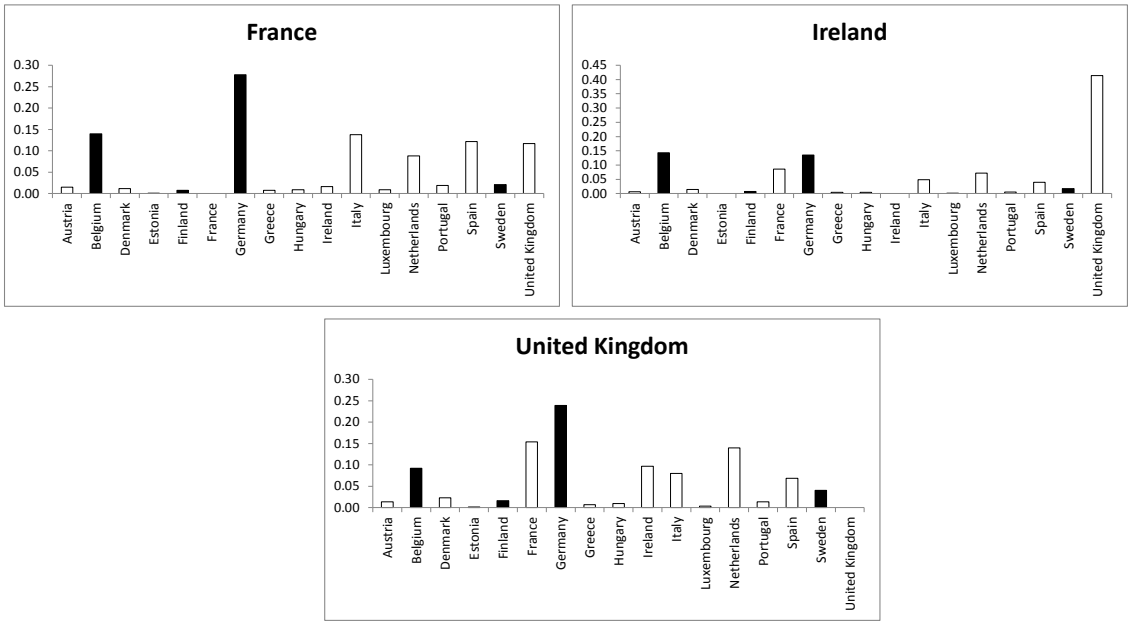


Figure 4.7: Financial weights between the Unbalanced and the Balanced regions

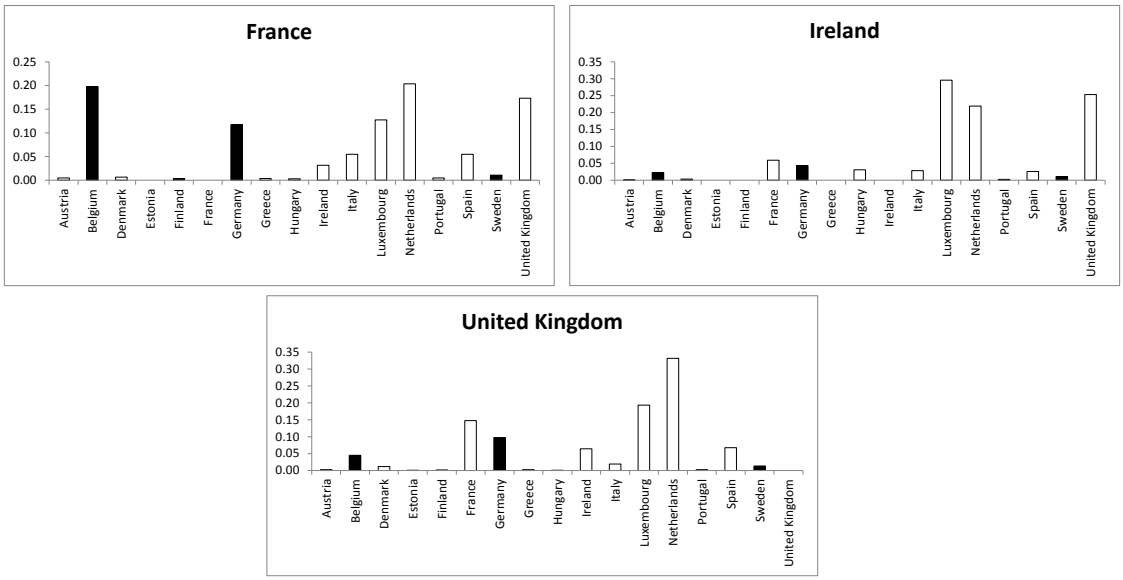


Figure 4.8: Migration weights between the Unbalanced and the Balanced regions

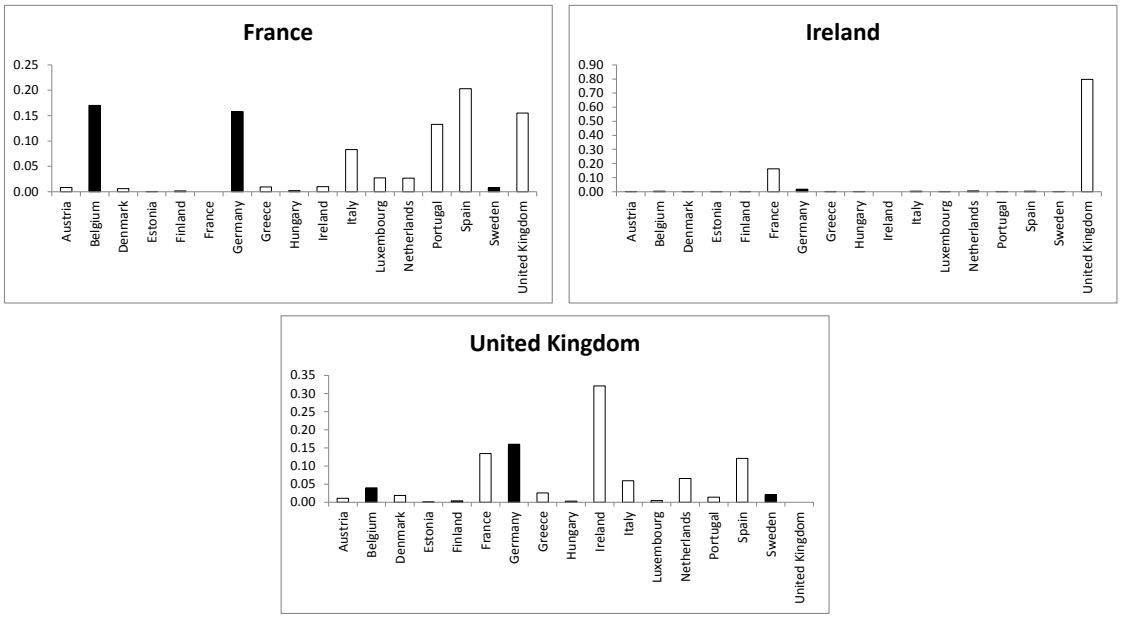
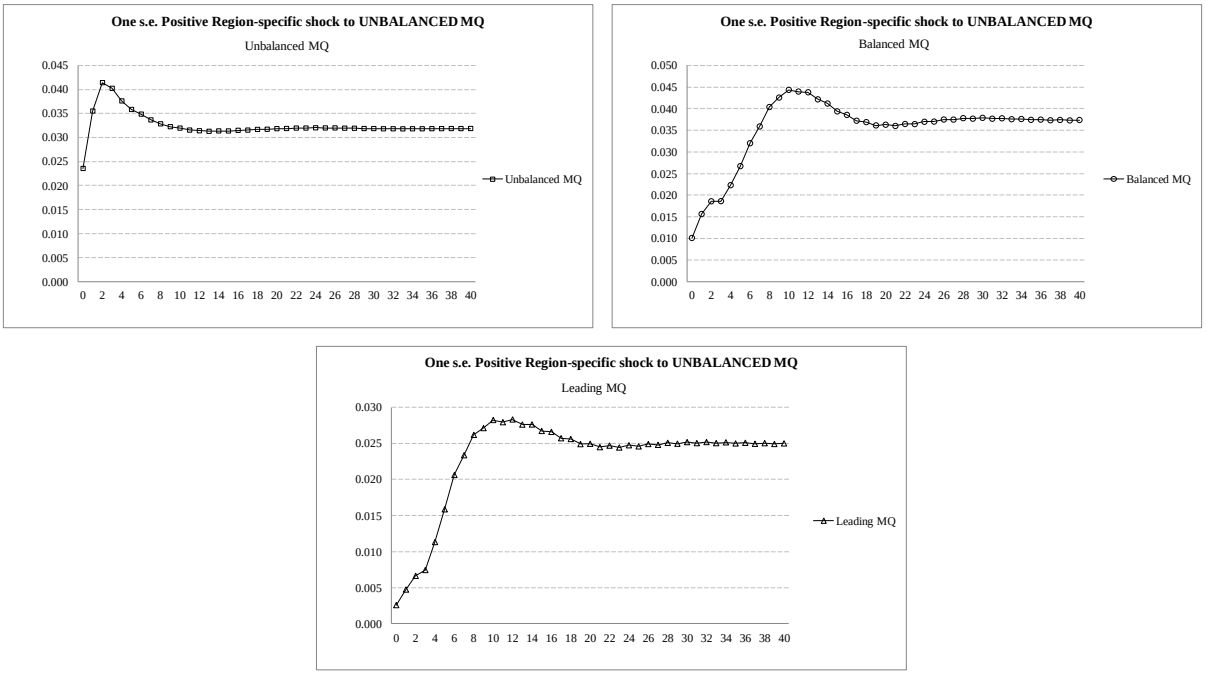


Figure 4.9: GIRF of a shock to Unbalanced MQ



4.4.4 A positive shock to the Balanced country group's modified inequality ratio

The results of a positive one standard error shock to the *Balanced* MQ are shown in Figure 4.9. This shock leads to an immediate increase of 0.4 percentage point followed by considerable subsequent increases in the MQ up to a maximum of 0.12 percentage point ten quarters after the initial impact. In turn, rising income inequalities originating in the *Balanced* group appear to elicit a more moderate impact on the MQ in other regions of Europe. The GIRFs show that the transmission of a one standard error positive MQ shock in the *Balanced* group to the *Leading* European countries is significant, and that it keeps building up in time to a maximum of 0.37 percentage point after two years. Furthermore, it is noticeable from the inter-regional weightings that the financial channel plays a considerable role in the interactions between these two groups, with Luxembourg and the Netherlands as key players. It is worth mentioning though that the Netherlands is also a significant counterpart for the *Balanced* group in trade and migration exchanges.

For the countries in the *Unbalanced* group, the MQ path after the shock is described by a decline in the group's MQ of around 0.5 per cent on impact, which again keeps operating until it reaches a maximum reduction of 2.8 per cent in a two-year horizon. The negative correlation identified between the developments of the MQ indicator in the *Unbalanced* group and shocks in the other European regions reveals contrasting features in the nature of the interactions between groups. This suggests that some of the factors affecting income distribution in *Unbalanced* economies are acting as direct competitors to their inter-regional equivalents. Take for example the competition between financial markets, which themselves have significant effects on overall macroeconomic performance and through that on the basis for income generation and distribution.

Figure 4.10: Trade weights between the Balanced and the Leading regions

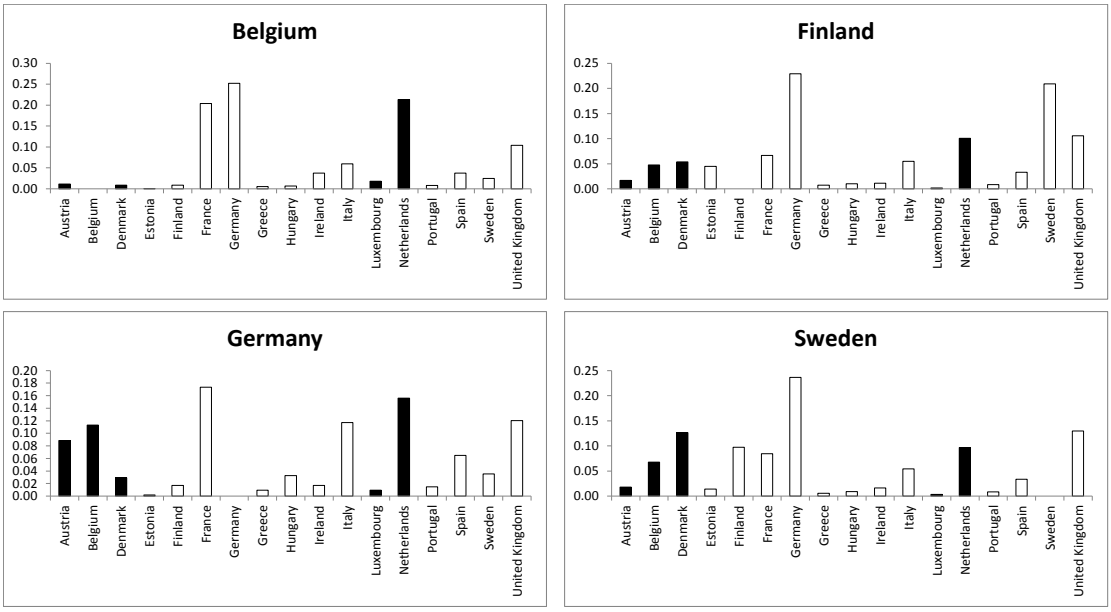


Figure 4.11: Financial weights between the Balanced and the Leading regions

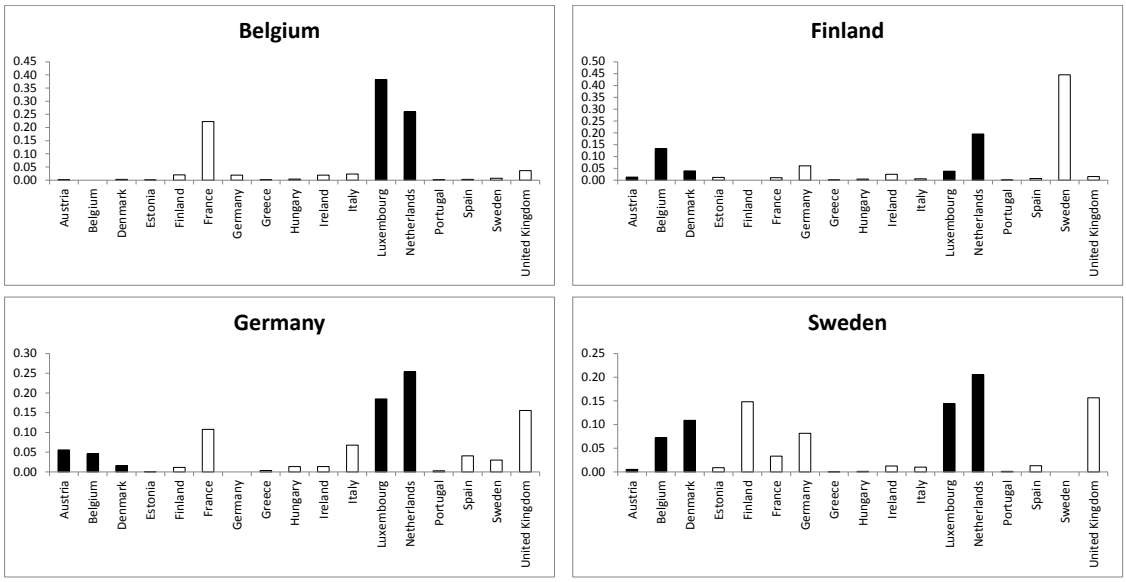


Figure 4.12: Migration weights between the Balanced and the Leading regions

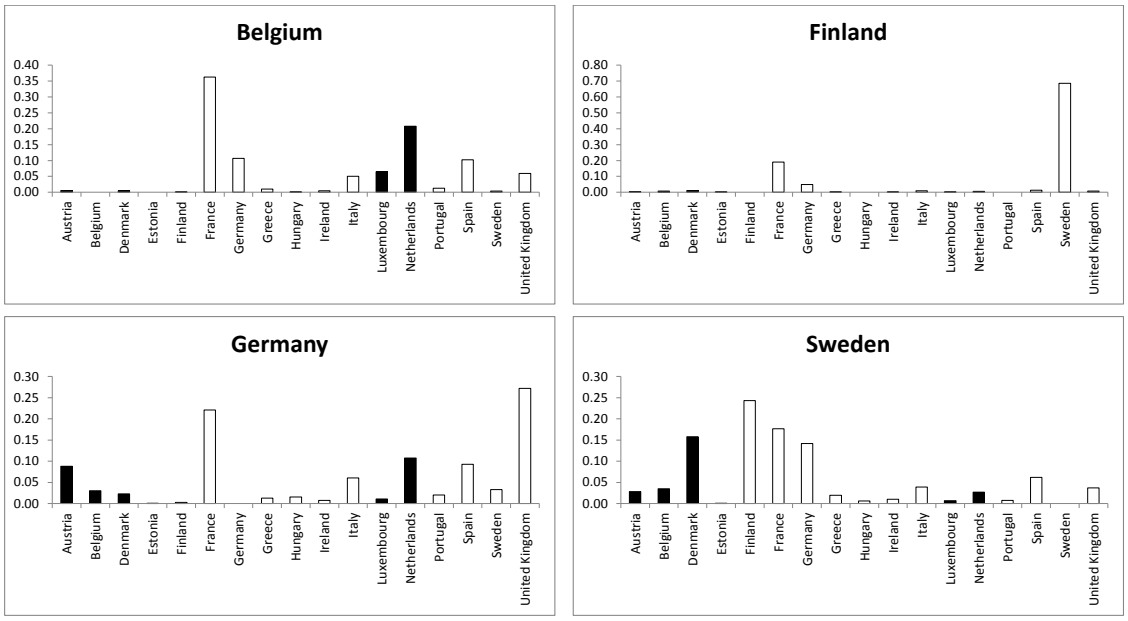
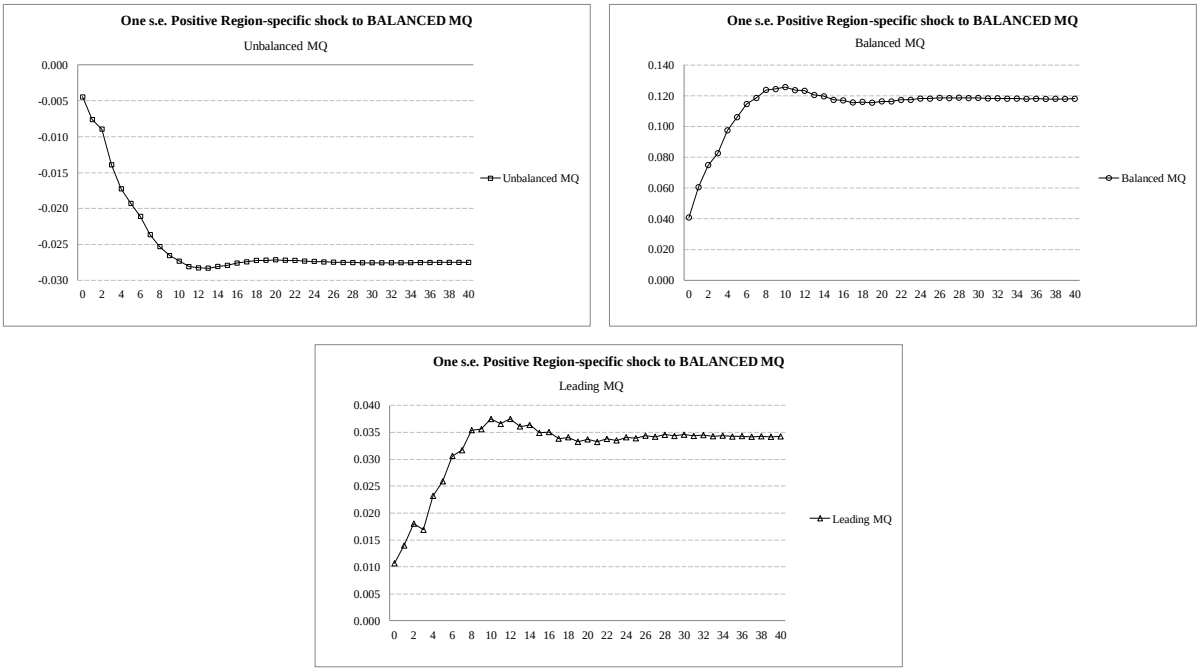


Figure 4.13: GIRF of a shock to Balanced MQ



4.4.5 The marriage of poverty and inequality: an intractable problem?

The dynamic analysis in this section has an eye to the EU 2020 targets that aim to reduce the number of Europeans living below national poverty lines by 25 per cent by 2020, which translates to getting 20 million people out of poverty. A recent study by the World Bank (2016) suggests that tackling income inequality can play a significant role in ending poverty. If countries act strategically to cut inequality, they will lift people out of poverty at a faster rate (World Bank, 2016).[31] To the best of our knowledge, this is the first time that such analysis has been done for Europe in GVAR settings to emphasise how the prevalence of poverty is related to increased divergence among income quintiles.

In contrast to the strong region-wide responses to the positive shock to the modified inequality indicator of one standard error in the *Vulnerable* and *Balanced* regions, the shocks to modified inequality in the *Unbalanced* and *Leading* European countries generate less severe region-wide responses in terms of the variations in poverty. Variations in the profile responses indicate that the distributional improvements we have explored so far have primarily been experienced by the intermediate income strata in the group, and not by the poorest agents of these economies. This then provides further evidence that the levels of poverty elasticity differ between country groups. The profile of the response in the *Balanced* group is similar to that of the *Vulnerable* European group in its direction and timing although the variations are clearly larger in the *Balanced* group. The immediate impact on the MQ in the *Balanced group* is 8 percentage points and its effect on the *at risk of poverty* rate rises further in the next three to four quarters, before the impact starts to diminish and finally dies out in around quarter 11. After an equivalent shock, the *Vulnerable* group also experiences an increase in poverty, mostly lagged until quarter 8, when it reaches a maximum of 11.2 percentage points. As expected, there is an immediate increase of 3.1 percentage points in the share of the population at risk of poverty after social transfers for the *Vulnerable* group, and a further rise to 11.2 percentage points in the 8th quarter, after which the growth in that share follows a shallow downwards trend and then dissipates in the following periods.

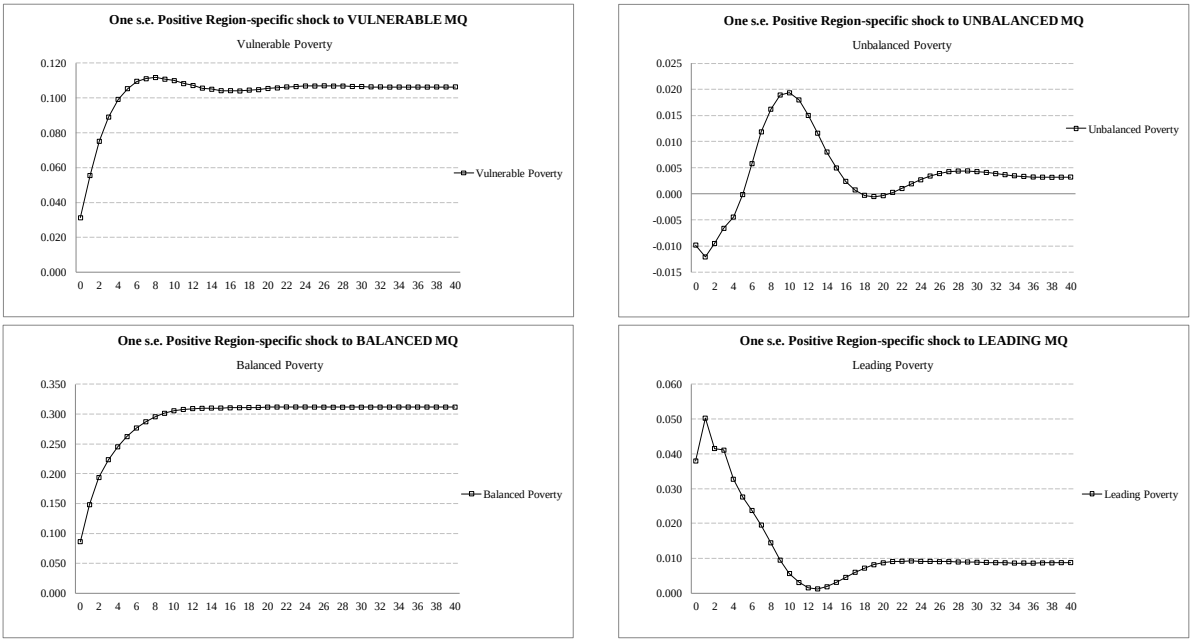
The response of poverty for the *Unbalanced* region is somewhat unconventional in comparison to other responses. The shock to the MQ, implying a deterioration in equality, is initially reflected as a reduction in poverty of close to 1 percentage point and even of 1.2 percentage points in the following quarter. It is only after six quarters that the group experiences an increase of poverty, which is then quickly reversed until the 16^{th} quarter. Scholars such as Wodon (1999) provide a theoretical model which is able to explain this behaviour. The dynamic analysis suggests that the shock to MQ in the *Leading* region is much more muted region-wide. It

[31] For reasons of space we do not elaborate on the dynamics between inequality and poverty. Please see Ahluwalia (1976); Gillis (1992) for further information on the dynamics between inequality and poverty.

is notable that the immediate bump in the poverty rate is around 3.8 percentage points, which is much less prominent than the rise in poverty in the *Balanced* and *Vulnerable* groups. The small initial impact on poverty is followed by a subsequent increase to only 5 percentage points and it then declines fairly quickly until, after a small dip in the third year, it finally dissipates near the 20^{th} quarter. This pattern of behaviour of poverty in response to a rise in inequality is consistent with earlier findings in the literature by Kanbur and Lustig (1999), Naschold (2002), and White and Anderson (2011).

In contrast to Fieldstein (1998), who noted that the real distributional problem is not inequality but poverty, our findings suggest that inequality matters for poverty. For the majority of the European countries, changes in income distribution have clearly been large enough to have a substantial impact on poverty, as documented in this section. This outcome is also well documented in the literature (see, among others: Morris 1986, Iradian 2005, Heshmati 2004 and Nissanke 2006). The outcome of this analysis not only provides further evidence on the extraordinary short and long-term dynamics between inequality and poverty, but it also documents the heterogeneous magnitude of the poverty responses to such developments in inequality across the groups we have defined for European economies.

Figure 4.14: GIRF's of shocks to modified inequality and their effects on poverty



4.4.6 Spillover of financial shocks: shocks to the interest rate in the Leading European Countries

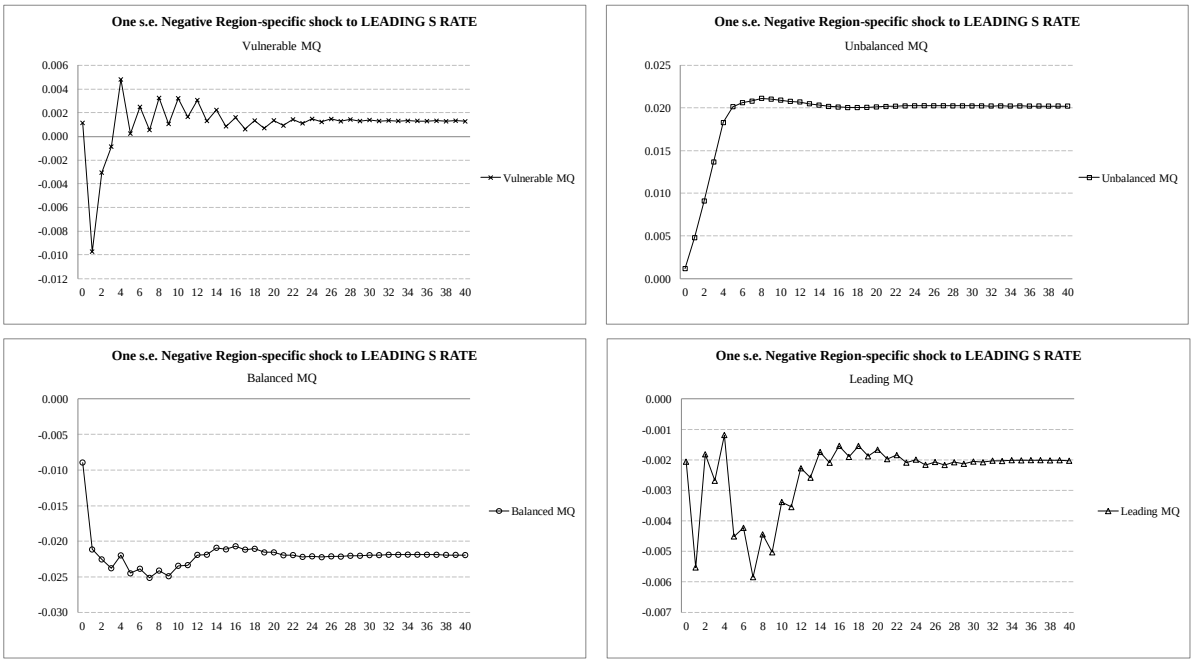
Figure 4.15 displays the outcomes of a one standard error negative shock to the short-term interest rate in the *Leading* region. Dynamic analysis suggests that the macroeconomic effects

of monetary policy shocks contribute significantly to the unprecedented increase in income inequality over the last quarter of a century. This finding is consistent with results documented in the literature by Coibion *et al.* (2012), Romer and Romer (2004) and Christiano *et al.* (1999).

This shockhas contrasting implications for the Balanced and the *Unbalanced* European countries, particularly in the improvement in equality in the former and the deterioration in it in the latter. These opposite trends reveal that the structural drivers in the credit markets of these two regions are different in nature, as the shock benefits borrowers in the *Balanced* region while mostly affecting savers in the *Unbalanced* region, where access to borrowing is not as efficient or widespread. The international impact on the *Vulnerable* European group is much more muted and short-lived, peaking in the first quarter after the shock and then rapidly declining during the same year. This finding illustrates the difficulties these countries face in channelling advantages, such as reduced costs of capital, into more structural developments with significant consequences for income distribution.

The analysis thus shows that a reduction in the interest rate in advanced economies may generate multiple equilibriums. We document that the estimated relationships between inequality and interest rates are different for poor and rich countries within the single period considered in this paper, in accordance with the findings of Battisti *et al.* (2014), as they are significantly negative in the rich group. More specifically, dynamic analysis reveals that these empirical facts of a reduction in interest rates and a rise in income polarisation, can have contrasting effects for different country groups depending on their initial level of income and on their initial level of income inequality. These findings also confirm the recent evidence of the increased importance of developments in monetary policy in Europe. More importantly, these findings may document how the resilience of similarly sized country groups to shocks originating in the *Leading* region is likely to have played an important role in the unfolding of the recent Eurozone crisis, particularly throughout the recovery.

Figure 4.15: GIRF of a shock to Leading short-term interest rate



4.4.7 Generalised forecast error variance decomposition

The GFEVD computes the proportion of the variance of the h-step ahead forecast errors of each variable that is explained by conditioning it on contemporaneous and future values of the non-orthogonalised, or generalised, shocks to the system.[32] The results for a selected sample of variables which are of potential interest for their importance in European distributional dynamics are presented in Appendix C.5.

Starting with modified quintile ratios, the results for the *Balanced* European countries show that the domestic variables of real exchange rate, imports and GDP contribute equally to the forecast variance after two years, alone explaining more than one-third of the total variance. The contribution of the same domestic variables at a shorter horizon is however much more heterogeneous, with the inflation almost unimportant before one year, and real GDP and short-term monetary policy interest rates playing the role of the main determinant. Economic performance shocks have a relatively high explanatory power for the income disparities in the *Vulnerable* and *Unbalanced* regions. However, they contribute much less in the *Leading* European country group, while short-term interest rates play the biggest role, alone explaining one quarter of the forecast variance. This finding confirms the result of section 4.6 that monetary policy shocks can account for a significant component of the income distribution in Europe. A similar but more pronounced pattern is also observed for the *Vulnerable* country group.

Inequality shocks originating from *Balanced* and *Unbalanced* country groups lead to an

[32]For a derivation of the generalised forecast error variance decomposition in a GVAR framework, see Dees *et al.* (2007).

immediate intra-regional increase of 49 per cent, and 34 per cent respectively. *Leading* group's contribution to explained share is relatively large for *Unbalanced* group. While, the small share of *Balanced* group's forecast error variance explained by *Leading* group's inequality shocks is interesting in the light of *Balanced* group's large financial and trade exposure to the Leading group, but possibly is supplementary indication the reputation of this group's financial system as being particularly stable (see e.g. Allen *et al.* 2005).

Leading group, which consists of Netherlands, Denmark, Austria and Luxembourg, inequality shocks make a considerable contribution to inter-country group fluctuations, where they explain a half of the variance within the first year, but also abroad where they account for 3-6 per cent. The explained shares are particularly large for *Unbalanced* group (France, United Kingdom and Ireland), but relatively small for *Balanced* group (Sweden, Netherlands, Finland, Germany and Belgium). The variance shares explained by *Unbalanced* and *Balanced* group of countries are smaller, accounting for 2 to 14 per cent. Finally, looking at the comparative contribution of each country group's inequality shock to the explanation of the forecast error variance, the country group of origin of the shock explains a large portion of the variance of the shock at all horizons, although the rest of the analysed country groups increase relevance as quarters go by.

Variance decompositions of the poverty rates of the two major European country groups, the *Balanced* and *Leading* regions, are shown in Appendix C.5. One of the key determinants for both groups of countries is disparities in income distribution, which alone explains more than one tenth of the variance decomposition for the at risk of poverty forecast. This result can easily be reconciled with the general findings of Ravaillon (2001), Buhmann *et al.* (1988), Korpi (1998) and Kakwani (1990) that very small improvements in income distribution can affect poverty rates in a substantial way.

4.5 Conclusions and combating inequality in Europe: the policy options assessed

Despite its limitations, this research has a number of potentially important implications and opens new avenues for research on inequality. Our findings suggest that spillover processes for income dispersion are in operation at both the national and the EU levels, and possibly at any level of aggregation. The main driver for decreasing regional inequalities according to the European Commission is that economic growth is the main tool for doing this. Even with the recent increase in intra-national inequalities and high growth rates, this viewpoint still remains unchallenged. However, evidence has been provided that intra-EU inequalities have a pro-cyclical character, where the transmission of a change in Eurozone economic performances into the extent of income inequality is statistically significant. GIRFs and GEVDS of a global

shock confirm this result and it appears that the stronger the European country is, the more the global shocks are absorbed. They are then transmitted from the Leading to the Unbalanced European countries, and from there they are transmitted further to other member states.

Our findings may have significant implications for policy-making. The outcome of the dynamic analysis not only provides further evidence on the short and long-term dynamics of inequalities and poverty, but also shows how the poverty responses to such developments in inequality vary in size across the groups that are defined for European economies. Changes in income distribution have clearly been large enough in the majority of the European countries to have a substantial impact on poverty. In fact, in some countries the effect has been even more than that, as it has greatly exacerbated the impact of negative growth on poverty. What does this mean for policy? The findings suggest that poverty and inequality are intrinsically linked and that poverty reduction may be significantly improved through distributional policies. Furthermore, our findings suggest in terms of the dynamics between monetary policy and income distribution that monetary shocks are transmitted relatively rapidly, and often get amplified as they travel from the Leading European countries to the Eurozone. In fact, a reduction in the interest rate in advanced economies generates multiple equilibriums, particularly causing enhancement in the *Balanced* group and deterioration in the *Unbalanced* region. That the spillover to the Unbalanced region is negative implies that the original shock is promoting conditions that this specific group requires to generate improvements in terms of income inequality. In this particular example, the indirect improving effects seem primarily to operate through the financial channel, which, in turn, is of especial relevance for the overall performance of economies like that of the United Kingdom.

Appendices

Appendix A

Appendix to Chapter 1

A.1 Dimensions of Deprivation

Table A.1.1

Dimensions	**Indicator**	**Deprived if ...**
Ability to keep home adequately warm	Can your household afford to keep its home adequately warm?	the household cannot keep its home adequately warm
Capacity to afford a nutritious meal every other day	Can your household afford a meal with meat or vegetarian equivalent every second day?	the household cannot afford a nutritious meal every other day, regardless if the household wants it
Leaking roof, damp walls, floors or rot in window frames; the condition of the dwelling	Do you have any of the following problems with your accommodation?Leaking roof/damp walls/rot in window frames or floor	the dwelling has a problem with a leaking roof and/or damp ceilings, dampness in the walls, floors or foundation or rot in window frames and doors
Pollution, grime or other environmental problems	Are there pollution, grime or other environmental problems in the local area?	the respondent feels pollution, grime as a problem for the household
Crime, violence, vandalism in the area	Do you have crime, violence, or vandalism in the local area?	the respondent feels crime, violence or vandalism to be a problem for the household
Leisure activity	Can your whole household afford to go for a week's annual holiday, away from home?	at least one household member cannot afford to go for holidays

Dimensions	**Indicator**	**Deprived if ...**
Ability to make ends meet	Thinking of your household's total income, is your household able to make ends meet,namely, to pay for its usual necessary expenses?	the respondent's assessment of the level of difficulty experienced by the household in making ends meet is with great difficulty/with difficulty/with some difficulty
Capacity to face unexpected financial expenses	Can your household afford an unexpected required expense and pay through its own resources?	the household cannot face itself unexpected financial expenses such as surgery, funeral, major repair in the house, or replacement of durables like washing machine, car
Arrears on hire purchase instalments or other loan payments	In the last twelve months, has the household been in arrears on hire purchase instalments or other loan payments? difficulties?	the household has been unable to pay on time repayments for hire purchase or other non-housing loans
Unmet need for medical examination or treatment when you really needed	Was there any time during the past 12 months when you really needed to consult a specialist but did not?	there was at least one occasion when the person really needed treatment but did not receive it
Limitation in activities because of health problems	For at least the past 6 months, to what extent have you been limited because of a health problem in activities?	the respondent has been severely limited or limited but not severely
Unmet need for dental examination or treatment	Was there any time during the past 12 months when you really needed to consult a dentist but did not?	there was at least one occasion when the person really needed dental treatment but did not receive it
Arrears on mortgage or rent payments	In the last twelve months, has the household been in arrears?	the household has been unable to pay on time the rent and/or the mortgage payment for the main dwelling as result of lack of money
Financial burden of the total housing cost	To what extent are your housing costs including mortgage repayment or rent a financial burden to you?	housing costs are a heavy burden/slight burden/somewhat a burden

A.2 EU Material deprivation rate : Economic strain and durables dimension

Let N be the total number of items that a person of the population, cannot afford to pay, with N ranging from 0 to 4. Material deprivation rate broken down by each combination of dimensions (k) (DEPR TOT$_k$) is calculated as the percentage of people (or thousands of people) in each k who cannot afford to pay N ITEM of material deprivation items (N ITEM <=4).

$$DEPR \quad TOT_k = \frac{\sum_{\forall i \ at \ k \ where \ N \ ITEM=j} RB050a_i}{\sum_{\forall i \ at \ k} RB050a_i} \times 100 \tag{A.2.1}$$

$$DEPR \quad TOT_k = \frac{\sum_{\forall i \ at \ k \ where \ N \ ITEM=j} RB050a_i}{1000} \tag{A.2.2}$$

The weight variable used is the Adjusted Cross Sectional Weight (RB050a), and j takes the values: 0, 1, 2, 3, 4.

A.3 Reliability and validity of the selected indicators: Cronbach's alpha

Table A.3.1: Cronbach Estimates

Item	Obs	Sign	item-test correlation	item-rest correlation	interitem covariance	alpha
leaking	40328	+	0.3893	0.2159	0.0388	0.7770
crime	40328	+	0.3629	0.1876	0.0413	0.7814
pollution	40328	+	0.3002	0.1205	0.0472	0.7918
holiday	40328	+	0.6627	0.5382	0.0125	0.7224
warm	40328	+	0.4590	0.2949	0.0319	0.7639
meat	40328	+	0.4565	0.2914	0.0323	0.7646
dental care	40328	+	0.3248	0.1500	0.0418	0.7623
limit in health activities	40328	+	0.3257	0.1466	0.0428	0.7841
medical care	40328	+	0.3077	0.1308	0.0431	0.7847
ends meet	40328	+	0.6170	0.4820	0.0168	0.7322
arrears loans	40328	+	0.4540	0.2998	0.0327	0.7654
unexpected expenses	40328	+	0.6730	0.5512	0.0155	0.7200
arrears	40328	+	0.4419	0.2874	0.0330	0.7659
housing burden	40328	+	0.4701	0.3088	0.0308	0.7617
Test scale					0.0327	0.7817

A.4 Alternative weighting schemes and cut-offs

Table A.4.1: Alternative Weighting Scheme: Equally weighted dimensions

Indicator	MPI	MPI	MPI	MPI	MPI	Relative Income Poverty	Material Deprivation
Deprivation cut-off	5 indicators	6 indicators	7 indicators	8 indicators	9 indicators		
age	0.055***	0.064***	0.076***	0.077***	0.056***	0.035***	-0.015***
	(0.004)	(0.005)	(0.007)	(0.011)	(0.016)	(0.004)	(0.003)
age2	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
female	0.075***	0.079***	0.052	0.089	0.253**	0.074***	0.055***
	(0.024)	(0.030)	(0.041)	(0.061)	(0.100)	(0.022)	(0.018)
marital status	-0.354***	-0.320***	-0.351***	-0.452***	-0.373***	-0.288***	-0.174***
	(0.028)	(0.036)	(0.049)	(0.075)	(0.127)	(0.026)	(0.022)
depratio	-0.160**	-0.300***	-0.342***	-0.546***	-0.521*	-0.034	0.983***
	(0.074)	(0.093)	(0.124)	(0.182)	(0.289)	(0.069)	(0.067)
education	-0.056***	-0.045***	-0.026***	-0.011	0.009	-0.078***	-0.086***
	(0.005)	(0.007)	(0.009)	(0.013)	(0.020)	(0.005)	(0.004)
household size	0.022*	0.010	0.003	0.002	-0.137***	-0.058***	-0.016
	(0.012)	(0.015)	(0.020)	(0.029)	(0.052)	(0.012)	(0.011)
home ownership	-0.700***	-0.670***	-0.544***	-0.458***	-0.359***	-0.932***	-0.331***
	(0.026)	(0.033)	(0.045)	(0.069)	(0.111)	(0.024)	(0.022)
benefitrec	0.451***	0.477***	0.527***	0.475***	0.539***	0.245***	0.319***
	(0.032)	(0.039)	(0.050)	(0.071)	(0.109)	(0.031)	(0.027)
hbenefitrec	0.371***	0.345***	0.365***	0.425***	0.576***	0.527***	-0.115***
	(0.030)	(0.038)	(0.051)	(0.077)	(0.124)	(0.028)	(0.026)
unemploy	0.215***	0.224***	0.177*	0.130	-0.423	0.388***	1.117***
	(0.068)	(0.077)	(0.095)	(0.131)	(0.277)	(0.066)	(0.061)
_cons	-1.553***	-2.202***	-3.062***	-3.722***	-3.662***	-0.297***	0.129
	(0.109)	(0.141)	(0.192)	(0.286)	(0.436)	(0.101)	(0.092)
N	40328	40328	40328	40328	40328	40328	40328

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A.5 2- Nested equally weighted dimensions and indicators

Table A.5.1: Alternative Weighting Scheme: Equally weighted dimensions and indicators

MPI Respective cut-off	wdep020 0.20	wdep030 0.30	wdep040 0.40	wdep050 0.50	wdep060 0.60
age	0.025***	0.033***	0.049***	0.060***	0.053***
	(0.003)	(0.003)	(0.004)	(0.007)	(0.010)
age2	-0.000***	-0.000***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
female	0.046***	0.042**	0.050**	0.037	0.082
	(0.016)	(0.017)	(0.024)	(0.039)	(0.059)
marital status	-0.217***	-0.273***	-0.291***	-0.313***	-0.372***
	(0.019)	(0.021)	(0.028)	(0.047)	(0.074)
depratio	-0.101*	-0.156***	-0.471***	-0.516***	-0.781***
	(0.058)	(0.060)	(0.074)	(0.116)	(0.168)
education	-0.067***	-0.072***	-0.052***	-0.029***	-0.019
	(0.003)	(0.004)	(0.005)	(0.009)	(0.013)
household size	0.058***	0.043***	0.056***	0.064***	0.055**
	(0.009)	(0.010)	(0.012)	(0.018)	(0.026)
home ownership	-0.680***	-0.742***	-0.685***	-0.617***	-0.505***
	(0.020)	(0.020)	(0.026)	(0.043)	(0.066)
benefitrec	0.356***	0.339***	0.462***	0.387***	0.425***
	(0.025)	(0.026)	(0.032)	(0.049)	(0.070)
hbenefitrec	0.307***	0.383***	0.404***	0.292***	0.599***
	(0.022)	(0.023)	(0.030)	(0.049)	(0.080)
unemploy	0.490***	0.424***	0.250***	0.339***	-0.023
	(0.068)	(0.064)	(0.068)	(0.087)	(0.136)
_cons	0.327***	-0.158*	-1.536***	-2.640***	-3.223***
	(0.078)	(0.083)	(0.108)	(0.177)	(0.262)
N	40328	40328	40328	40328	40328

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix B

Appendix to Chapter 2

B.1 Data sources

BANXICO, Banco de Mexico.

BCL, Banque Centrale du Luxembourg.

Bloomberg, Bloomberg© data service.

Datastream, Datastream© data service.

FRED, FRED Economic Data, Federal Reserve Bank of St. Louis.

GVARdb, GVAR database (2013 Vintage). Bianchi, A.C., Rebucci, A. and Mariscal, R., Inter-American Development Bank, Washington DC.

IMF CDIS, Coordinated Direct Investment Survey, International Monetary Fund.

IMF DTS, Direction of Trade Statistics, International Monetary Fund.

IMF IFS, International Financial Statistics, International Monetary Fund.

OECD EO, Economic Outlook, Organisation for Economic Cooperation and Development.

OECD EO78, Economic Outlook, Standard EO78 (discontinued series), Organisation for Economic Cooperation and Development.

OECD MEI, Main Economic Indicators, Organisation for Economic Cooperation and Development.

OECD QNA, Quarterly National Accounts dataset, Organisation for Economic Cooperation and Development.

OECD Stat, OECD Stat website http://stats.oecd.org/, Organisation for Economic Cooperation and Development.

OxEc, Oxford Economics (via Datastream).

World Bank Global Bilateral Migration Database.

World Bank online database API, http://api.worldbank.org/countries

B.2 Weight matrix

	Austria	Australia	Belgium	Canada	Switzerland	Chile	Germany	Denmark	Greece	Spain	Finland	France
Austria	0.0000	0.0051	0.0070	0.0027	0.0517	0.0051	0.0536	0.0098	0.0234	0.0090	0.0137	0.0088
Australia	0.0175	0.0000	0.0094	0.0177	0.0177	0.0373	0.0148	0.0190	0.0357	0.0083	0.0108	0.0086
Belgium	0.0244	0.0113	0.0000	0.0062	0.0272	0.0156	0.0528	0.0233	0.0298	0.0471	0.0640	0.1377
Canada	0.0211	0.0413	0.0238	0.0000	0.0358	0.0902	0.0229	0.0344	0.0259	0.0105	0.0202	0.0260
Switzerland	0.0713	0.0261	0.0253	0.0131	0.0000	0.0161	0.0584	0.0316	0.0219	0.0536	0.0114	0.0569
Chile	0.0014	0.0043	0.0022	0.0076	0.0022	0.0000	0.0019	0.0014	0.0015	0.0123	0.0021	0.0022
Germany	0.4101	0.0451	0.1079	0.0172	0.1763	0.0327	0.0000	0.1486	0.2109	0.1274	0.1003	0.1401
Denmark	0.0127	0.0056	0.0073	0.0031	0.0109	0.0056	0.0235	0.0000	0.0103	0.0080	0.0351	0.0083
Greece	0.0072	0.0125	0.0050	0.0030	0.0052	0.0037	0.0064	0.0052	0.0000	0.0053	0.0051	0.0059
Spain	0.0178	0.0091	0.0332	0.0053	0.0569	0.1376	0.0385	0.0220	0.0331	0.0000	0.0159	0.0842
Finland	0.0083	0.0055	0.0135	0.0028	0.0046	0.0050	0.0102	0.0243	0.0076	0.0039	0.0000	0.0046
France	0.0437	0.0399	0.2485	0.0196	0.1061	0.0395	0.1013	0.0663	0.0689	0.1861	0.0649	0.0000
Ireland	0.0043	0.0108	0.0236	0.0112	0.0148	0.0054	0.0103	0.0089	0.0082	0.0163	0.0135	0.0177
Italy	0.0933	0.0207	0.0411	0.0069	0.0777	0.0318	0.0599	0.0264	0.0840	0.0708	0.0221	0.0708
Japan	0.0074	0.1539	0.0166	0.0237	0.0173	0.0700	0.0194	0.0158	0.0112	0.0086	0.0116	0.0171
Korea	0.0034	0.0455	0.0028	0.0074	0.0045	0.0320	0.0079	0.0037	0.0132	0.0039	0.0051	0.0042
Mexico	0.0021	0.0055	0.0033	0.0171	0.0051	0.0349	0.0049	0.0025	0.0013	0.0313	0.0018	0.0038
Netherlands	0.0778	0.0409	0.2479	0.0321	0.1084	0.0534	0.1289	0.0721	0.1366	0.1057	0.0971	0.0932
Norway	0.0052	0.0038	0.0075	0.0060	0.0059	0.0133	0.0138	0.0873	0.0047	0.0076	0.0262	0.0085
Portugal	0.0035	0.0032	0.0068	0.0036	0.0129	0.0035	0.0077	0.0079	0.0038	0.0556	0.0041	0.0299
Sweden	0.0157	0.0104	0.0130	0.0045	0.0119	0.0397	0.0248	0.2083	0.0131	0.0109	0.3604	0.0117
Turkey	0.0254	0.0068	0.0131	0.0024	0.0135	0.0047	0.0302	0.0078	0.0926	0.0095	0.0072	0.0101
United Kingdom	0.0424	0.2077	0.0656	0.0731	0.0627	0.0415	0.1046	0.0752	0.0419	0.1093	0.0403	0.1150
United States	0.0841	0.2850	0.0759	0.7136	0.1706	0.2814	0.2035	0.0982	0.1203	0.0988	0.0669	0.1348

	Ireland	Italy	Japan	Korea	Mexico	Netherlands	Norway	Portugal	Sweden	Turkey	United Kingdom	United States
Austria	0.0041	0.0391	0.0043	0.0054	0.0026	0.0118	0.0092	0.0096	0.0134	0.0484	0.0060	0.0063
Australia	0.0189	0.0242	0.0627	0.0403	0.0019	0.0376	0.0077	0.0050	0.0123	0.0058	0.0957	0.0290
Belgium	0.0546	0.0607	0.0169	0.0126	0.0041	0.1278	0.0416	0.0268	0.0476	0.0416	0.0434	0.0215
Canada	0.0192	0.0357	0.0293	0.0316	0.0274	0.0598	0.0280	0.0531	0.0174	0.0057	0.0722	0.2176
Switzerland	0.0308	0.0718	0.0142	0.0102	0.0129	0.0436	0.0167	0.0427	0.0249	0.0344	0.0316	0.0341
Chile	0.0007	0.0028	0.0055	0.0068	0.0087	0.0020	0.0017	0.0011	0.0030	0.0015	0.0013	0.0086
Germany	0.0564	0.1780	0.0516	0.0486	0.0208	0.1683	0.1117	0.1067	0.1087	0.2860	0.0900	0.0710
Denmark	0.0079	0.0091	0.0042	0.0048	0.0034	0.0111	0.0786	0.0149	0.0902	0.0094	0.0116	0.0061
Greece	0.0027	0.0115	0.0028	0.0041	0.0017	0.0049	0.0030	0.0029	0.0058	0.0332	0.0047	0.0063
Spain	0.0240	0.0614	0.0071	0.0079	0.0573	0.0333	0.0313	0.2165	0.0216	0.0371	0.0400	0.0156
Finland	0.0034	0.0053	0.0038	0.0046	0.0020	0.0083	0.0184	0.0039	0.1048	0.0246	0.0057	0.0038
France	0.0805	0.1391	0.0353	0.0244	0.0092	0.0705	0.0797	0.1379	0.0561	0.0673	0.0861	0.0489
Ireland	0.0000	0.0148	0.0051	0.0070	0.0034	0.0270	0.0095	0.0158	0.0104	0.0082	0.0580	0.0273
Italy	0.0258	0.0000	0.0149	0.0118	0.0064	0.0393	0.0162	0.0457	0.0243	0.0558	0.0287	0.0218
Japan	0.0126	0.0105	0.0000	0.2939	0.0174	0.0170	0.0105	0.0065	0.0131	0.0138	0.0225	0.0874
Korea	0.0038	0.0049	0.0752	0.0000	0.0089	0.0043	0.0075	0.0024	0.0047	0.0123	0.0048	0.0223
Mexico	0.0023	0.0036	0.0099	0.0109	0.0000	0.0052	0.0010	0.0023	0.0030	0.0018	0.0032	0.1352
Netherlands	0.1087	0.1186	0.0762	0.0504	0.0433	0.0000	0.0903	0.1527	0.0903	0.1430	0.1191	0.0760
Norway	0.0084	0.0049	0.0038	0.0102	0.0020	0.0137	0.0000	0.0059	0.1047	0.0060	0.0169	0.0097
Portugal	0.0057	0.0116	0.0021	0.0025	0.0027	0.0081	0.0039	0.0000	0.0048	0.0044	0.0065	0.0040
Sweden	0.0107	0.0116	0.0073	0.0108	0.0043	0.0197	0.1847	0.0102	0.0000	0.0130	0.0154	0.0125
Turkey	0.0028	0.0129	0.0041	0.0069	0.0018	0.0127	0.0087	0.0039	0.0096	0.0000	0.0073	0.0065
United Kingdom	0.3614	0.0639	0.0640	0.0499	0.0151	0.1276	0.1088	0.0570	0.0860	0.0649	0.0000	0.1285
United States	0.1545	0.1039	0.4995	0.3443	0.7425	0.1466	0.1313	0.0765	0.1434	0.0818	0.2293	0.0000

B.3 Regional aggregation weights

Data for constructing aggregation weights	GDP, PPP (current USD, millions) AVERAGE 1995-2013
Austria	275,496.43
Australia	700,710.00
Belgium	334,752.05
Canada	1,090,617.71
Switzerland	293,149.10
Chile	217,801.74
Germany	2,560,772.61
Denmark	180,329.51
Greece	249,386.24
Spain	1,122,600.27
Finland	157,661.07
France	1,823,464.07
Ireland	144,268.97
Italy	1,666,594.96
Japan	3,740,815.66
Korea	1,045,376.99
Mexico	1,297,748.19
Netherlands	553,903.50
Norway	210,681.30
Portugal	214,802.56
Sweden	296,971.76
Turkey	814,428.09
United Kingdom	1,835,163.83
United States	12,258,968.42

B.4 Contemporaneous effects of foreign variables

Country	Statistic	lgdp	infl	curracc	govbal	dgdebt	lrate	corprate	shprind	unempr
Austria	Coefficient	0.25	**0.68**		0.02	-0.13	**1.54**		**0.86**	-0.03
	Newey-West t-ratio	1.56	2.93		0.34	-0.77	2.55		4.03	-0.18
Australia	Coefficient	**0.75**	**0.47**	-0.38	**1.69**	1.39	0.03	0.16	**0.65**	0.40
	Newey-West t-ratio	3.69	2.92	-1.04	3.76	1.92	0.16	0.90	5.87	1.38
Belgium	Coefficient			-0.04	0.03	0.01	**0.46**	**0.34**	**0.83**	0.87
	Newey-West t-ratio			-0.08	0.60	0.17	2.94	8.48	5.54	1.90
Canada	Coefficient	**0.35**		**-0.89**	0.02	**0.64**	**1.22**	**1.03**	**0.88**	
	Newey-West t-ratio	2.79		-2.27	0.09	4.23	7.34	4.04	11.53	
Switzerland	Coefficient	**0.40**					**0.14**	**0.68**		-0.01
	Newey-West t-ratio	2.90					2.69	5.69		-0.03
Chile	Coefficient	-0.09	0.27			0.18	0.44		**0.25**	-0.73
	Newey-West t-ratio	-0.14	0.80			0.26	0.34		3.03	-0.94
Germany	Coefficient	**0.87**		**0.65**		0.59	**0.18**	**0.93**	**1.28**	0.44
	Newey-West t-ratio	2.44		3.03		1.22	2.55	6.30	11.21	1.17
Denmark	Coefficient		**0.67**	0.18	0.03	0.22				
	Newey-West t-ratio		7.06	0.63	0.46	1.31				
Greece	Coefficient	0.49	**1.27**		-0.32	0.19	0.71		**1.98**	**1.65**
	Newey-West t-ratio	0.54	3.38		-0.91	1.84	0.63		5.01	2.75
Spain	Coefficient		**1.06**	0.23	-0.05	-0.07	0.62	**1.26**	**1.01**	1.39
	Newey-West t-ratio		5.38	1.00	-0.62	-0.55	1.74	5.63	12.03	1.90
Finland	Coefficient	**0.44**		-0.76		0.21	**0.86**		**1.50**	0.23
	Newey-West t-ratio	2.19		-1.93		0.17	3.73		3.98	1.24
France	Coefficient		**0.87**	0.07	0.00	0.65	0.28	**1.14**	**1.12**	**0.49**
	Newey-West t-ratio		14.28	0.96	-0.09	1.73	1.91	10.59	15.50	2.70
Ireland	Coefficient	0.79		-0.12			0.08	**0.87**	**1.60**	**0.68**
	Newey-West t-ratio	1.33		-0.42			0.07	4.71	8.38	2.16
Italy	Coefficient	**0.81**	**0.55**	**0.72**	-0.03	0.00	**0.67**	**1.07**	**1.46**	0.14
	Newey-West t-ratio	3.27	6.60	4.26	-0.50	0.03	3.03	3.09	11.43	0.33
Japan	Coefficient	**0.82**	**0.18**	-0.07	0.17	0.35		**0.39**	**1.18**	0.24
	Newey-West t-ratio	2.01	2.88	-0.33	1.03	1.57		2.06	3.98	1.24
Korea	Coefficient	0.38	**0.86**	-0.01	0.04		0.11	0.33		-0.86
	Newey-West t-ratio	1.52	3.54	-0.01	0.02		0.45	0.81		-1.68
Mexico	Coefficient	0.69	-0.31	0.36	0.74		2.44		**0.58**	0.12
	Newey-West t-ratio	1.17	-0.98	0.66	1.18		0.73		5.19	0.35
Netherlands	Coefficient	**0.59**		-0.09	0.30	0.27	**1.13**	**0.78**		-0.24
	Newey-West t-ratio	2.59		-0.22	0.54	1.49	2.36	7.00		-0.99
Norway	Coefficient	**0.84**				0.65			**0.86**	
	Newey-West t-ratio	3.53				1.52			6.79	
Portugal	Coefficient	**1.12**	**1.09**				0.21		**1.03**	
	Newey-West t-ratio	4.09	8.85				0.64		7.70	
Sweden	Coefficient	**1.14**	**0.78**	-0.24	-0.05	-0.25	**0.46**	**1.38**	**0.99**	0.91
	Newey-West t-ratio	4.42	3.15	-0.71	-0.60	-1.30	2.05	5.23	9.40	1.24
Turkey	Coefficient				0.33	-1.13			**0.53**	-0.11
	Newey-West t-ratio				0.72	-0.97			6.07	-0.18
United Kingdom	Coefficient	**0.76**		-0.39			-0.87	**0.92**		
	Newey-West t-ratio	4.60		-1.19			-0.93	4.68		
United States	Coefficient	**0.37**	**0.77**		0.16	**0.39**	**0.58**		**0.70**	0.37
	Newey-West t-ratio	2.63	3.65		1.19	2.05	10.10		6.02	1.35

Significant coefficients at the 5% level are marked in bold.

B.5 Lag-orders

The Akaike Information Criterion (AIC) was used for determining the adequate lag order for both domestic and foreign variables.

Table B.5.1: Lag order for domestic and foreign variables

Country	Domestic variables	Foreign variables
Austria	2	2
Australia	2	2
Belgium	2	2
Canada	2	2
Switzerland	2	2
Chile	2	2
Germany	2	2
Denmark	2	1
Greece	2	2
Spain	2	2
Finland	2	2
France	2	2
Ireland	2	1
Italy	2	2
Japan	2	2
Korea	2	2
Mexico	2	2
Netherlands	2	2
Norway	2	1
Portugal	2	1
Sweden	2	2
Turkey	1	1
United Kingdom	2	2
United States	2	2

Appendix C

Appendix to Chapter 3

C.1 Contemporaneous effects of foreign variables on their domestic counterparts

Country	Statistics	ly	r	mq	pov	Dp
AUSTRIA	Coefficient	**0.3865***	**0.9878**	**0.5328**		**0.8361**
	Newey-West t-ratio	3.0518	43.355	5.0930		6.5317
BELGIUM	Coefficient	**0.4029**	**0.9697**	**0.9427**	-0.3451	**0.9892**
	Newey-West t-ratio	5.0125	77.3768	9.0327	-0.9059	15.4025
DENMARK	Coefficient	**1.2458**			-0.2531	**0.8486**
	Newey-West t-ratio	8.9735			-1.4633	10.7354
ESTONIA	Coefficient	**1.1705**	**1.3586**		**1.1933**	**0.7844**
	Newey-West t-ratio	3.3372	2.3028		2.2618	2.4343
FINLAND	Coefficient	**0.7423**	**0.8597**	**0.9431**	0.0730	**0.7798**
	Newey-West t-ratio	5.6900	11.5932	7.8217	0.5563	11.2354
FRANCE	Coefficient	**0.5819**	**0.9476**			**0.9290**
	Newey-West t-ratio	7.9848	17.4731			21.7522
GERMANY	Coefficient	**0.8264**	**0.9605**	**0.6962**		
	Newey-West t-ratio	9.1990	15.9707	8.2607		
GREECE	Coefficient					**1.1829**
	Newey-West t-ratio					4.6401
HUNGARY	Coefficient					**1.3756**
	Newey-West t-ratio					8.8723
IRELAND	Coefficient		**1.0946**		-0.2542	**1.3690**
	Newey-West t-ratio		7.4025		-0.2542	**1.3690**
ITALY	Coefficient	**0.8648**	**1.0335**	**2.1194**		**0.3990**
	Newey-West t-ratio	10.1280	17.5399	9.3086		7.8401
LUXEMBOURG	Coefficient	**2.7466**		**1.6099**		
	Newey-West t-ratio	5.1620		17.0581		
NETHERLANDS	Coefficient	**0.5789**	**0.9284**	0.4421		
	Newey-West t-ratio	4.7703	13.3184	1.9647		
PORTUGAL	Coefficient	**0.7881**	**1.0221**		**0.8263**	**1.0791**
	Newey-West t-ratio	3.4172	66.7643		2.1448	11.5658
SPAIN	Coefficient		**1.0044**	**2.0026**	-0.6092	**0.4679**
	Newey-West t-ratio		25.1938	4.0892	-1.1572	2.4557
SWEDEN	Coefficient	**1.1118**	**0.4570**	**0.8665**	**-0.8404**	
	Newey-West t-ratio	4.5528	3.7270	4.0981	-2.2093	
UK	Coefficient	**0.5731**	**0.7102**	**-0.3365**	**-0.7009**	**0.7114**
	Newey-West t-ratio	4.0946	4.5328	-2.2526	-4.3663	6.3057

*Significant coefficients at the 5 percent level are marked in bold.

C.2 Average pair-wise cross-section correlations

Country	Real Output (log)		
	Levels	First Differences	VECMX Residuals
AUSTRIA	0.97	0.63	0.03
BELGIUM	0.97	0.64	-0.03
DENMARK	0.95	0.43	-0.02
ESTONIA	0.96	0.53	0.00
FINLAND	0.98	0.62	-0.04
FRANCE	0.98	0.67	-0.07
GERMANY	0.94	0.60	-0.14
GREECE			
HUNGARY			
IRELAND			
ITALY	0.91	0.66	-0.01
LUXEMBOURG	0.97	0.43	-0.03
NETHERLANDS	0.97	0.62	-0.03
PORTUGAL	0.93	0.48	0.02
SPAIN			
SWEDEN	0.97	0.57	-0.01
UNITED KINGDOM	0.97	0.61	-0.07

Country	Interest rate		
	Levels	First Differences	VECMX Residuals
AUSTRIA	0.90	0.87	0.07
BELGIUM	0.90	0.86	0.02
DENMARK	0.87	0.75	0.01
ESTONIA	0.54	0.13	-0.12
FINLAND	0.89	0.86	0.07
FRANCE	0.90	0.87	0.07
GERMANY	0.89	0.86	0.04
GREECE			
HUNGARY			
IRELAND	0.87	0.73	0.03
ITALY	0.85	0.82	-0.03
LUXEMBOURG			
NETHERLANDS	0.89	0.86	0.10
PORTUGAL	0.89	0.84	0.04
SPAIN	0.90	0.85	0.02
SWEDEN	0.84	0.70	-0.07
UNITED KINGDOM	0.82	0.75	-0.19

Country	Modified Quintile ratio		
	Levels	First Differences	VECMX Residuals
AUSTRIA	0.14	0.38	0.07
BELGIUM	-0.14	0.30	0.03
DENMARK	0.06	0.28	0.08
ESTONIA			
FINLAND	0.10	0.49	0.03
FRANCE	-0.19	0.16	-0.06
GERMANY	0.02	0.31	0.01
GREECE			
HUNGARY			
IRELAND			
ITALY	0.05	0.53	0.04
LUXEMBOURG	0.15	0.53	0.09
NETHERLANDS	-0.07	0.41	-0.01
PORTUGAL	-0.06	0.52	0.07
SPAIN	-0.16	0.49	-0.08
SWEDEN	0.09	0.43	0.00
UNITED KINGDOM	0.03	-0.15	-0.09

Country	Poverty		
	Levels	First Differences	VECMX Residuals
AUSTRIA			
BELGIUM	0.20	-0.07	-0.05
DENMARK	0.21	-0.10	-0.10
ESTONIA	0.05	0.07	0.04
FINLAND	0.21	0.03	0.06
FRANCE	-0.26	0.00	0.03
GERMANY	0.17	-0.07	-0.02
GREECE			
HUNGARY	0.24	0.04	0.03
IRELAND	-0.25	-0.06	-0.03
ITALY	0.11	0.04	0.07
LUXEMBOURG	0.19	-0.03	-0.03
NETHERLANDS	-0.05	0.04	0.05
PORTUGAL	-0.36	-0.03	-0.04
SPAIN	0.20	-0.03	-0.06
SWEDEN	0.22	0.04	0.06
UNITED KINGDOM	-0.17	-0.11	-0.01

Country	Inflation		
	Levels	First Differences	VECMX Residuals
AUSTRIA	0.55	0.54	0.03
BELGIUM	0.47	0.35	-0.06
DENMARK	0.55	0.58	0.07
ESTONIA	0.35	0.24	0.03
FINLAND	0.55	0.54	0.04
FRANCE	0.62	0.64	0.05
GERMANY	0.35	0.16	-0.02
GREECE	0.39	0.46	0.05
HUNGARY	0.20	0.30	0.02
IRELAND	0.47	0.50	0.01
ITALY	0.50	0.40	0.09
LUXEMBOURG			
NETHERLANDS	0.50	0.54	0.01
PORTUGAL	0.56	0.55	-0.03
SPAIN	0.45	0.43	0.01
SWEDEN	0.51	0.51	0.07
UNITED KINGDOM	0.44	0.53	0.06

C.3 Cross-country weight matrix

	AUSTRIA	BELGIUM	DENMARK	ESTONIA	FINLAND	FRANCE	GERMANY	GREECE	HUNGARY
AUSTRIA	0.0000	0.0075	0.0124	0.0117	0.0130	0.0109	0.0781	0.0274	0.1008
BELGIUM	0.0256	0.0000	0.0296	0.0139	0.0660	0.1699	0.0664	0.0390	0.0242
DENMARK	0.0133	0.0074	0.0000	0.0276	0.0372	0.0100	0.0305	0.0124	0.0121
ESTONIA	0.0029	0.0012	0.0045	0.0000	0.0514	0.0013	0.0030	0.0030	0.0032
FINLAND	0.0086	0.0109	0.0308	0.3206	0.0000	0.0055	0.0129	0.0095	0.0089
FRANCE	0.0551	0.2468	0.0990	0.0475	0.0755	0.0000	0.1560	0.0852	0.0860
GERMANY	0.5151	0.1236	0.1980	0.1797	0.1151	0.1799	0.0000	0.3371	0.3189
GREECE	0.0078	0.0057	0.0070	0.0019	0.0044	0.0076	0.0093	0.0000	0.0062
HUNGARY	0.0483	0.0053	0.0073	0.0089	0.0070	0.0063	0.0238	0.0129	0.0000
IRELAND	0.0045	0.0227	0.0118	0.0071	0.0138	0.0219	0.0140	0.0100	0.0311
ITALY	0.1055	0.0434	0.0352	0.0197	0.0246	0.0902	0.0824	0.1058	0.0473
LUXEMBOURG	0.0345	0.1656	0.0359	0.0097	0.0155	0.0611	0.0747	0.0840	0.1632
NETHERLANDS	0.0862	0.2297	0.0931	0.0662	0.1059	0.1148	0.1736	0.1581	0.0628
PORTUGAL	0.0036	0.0077	0.0099	0.0019	0.0038	0.0434	0.0124	0.0045	0.0039
SPAIN	0.0205	0.0411	0.0316	0.0086	0.0179	0.1151	0.0615	0.0408	0.0471
SWEDEN	0.0186	0.0132	0.2957	0.2455	0.4037	0.0145	0.0348	0.0187	0.0338
UNITED KINGDOM	0.0500	0.0682	0.0982	0.0295	0.0453	0.1476	0.1667	0.0515	0.0505

	IRELAND	ITALY	LUXEMBOURG	NETHERLANDS	PORTUGAL	SPAIN	SWEDEN	UNITED KINGDOM
AUSTRIA	0.0049	0.0443	0.0145	0.0159	0.0100	0.0105	0.0187	0.0100
BELGIUM	0.0635	0.0851	0.1979	0.1729	0.0319	0.0569	0.0600	0.0647
DENMARK	0.0095	0.0105	0.0090	0.0143	0.0150	0.0093	0.1279	0.0193
ESTONIA	0.0017	0.0024	0.0012	0.0016	0.0017	0.0016	0.0142	0.0018
FINLAND	0.0042	0.0063	0.0038	0.0103	0.0041	0.0046	0.1524	0.0084
FRANCE	0.0968	0.1865	0.1450	0.0945	0.2039	0.2412	0.0875	0.1474
GERMANY	0.0694	0.2584	0.1988	0.2421	0.1386	0.1622	0.1516	0.1599
GREECE	0.0033	0.0143	0.0034	0.0068	0.0033	0.0062	0.0087	0.0110
HUNGARY	0.0145	0.0132	0.0067	0.0071	0.0047	0.0133	0.0085	0.0058
IRELAND	0.0000	0.0165	0.0336	0.0351	0.0162	0.0192	0.0140	0.1412
ITALY	0.0301	0.0000	0.0442	0.0525	0.0482	0.0842	0.0344	0.0516
LUXEMBOURG	0.1081	0.0543	0.0000	0.0891	0.0597	0.0581	0.0559	0.0747
NETHERLANDS	0.1074	0.1263	0.1144	0.0000	0.1516	0.1228	0.1152	0.1873
PORTUGAL	0.0064	0.0130	0.0377	0.0107	0.0000	0.0657	0.0063	0.0112
SPAIN	0.0278	0.0722	0.0295	0.0476	0.2405	0.0000	0.0333	0.0803
SWEDEN	0.0121	0.0140	0.0147	0.0257	0.0109	0.0131	0.0000	0.0255
UNITED KINGDOM	0.4405	0.0827	0.1456	0.1737	0.0597	0.1311	0.1114	0.0000

C.4 Regional weights

Region	Country	ly	r	mq	pov	Dp
hvulnerable	hun				0.8864	0.3726
hvulnerable	est	1.0000	1.0000		0.1136	0.0478
hvulnerable	grc					0.5796
vulnerable	prt	0.1151	0.0718	0.0718	0.0718	0.0718
vulnerable	ita	0.8849	0.5516	0.5516	0.5516	0.5516
vulnerable	esp		0.3766	0.3766	0.3766	0.3766
unbalanced	fra	0.4969	0.4777	0.4969	0.4777	0.4777
unbalanced	gbr	0.5031	0.4837	0.5031	0.4837	0.4837
unbalanced	ire		0.0386		0.0386	0.0386
balanced	swe	0.0890	0.0890	0.0890	0.0890	0.0890
balanced	fin	0.0477	0.0477	0.0477	0.0477	0.0477
balanced	deu	0.7630	0.7630	0.7630	0.7630	0.7630
balanced	bel	0.1003	0.1003	0.1003	0.1003	0.1003
leading	nld	0.5346	0.5512	0.5346	0.7252	0.5512
leading	dnk	0.1725	0.1778	0.1725	0.2340	0.1778
leading	lux	0.0300		0.0300	0.0408	
leading	aut	0.2629	0.2710	0.2629		0.2710

C.5 Variance Decompositions

Proportion of the N-step ahead Forecast Error Variance of BALANCED MQ Explained by Conditioning on Contemporaneous and Future Innovations of the Country Equations

		Horizon																				
Region	**Variable**	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Vulnerable	MQ	0.0377	0.0199	0.0137	0.0125	0.0122	0.0111	0.0100	0.0091	0.0082	0.0075	0.0069	0.0064	0.0060	0.0056	0.0054	0.0051	0.0050	0.0048	0.0047	0.0046	0.0045
Unbalanced	MQ	0.0200	0.0188	0.0166	0.0147	0.0140	0.0143	0.0154	0.0169	0.0186	0.0202	0.0217	0.0229	0.0239	0.0246	0.0252	0.0256	0.0259	0.0261	0.0263	0.0264	0.0265
Balanced	MQ	0.4930	0.4508	0.4099	0.3953	0.3863	0.3810	0.3777	0.3771	0.3773	0.3780	0.3790	0.3803	0.3816	0.3831	0.3845	0.3860	0.3874	0.3887	0.3899	0.3909	0.3918
Leading	MQ	0.0157	0.0209	0.0254	0.0269	0.0278	0.0285	0.0285	0.0284	0.0280	0.0276	0.0271	0.0267	0.0262	0.0259	0.0256	0.0253	0.0251	0.0250	0.0249	0.0248	0.0248

Proportion of the N-step ahead Forecast Error Variance of UNBALANCED MQ Explained by Conditioning on Contemporaneous and Future Innovations of the Country Equations

		Horizon																				
Region	**Variable**	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Vulnerable	MQ	0.0512	0.0350	0.0338	0.0350	0.0342	0.0329	0.0322	0.0318	0.0314	0.0311	0.0310	0.0308	0.0307	0.0306	0.0305	0.0304	0.0303	0.0302	0.0301	0.0300	0.0300
Unbalanced	MQ	0.3432	0.3161	0.2934	0.2587	0.2283	0.2057	0.1892	0.1757	0.1651	0.1569	0.1505	0.1453	0.1412	0.1378	0.1353	0.1332	0.1315	0.1302	0.1291	0.1282	0.1273
Balanced	MQ	0.0213	0.0221	0.0216	0.0287	0.0363	0.0427	0.0484	0.0548	0.0609	0.0665	0.0715	0.0762	0.0801	0.0835	0.0864	0.0888	0.0908	0.0925	0.0939	0.0951	0.0962
Leading	MQ	0.0363	0.0308	0.0316	0.0368	0.0413	0.0442	0.0464	0.0485	0.0504	0.0519	0.0532	0.0542	0.0550	0.0556	0.0559	0.0563	0.0565	0.0567	0.0568	0.0570	0.0572

Proportion of the N-step ahead Forecast Error Variance of LEADING MQ Explained by Conditioning on Contemporaneous and Future Innovations of the Country Equations

		Horizon																				
Region	**Variable**	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Vulnerable	MQ	0.0233	0.0163	0.0137	0.0132	0.0125	0.0119	0.0111	0.0107	0.0102	0.0101	0.0101	0.0103	0.0105	0.0108	0.0111	0.0115	0.0118	0.0121	0.0123	0.0125	0.0127
Unbalanced	MQ	0.0182	0.0234	0.0285	0.0317	0.0382	0.0445	0.0512	0.0563	0.0604	0.0629	0.0647	0.0656	0.0662	0.0665	0.0666	0.0666	0.0665	0.0664	0.0663	0.0662	0.0661
Balanced	MQ	0.0726	0.0906	0.1051	0.1065	0.1203	0.1285	0.1367	0.1396	0.1432	0.1436	0.1441	0.1430	0.1421	0.1403	0.1389	0.1371	0.1356	0.1341	0.1329	0.1317	0.1308
Leading	MQ	0.3418	0.2710	0.2233	0.1907	0.1615	0.1386	0.1195	0.1062	0.0955	0.0879	0.0819	0.0776	0.0740	0.0714	0.0692	0.0675	0.0662	0.0651	0.0643	0.0637	0.0631

Proportion of the N-step ahead Forecast Error Variance of LEADING S RATE Explained by Conditioning on Contemporaneous and Future Innovations of the Country Equations

		Horizon																				
Region	**Variable**	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Vulnerable	MQ	0.0123	0.0325	0.0384	0.0397	0.0393	0.0381	0.0361	0.0339	0.0320	0.0303	0.0289	0.0277	0.0268	0.0260	0.0255	0.0251	0.0248	0.0245	0.0243	0.0242	0.0241
Unbalanced	MQ	0.0036	0.0065	0.0078	0.0082	0.0075	0.0061	0.0051	0.0048	0.0051	0.0058	0.0066	0.0074	0.0080	0.0084	0.0087	0.0089	0.0090	0.0090	0.0089	0.0088	0.0088
Balanced	MQ	0.0024	0.0164	0.0328	0.0464	0.0593	0.0738	0.0882	0.1018	0.1140	0.1249	0.1342	0.1420	0.1483	0.1536	0.1578	0.1613	0.1641	0.1664	0.1683	0.1699	0.1712
Leading	MQ	0.0083	0.0227	0.0298	0.0333	0.0352	0.0371	0.0388	0.0401	0.0410	0.0415	0.0418	0.0420	0.0420	0.0420	0.0420	0.0420	0.0421	0.0422	0.0423	0.0424	0.0426

Proportion of the N-step ahead Forecast Error Variance of REAL OUTPUT Explained by Conditioning on Contemporaneous and Future Innovations of the Country Equations

		Horizon																				
Region	**Variable**	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Vulnerable	MQ	0.0135	0.0248	0.0243	0.0243	0.0220	0.0202	0.0181	0.0166	0.0152	0.0141	0.0132	0.0126	0.0121	0.0117	0.0114	0.0112	0.0110	0.0108	0.0107	0.0106	0.0105
Unbalanced	MQ	0.0054	0.0028	0.0024	0.0028	0.0042	0.0060	0.0083	0.0106	0.0129	0.0148	0.0164	0.0176	0.0185	0.0191	0.0196	0.0198	0.0200	0.0201	0.0201	0.0201	0.0201
Balanced	MQ	0.0184	0.0359	0.0542	0.0707	0.0850	0.0980	0.1092	0.1190	0.1270	0.1336	0.1386	0.1426	0.1455	0.1478	0.1495	0.1508	0.1518	0.1527	0.1533	0.1539	0.1544
Leading	MQ	0.0051	0.0202	0.0247	0.0297	0.0319	0.0338	0.0347	0.0354	0.0356	0.0357	0.0355	0.0354	0.0353	0.0352	0.0351	0.0352	0.0353	0.0354	0.0356	0.0359	0.0361

Proportion of the N-step ahead Forecast Error Variance of Regional MQ Explained by Conditioning on Contemporaneous and Future Innovations of the Country Equations

		Horizon																				
Region	**Variable**	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Vulnerable	Poverty	0.0149	0.0304	0.0340	0.0405	0.0412	0.0425	0.0418	0.0422	0.0418	0.0420	0.0419	0.0422	0.0423	0.0427	0.0429	0.0434	0.0437	0.0441	0.0444	0.0448	0.0450
Unbalanced	Poverty	0.0064	0.0030	0.0028	0.0020	0.0015	0.0017	0.0025	0.0037	0.0049	0.0061	0.0072	0.0082	0.0090	0.0096	0.0102	0.0106	0.0110	0.0113	0.0116	0.0118	0.0120
Balanced	Poverty	0.2186	0.3516	0.4094	0.4382	0.4505	0.4623	0.4708	0.4784	0.4838	0.4887	0.4924	0.4957	0.4984	0.5008	0.5030	0.5050	0.5069	0.5086	0.5102	0.5116	0.5129
Leading	Poverty	0.0862	0.1635	0.1654	0.1809	0.1737	0.1608	0.1417	0.1274	0.1138	0.1040	0.0957	0.0898	0.0847	0.0810	0.0776	0.0751	0.0728	0.0711	0.0695	0.0683	0.0672

C.6 Data Sources

The sample consists of 18 European countries: Hungary, France, Netherlands, Estonia, United Kingdom, Denmark, Greece, Ireland, Luxembourg, Austria, Spain, Sweden, Portugal, Netherlands, Italy, Finland, Germany and Belgium, quarterly data between 1996Q1 and 2012Q1 comprising geographic data, macroeconomic aggregates, financial indicators as well as migration and key open-economy variables.

1 S20/ S80 ratio, it is calculated as the ratio of total income received by the 20 percent of the population with the highest income (the top quintile) to that received by the 20 percent of the population with the lowest income (the bottom quintile). All incomes are compiled as equivalised disposable incomes, (EUROSTAT).

2 At-risk-of-poverty rates, the share of people with an equivalised disposable income (after social transfer) below the at-risk-of-poverty threshold, which is set at 60 percent of the national median equivalised disposable income after social transfers, (EUROSTAT).

3 Modified quintile ratio, own calculations. *Data adjustment: At risk of poverty rates and income quintile data are used to interpolated using the Denton (1971) interpolation.*

5 Social benefits other than social transfers in kind, percent of GDP, (OECD).

6 Total imports and Total exports, bi-lateral trade data, millions US dollars (IMF DTS).

7 Total taxes, percent of GDP, (OECD).

8 Geo-localisation data, coordinates of capital cities from the World Bank's online database's API. Geographic distances are calculated using James P. LeSage's econometric toolbox.

9 Foreign direct investment positions (inward plus outward) bi-lateral totals, normalised with respect to each country's total in relation to the other economies in the sample. Calculated with data from IMF's Coordinated Direct Investment Survey.

10 GDP, (quarterly), current prices, current PPPs, millions (EUROSTAT).

11 Bi-lateral migration, total stocks 1990 and 2000, weighted average calculated with data from the World Bank's Global Bilateral Migration Database.

12 Short term interest rate, 3-months interest rate, (EUROSTAT).

Bibliography

[1] Aberge R., Langorgen A., Lindgren P. (2010). The impact of basic public services on the distribution of income in European countries, Eurostat, Belgium, pp. 329- 43.

[2] Acar A. (2014). The Dynamics of Multidimensional Poverty in Turkey, BETAM Working Paper, 014.

[3] Adams, J., and White, M. (2006). Removing the health domain from the Index of Multiple Deprivation 2004effect on measured inequalities in census measure of health. Journal of Public Health, 28(4), 379-383.

[4] Ahluwalia, M. S. (1976). Income distribution and development: Some stylized facts. The American Economic Review, 66(2), 128-135.

[5] Akresh, R., D. de Walque and H. Kazianga (2013): Cash transfers and child schooling: Evidence from a randomized evaluation of the role of conditionality policy. World Bank Development Research Group Working Paper 6340.

[6] Alkire, S., and Foster, J. (2011). Counting and multidimensional poverty measurement. Journal of public economics, 95(7), 476-487.

[7] Alkire, S., and Santos, M. E. (2010). Acute multidimensional poverty: A new index for developing countries.

[8] Alkire, S., and Santos, M. E. (2014). Measuring acute poverty in the developing world: Robustness and scope of the multidimensional poverty index. World Development, 59, 251-274.

[9] Alkire, S., and Seth, S. (2009). Determining BPL status: Some methodological improvements.

[10] Alkire, S., Conconi, A., and Seth, S. (2014). Multidimensional Poverty Index 2014: Brief methodological note and results.

[11] Alkire, S., Foster, J., Seth, S., Santos, M. E., Roche, J. M., and Ballon, P. (2015). Multidimensional poverty measurement and analysis. Oxford University Press, USA.

[12] Alkire, Sabina, Dimensions of Human Development (2002). World Development, Volume 30, Issue 2, February 2002, pp. 181205.

[13] Allen, F., Bartiloro, L., and Kowalewski, O. (2005). The financial system of the EU 25.

[14] Anand, S., and Sen, A. (1997). Concepts or Human Development and Poverty! A Multidimensional Perspective. United Nations Development Programme, Poverty and human development: Human development papers, 1-20.

[15] Andrews, Frank M., and Stephen B. (2012). Social indicators of well-being: Americans' perceptions of life quality. Springer Science and Business Media.

[16] Anyanwu, John C. Marital status, household size and poverty in Nigeria: evidence from the 2009/2010 survey data. African Development Review 26.1 (2014): 118-137.

[17] Arora, V., and Vamvakidis, A. (2006). The impact of US economic growth on the rest of the world: How much does it matter?. Journal of Economic Integration, 21-39.

[18] Artelaris, P., and Petrakos, G. (2016). Intraregional Spatial Inequalities and Regional Income Level in the European Union: Beyond the Inverted-U Hypothesis. International Regional Science Review, 39(3), 291-317.

[19] Atkinson, A. B. (2015). Inequality. Harvard University Press.

[20] Atkinson, T., Cantillon, B., Marlier, E., and Nolan, B. (2002). Social indicators: The EU and social inclusion. OUP Oxford.

[21] Bae, K. H., and Karolyi, G. A. (1994). Good news, bad news and international spillovers of stock return volatility between Japan and the US. Pacific-Basin Finance Journal, 2(4), 405-438.

[22] Banbura, M., Giannone, D., and Reichlin, L. (2007). Bayesian VARs with large panels.

[23] Barnes, M. (2005). Social exclusion in Great Britain: An empirical investigation and comparison with the EU. Gower Publishing, Ltd.

[24] Barro, R. J., and Sala-i-Martin, X. (1992). Convergence. Journal of political Economy, 100(2), 223-251.

[25] Bartholomew, D. J., Steele, F., Galbraith, J., and Moustaki, I. (2008). Analysis of multivariate social science data. CRC press.

[26] Battisti, M., Fioroni, T., Lavezzi, A. M. (2014). World Interest Rates, Inequality and Growth: an Empirical Analysis of the Galor-Zeira Model (No. 2014/184).

[27] Bayoumi, M. T., and Vitek, F. (2013). Macroeconomic Model Spillovers and Their Discontents (No. 13-14). International Monetary Fund.

[28] Bayoumi, T. and A. Swiston. (2009) Foreign Entanglements; Estimating the Source and Size of Spillovers Across Industrial Countries, IMF Staff Papers, Vol. 56(2), pp. 35383.

[29] Bayoumi, T., and Bui, T. T. (2010). Deconstructing the international business cycle: Why does A US sneeze give the rest of the world a cold?.

[30] Beaton, K., and Desroches, B. (2011). Financial spillovers across countries: the case of Canada and the United States (No. 2011-1). Bank of Canada Discussion Paper.

[31] Beck, T., Demirg-Kunt, A., and Levine, R. (2007). Finance, inequality and the poor. Journal of economic growth, 12(1), 27-49.

[32] Beckfield, J. (2006). European integration and income inequality. American Sociological Review, 71(6), 964-985.

[33] Beetsma, R. and Giuliodori, M. (2011). The effects of government purchases shocks: review and estimates for the EU. The Economic Journal, No. 121, F4-F32. February.

[34] Bnassy-Qur, A., and Cimadomo, J. (2006). Changing patterns of domestic and cross-border fiscal policy multipliers in Europe and the US.

[35] Blanchard, E., and Willmann, G. (2011). Escaping a protectionist rut: Policy mechanisms for trade reform in a democracy. Journal of International Economics, 85(1), 72-85.

[36] Boelhouwer, J. (2010). Wellbeing in the Netherlands: The SCP life situation index since 1974. The Netherlands Institute for Social Research SCP.

[37] Bianchi, A. (2012). Housing Cycles and Macroeconomic Fluctuations: A Global Perspective.

[38] Booysen, F., S. V. D. Berg, R. Burger, M. V. Maltitz and G. D. Rand (2008) Using an Asset Index to Assess Trends in Poverty in Seven Sub-Saharan African Countries, World Development, 36 (6): 111330.

[39] Bossert, W., Chakravarty, S. R., and D'Ambrosio, C. (2013). Multidimensional poverty and material deprivation with discrete data. Review of Income and Wealth, 59(1), 29-43.

[40] Bourguignon, F. (2004). The poverty-growth-inequality triangle. Poverty, Inequality and Growth, 69.

[41] Bourguignon, F., and Chakravarty, S. R. (2003). The measurement of multidimensional poverty. Journal of Economic inequality, 1(1), 25-49.

[42] Bourguignon, F., and Morrisson, C. (2002). Inequality among world citizens: 18201992. The American Economic Review, 92(4), 727-744.

[43] Bowles, S., and Gintis, H. (2002). Schooling in capitalist America revisited. Sociology of education, 1-18.

[44] Brandolini, A. (2007). Measurement of income distribution in supranational entities: The case of the European Union.

[45] Brandolini, A. (2007). On synthetic indices of multidimensional well-being: Health and income inequalities in France, Germany, Italy and the United Kingdom. Roma: Bank of Italy, Economic Research Department.

[46] Brinca, P., Ferreira, M. H., Franco, F., Holter, H. A., and Malafry, L. (2017). Fiscal Consolidation Programs and Income Inequality.

[47] Brown, Charles. Minimum wages, employment, and the distribution of income. Handbook of labour economics 3 (1999): 2101-2163.

[48] Buhmann, B., Rainwater, L., Schmaus, G., Smeeding, T. M. (1988). Equivalence Scales, WellBeing, Inequality, and Poverty: Sensitivity Estimates across Ten Countries Using the Luxembourg Income Study (LIS) Database. Review of income and wealth, 34(2), 115-142.

[49] Burchardt, T, Legrand, J., and Piachaud, D. (2002). Degrees of exclusion: Developing a Dynamic, Multidimensional measure, In: Hills, J., J. Legrand, D. Piachaud (eds.), Understanding social exclusion. Oxford: Oxford University Press.

[50] Bussire, M., Chudik, A., and Sestieri, G. (2009). Modelling global trade flows: results from a GVAR model.

[51] Buvini, M., and Gupta, G. R. (1997). Female-headed households and female-maintained families: are they worth targeting to reduce poverty in developing countries?. Economic development and cultural change, 45(2), 259-280.

[52] Cakr, M. Y., Kabundi, A. (2013). Trade shocks from BRIC to South Africa: A global VAR analysis. Economic Modelling, 32, 190-202.

[53] Caminada, K., Goudswaard, K. (2001). International trends in income inequality and social policy. International Tax and Public Finance, 8(4), 395-415.

[54] Canova, F. (2005). The transmission of US shocks to Latin America. Journal of Applied econometrics, 20(2), 229-251.

[55] Canova, F., Ciccarelli, M., and Ortega, E. (2006). Do political events affect business cycles? The Maastricht treaty, the creation of the ECB and the euro economy. mimeo, presented at the Bundesbank spring conference.

[56] Caporale, G. M., and Girardi, A. (2013). Fiscal spillovers in the euro area. Journal of International Money and Finance, 38, 84-e1.

[57] Castles, Francis G. (1998). The really big trade-off: Home ownership and the welfare state in the new world and the old. Acta politica 33: 5-19.

[58] Cerioli, A., and Zani, S. (1990). A fuzzy approach to the measurement of poverty. In Income and wealth distribution, inequality and poverty (pp. 272-284). Springer Berlin Heidelberg.

[59] Chakravarty, S. R., and D'Ambrosio, C. (2006). The measurement of social exclusion. Review of income and wealth, 52(3), 377-398.

[60] Chant, S. (2003). Female household headship and the feminisation of poverty: facts, fictions and forward strategies.

[61] Cheewatrakoolpong, K., and Manprasert, S. (2014). Trade linkages and crisis spillovers. Asian Economic Papers, 13(1), 84-103.

[62] Chen, Q., Gray, D. F., N'Diaye, P., Oura, H., and Tamirisa, N. T. (2010). International transmission of bank and corporate distress.

[63] Chen, Y. F., Grg, H., Grlich, D., Molana, H., Montagna, C., and Temouri, Y. (2014). Globalisation and the Future of the Welfare State (No. 81). IZA Policy Paper.

[64] Chowdhury, S., and Squire, L. (2006). Setting weights for aggregate indices: An application to the commitment to development index and human development index. The Journal of Development Studies, 42(5), 761-771.

[65] hristiano, L. J., Eichenbaum, M., Evans, C. L. (1999). Monetary policy shocks: What have we learned and to what end?. Handbook of macroeconomics, 1, 65-148.

[66] Coibion, O., Gorodnichenko, Y., Kueng, L., Silvia, J. (2012). Innocent bystanders? Monetary policy and inequality in the US (No. w18170). National Bureau of Economic Research.

[67] Colby, C. C. (1933). Centrifugal and centripetal forces in urban geography. Annals of the Association of American Geographers, 23(1), 1-20.

[68] Coromaldi, M., and Zoli, M. (2007). A multidimensional poverty analysis. Evidence from Italian data. Preliminary draft.

[69] Corsetti, G. and Müller, G.J. (2011). Multilateral Economic Cooperation and the International Transmission of Fiscal Policy. NBER Working Paper Series, No. 17708. December.

[70] Corsetti, G., Pericoli, M., and Sbracia, M. (2011). Correlation analysis of financial contagion. Financial contagion: the viral threat to the wealth of nations, 604, 11.

[71] Costa, M. (2003). A comparison between unidimensional and multidimensional approaches to the measurement of poverty (No. 2003-02). IRISS at CEPS/INSTEAD.

[72] Cowell, F., Karagiannaki, E., and McKnight, A. (2012). Mapping and measuring the distribution of household wealth: A cross-country analysis.

[73] Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. psychometrika, 16(3), 297-334.

[74] Davies, J. B., and Wooton, I. (1992). Income inequality and international migration. The Economic Journal, 102(413), 789-802.

[75] Decancq, K., and Lugo, M. A. (2008). Setting weights in multidimensional indices of well-being.

[76] Decancq, K., and Lugo, M. A. (2012). Inequality of wellbeing: A multidimensional approach. Economica, 79(316), 721-746.

[77] Decancq, K., and Lugo, M. A. (2013). Weights in multidimensional indices of wellbeing: An overview. Econometric Reviews, 32(1), 7-34.

[78] Dees, S., Mauro, F. D., Pesaran, M. H., and Smith, L. V. (2007). Exploring the international linkages of the euro area: a global VAR analysis. Journal of applied econometrics, 22(1), 1-38.

[79] Denton, F. T. (1971). Adjustment of monthly or quarterly series to annual totals: an approach based on quadratic minimization. Journal of the American Statistical Association, 66(333), 99-102.

[80] Department of Work and Pensions. (2017). Improving Lives Helping Workless Families.

[81] Desai, M., and Shah, A. (1988). An econometric approach to the measurement of poverty. Oxford Economic Papers, 40(3), 505-522.

[82] Deutsch, J., and Silber, J. (2005). Measuring multidimensional poverty: An empirical comparison of various approaches. Review of Income and Wealth, 51(1), 145-174.

[83] Di Tommaso, M. L. (2006). Measuring the well-being of children using a capability approach An application to Indian data (No. wp0506). CHILD-Centre for Household, Income, Labour and Demographic economics-ITALY.

[84] Diebold, F. X., and Yilmaz, K. (2009). Measuring financial asset return and volatility spillovers, with application to global equity markets. The Economic Journal, 119(534), 158-171.

[85] Dixon, A., Le Grand, J., Henderson, J., Murray, R., and Poteliakhoff, E. (2011). Is the NHS equitable?: a review of the evidence. London: LSE Health and Social Care, London School of Economics and Political Science.

[86] Doepke, M., Schneider, M. (2006). Inflation and the redistribution of nominal wealth. Journal of Political Economy, 114(6), 1069-1097.

[87] Dorling, D. (2014). Inequality and the 1 percent. Verso Books.

[88] Dumont, J. C., and Lematre, G. (2005). Counting immigrants and expatriates in OECD countries.

[89] ECB Economic Bulletin Issue 2 / 2015IMF, 2006: 124.

[90] Eggebeen, D. J., and Lichter, D. T. (1991). Race, family structure, and changing poverty among American children. American Sociological Review, 801-817.

[91] Eickmeier, S., Ng, T. (2015). How do US credit supply shocks propagate internationally? A GVAR approach. European Economic Review, 74, 128-145.

[92] Eid, Michael, and Randy J. Larsen, eds. The science of subjective well-being. Guilford Press, 2008.

[93] Ericsson, N. R. and Reisman, E. L. (2012). Evaluating a Global Vector Autoregression for Forecasting. International Advances in Economic Research, Vol. 18, Issue 3, p. 247-258. August.

[94] Espinoza, R., Fornari, F., and Lombardi, M. J. (2012). The role of financial variables in predicting economic activity. Journal of Forecasting, 31(1), 15-46.

[95] Estrella, A., and Mishkin, F. S. (1998). Predicting US recessions: Financial variables as leading indicators. Review of Economics and Statistics, 80(1), 45-61.

[96] EU, 2005: Foreign Direct Investment Yearbook, p. 22.

[97] European Central Bank. (2015). Economic Bulletin: Economic and Monetary Developments. Issue 2.

[98] European Economic Review, Vol.55, Issue 3, p. 325-339. April.

[99] Eurostat. (2015). GDP per capita in the EU in 2013: seven capital regions among the ten most prosperous.

[100] Eurostat. (2017). Foreign direct investment statistics.

[101] Fama, E. F., and French, K. R. (1993). Common risk factors in the returns on stocks and bonds. Journal of financial economics, 33(1), 3-56.

[102] Feldkircher, M., and Huber, F. (2016). Forecasting with global vector autoregressive models: a Bayesian approach. Journal of Applied Econometrics.

[103] Feldstein, M. (1998). Income inequality and poverty (No. w6770). National bureau of economic research.

[104] Fiszbein, A., Schady, N., Ferreira, F. H., Grosh, M., Keleher, N., Olinto, P., and Skoufias, E. (2009). Conditional cash transfers: reducing present and future poverty. Washington, DC: World Bank.

[105] Frster, M., Jesuit, D., and Smeeding, T. (2005). Regional poverty and income inequality in Central and Eastern Europe: evidence from the Luxembourg income study. Spatial Inequality and Development, 311-347.

[106] Fuente, A. D. L., and Vives, X. (1995). Infrastructure and education as instruments of regional policy: evidence from Spain. Economic policy, 10(20), 11-51.

[107] Furceri, D., and Mourougane, A. (2012). The effect of financial crises on potential output: New empirical evidence from OECD countries. Journal of Macroeconomics, 34(3), 822-832.

[108] Galesi, A., Sgherri, S. (2009). Regional financial spillovers across Europe: a global VAR analysis (No. 9-23). International Monetary Fund.

[109] Garca-Pealosa, C. (2010). Income distribution, economic growth and European integration. Journal of economic inequality, 8(3), 277-292.

[110] Garratt, A., Lee, K., Pesaran, M. H., and Shin, Y. (2006). National and global macroeconometric modelling: A long-run structural modelling approach.

[111] Geddes, A. (2001). International migration and state sovereignty in an integrating Europe. International Migration, 39(6), 21-42.

[112] Giacomini, R., and White, H. (2006). Tests of conditional predictive ability. Econometrica, 74(6), 1545-1578.

[113] Gillis, M., Perkins, D. H., Roemer, M., and Snodgrass, D. R. (1992). Economics of development (No. Ed. 3). WW Norton and Company, Inc.

[114] Goodhart, C. A. (2006). A framework for assessing financial stability?. Journal of Banking and Finance, 30(12), 3415-3422.

[115] Gordon, D. (2013). The Impoverishment of the UK PSE UK first results: Living Standards.

[116] Gordon, R. (2012): Is US economic growth over? Faltering innovation confronts the six headwinds, NBER Working Paper No. 18315.

[117] GreenwoodNimmo, M., Nguyen, V. H., and Shin, Y. (2012).

[118] Gross, M. (2013). Estimating GVAR weight matrices.

[119] Guesmi, K., Kaabia, O., and Irfan, K. A. Z. I. (2013). Does Shift Contagion Exist Between OECD Stock Markets During The Financial Crisis?. Journal of Applied Business Research (JABR), 29(2), 469-484.

[120] Guio A. (2005). Income poverty and social exclusion in the EU 25. Eurostat, Statistics in Focus Series, No. 13.

[121] Hallerd, B., and Larsson, D. (2008). Poverty, welfare problems and social exclusion. International Journal of Social Welfare, 17(1), 15-25.

[122] Harbo, I., Johansen, S., Nielsen, B., Rahbek, A. (1998). Asymptotic inference on cointegrating rank in partial systems. Journal of Business and Economic Statistics, 16(4), 388-399.

[123] Harding, Ann, and Sue Richardson. Unemployment and income distribution. University of Canberra. National Centre for Social and Economic Modelling, 1998.

[124] Hassapis, C. (2003). Financial variables and real activity in Canada. Canadian Journal of Economics/Revue canadienne dconomique, 36(2), 421-442.

[125] Heady C, Mitrakos T, Tsakloglou P. (2001). The Distributional Impact of Social Transfers in the European Union: Evidence from the ECHP, IZA Discussion paper series, No. 356.

[126] Heshmati, A. (2004). The relationship between income inequality, poverty and globalisation.

[127] Hiebert, P., and Vansteenkiste, I. (2010). International trade, technological shocks and spillovers in the labour market: a GVAR analysis of the US manufacturing sector. Applied Economics, 42(24), 3045-3066.

[128] Hulme, D., and McKay, A. (2007). Identifying and measuring chronic poverty: Beyond monetary measures?. In The many dimensions of poverty (pp. 187-214). Palgrave Macmillan UK.

[129] Inklaar, R., Jong-A-Pin, R., and De Haan, J. (2008). Trade and business cycle synchronization in OECD countriesA re-examination. European Economic Review, 52(4), 646-666.

[130] Iradian, G. (2005). Inequality, poverty, and growth: cross-country evidence. International Monetary Fund.

[131] Jayaraj, D., and Subramanian, S. (2010). A Chakravarty-D'Ambrosio View of Multidimensional Deprivation: Some Estimates for India. Economic and Political Weekly, 53-65.

[132] Jencks, Christopher. Who Gets Ahead? The Determinants of Economic Success in America. (1979).

[133] Jermann, U., and Quadrini, V. (2012). Macroeconomic effects of financial shocks. The American Economic Review, 102(1), 238-271.

[134] Johansen S. (1992). Testing weak exogeneity and the order of cointegration in UK money demand data. Journal of Policy modeling, 14(3), 313-334.

[135] Jordan, H., Roderick, P., and Martin, D. (2004). The Index of Multiple Deprivation 2000 and accessibility effects on health. Journal of epidemiology and community health, 58(3), 250-257.

[136] Kakwani, N. (1990). Income inequality and poverty. Oxford University Press.

[137] Kali, R., and Reyes, J. A. (2005). Financial contagion on the international trade network.

[138] Kanbur, S. R., Lustig, N. (1999). Why is inequality back on the agenda?. Department of Agricultural, Resource, and Managerial Economics, Cornell University.

[139] Kapteyn, Arie., Kooreman, P. and Willemse, R. (1988). Some Methodological Issues in the Implementation of Subjective Poverty Definitions. Journal of Human Resources 23: 22242.

[140] Kerr, K., and West, M. (2010). Insight 2: Social inequality: can schools narrow the gap. Macclesfield: British Educational Research Association.

[141] Knoop, T.A. (2008) Modern Financial Macroeconomics: Panics, Crashes and Crises. Oxford: Blackwell.

[142] Kolenikov, S., Angeles, G. (2004). The use of discrete data in PCA: theory, simulations, and applications to socioeconomic indices. Chapel Hill: Carolina Population Center, University of North Carolina, 1-59.

[143] Kolenikov, S., and Angeles, G. (2009). Socioeconomic status measurement with discrete proxy variables: Is principal component analysis a reliable answer?. Review of Income and Wealth, 55(1), 128-165.

[144] Kolenikov, S., Angeles, G. (2008). On costs of repeated clustered surveys.

[145] Koop, G., Pesaran, M. H., and Potter, S. M. (1996). Impulse response analysis in nonlinear multivariate models. Journal of econometrics, 74(1), 119-147.

[146] Korpi, W., Palme, J. (1998). The paradox of redistribution and strategies of equality: Welfare state institutions, inequality, and poverty in the Western countries. American sociological review, 661-687.

[147] Krishnakumar, J. (2007). Going beyond Functionings to Capabilities: an Econometric Model to explain and estimate Capabilities. Journal of Human Development, 8(1), 39-63.

[148] Krishnakumar, J., and Nadar, A. (2008). On exact statistical properties of multidimensional indices based on principal components, factor analysis. MIMIC and structural equation models, Social Indicators Research, 86(3).

[149] Krugman, P. (1991). Increasing returns and economic geography. Journal of political economy, 99(3), 483-499.

[150] Langel, M., Till, Y. (2011). Statistical inference for the quintile share ratio. Journal of Statistical Planning and Inference, 141(8), 2976-2985.

[151] Lansley, S., and Mack, J. (2015). Breadline Britain: The rise of mass poverty. Oneworld Publications.

[152] Leahy, M., Schich, S., Wehinger, G., Pelgrin, F., and Thorgeirsson, T. (2001). Contributions of financial systems to growth in OECD countries.

[153] LeSage J, Pace K, (2010), Spatial econometric models. In Handbook of Applied Spatial Analysis (pp. 355-376), Springer Berlin Heidelberg.c inequality, 8(3), 277-292.

[154] LeSage, J. and Pace, R. K. (2009). Introduction to Spatial Econometrics. CRC Press, Boca Raton, USA.

[155] Lombardi, M., Espinoza, R. A., and Fornari, F. (2009). The Role of Financial Variables in Predicting Economic Activity in the Euro Area (No. 9-241). International Monetary Fund.

[156] Lopez-Rodriguez, J., and Faina, A. (2007). Regional wage disparities in the European Union: what role for market access. Investigaciones regionales.

[157] Lucchini, M., Saraceno, C., and Schizzerotto, A. (2007). Dual-earner and dual-career couples in contemporary Italy. Zeitschrift fr Familienforschung, 19(3), 290-310.

[158] Maasoumi, E., and Xu, T. (2015). Weights and substitution degree in multidimensional well-being in China. Journal of Economic Studies, 42(1), 4-19.

[159] Maasoumi, E., and Yalonetzky, G. (2013). Introduction to robustness in multidimensional wellbeing analysis. Econometric Reviews, 32(1), 1-6.

[160] Maluccio, J., and Flores, R. (2005). Impact evaluation of a conditional cash transfer program: The Nicaraguan Red de Proteccin Social International Food Policy.

[161] Malul M., Shapira D., Shoham, A. (2013). Modified Gini Index, Applied Economics Letters.

[162] Mau, S., Burkhardt, C. (2009). Migration and welfare state solidarity in Western Europe. Journal of European Social Policy, 19(3), 213-229.

[163] Melyn, W., and Moesen, W. (1991). Towards a synthetic indicator of macroeconomic performance: unequal weighting when limited information is available.

[164] Miao, H., Ramchander, S. and Zumwalt, J. K. (2014). S and P 500 Index-Futures Price Jumps and Macroeconomic News. Journal of Futures Markets, Vol. 34, Issue 10, p. 980-1001. October.

[165] Milanovic, B., Yitzhaki, S. (2002). Decomposing world income distribution: Does the world have a middle class?. Review of Income and Wealth, 48(2), 155-178.

[166] Mitra, S. (2016). Synergies among monetary, multidimensional and subjective poverty: Evidence from Nepal. Social Indicators Research, 125(1), 103-125.

[167] Mitra, S., Posarac, A., and Vick, B. (2013). Disability and poverty in developing countries: a multidimensional study. World Development, 41, 1-18.

[168] Moghadam, V. M. (2005). The'Feminization of Poverty'and Women's Human Rights.

[169] Moneta, F. (2005). Does the yield spread predict recessions in the Euro area?. International Finance, 8(2), 263-301.

[170] Morris, N., Preston, I. (1986). Inequality, poverty and the redistribution of income. Bulletin of Economic Research, 38(4), 275-344.

[171] Mulas-Granados, C. (2005). Fiscal adjustments and the short-term trade-off between economic growth and equality. Hacienda Pblica Espaola/Revista de Economia Pblica, 172(1), 61-92.

[172] Narayan, D. (2000). Poverty is powerlessness and voicelessness. Finance and Development, 37(4), 18.

[173] Naschold, F., Fozzard, A. (2002). Poverty Reduction Strategy and Public Expenditure in Tanzania.

[174] Neighbourhood deprivation and self-rated health: the role of perceptions of the neighbourhood and of housing problems. Health and place, 14(3), 562-575.

[175] NguefackTsague, G., Klasen, S., and Zucchini, W. (2011). On weighting the components of the human development index: a statistical justification. Journal of Human development and Capabilities, 12(2), 183-202.

[176] Nicolini, M., and Resmini, L. (2010). FDI spillovers in new EU member states. Economics of Transition, 18(3), 487-511.

[177] Nissanke, Machiko, and Erik Thorbecke. Channels and policy debate in the globalization-inequalitypoverty nexus. World development 34.8 (2006): 1338-1360.

[178] Nolan, B., and Whelan, C. T. (2011). Poverty and deprivation in Europe. OUP Catalogue.

[179] Notten, G., and Roelen, K. (2010). Cross-national comparison of monetary and multidimensional child poverty in the European Union: Puzzling with the few pieces that the EU-SILC provides. Manchester: University of Manchester/BWPI.

[180] Notten, G., and Roelen, K. (2012). A new tool for monitoring (child) poverty: measures of cumulative deprivation. Child Indicators Research, 5(2), 335-355.

[181] Nunnally, Jum C. (1967). Psychometric Theory, 1st ed., New York: McGraw-Hill.

[182] Nussbaum, M. (2000). Women's capabilities and social justice. Journal of Human Development, 1(2), 219-247.

[183] Obstfeld M,Peri G, (1998), Regional non-adjustment and fiscal policy. Economic Policy, 13(26), 206-259.

[184] OECD. (2011). Financial Contagion in the Era of Globalised Banking? OECD Economics Department Policy Notes, No. 14, June Outlook, O. R. Building Resilient Regions for Stronger Economies. OECD Publishing, Paris, 6, 2011.

[185] Office for National Statistics (ONS). (2016). Persistent Poverty in the UK and EU: 2014.

[186] Olsson, U. (1979). Maximum likelihood estimation of the polychoric correlation, Psychometrika 44, 443460.

[187] Osberg, L., and Sharpe, A. (2002). An index of economic wellbeing for selected OECD countries. Review of Income and Wealth, 48(3), 291-316.

[188] Pearson, K. and Pearson, E. S. (1922). On polychoric coefficients of correlation, Biometrika 14, 127156.

[189] Pedersen, P. J., Pytlikova, M., and Smith, N. (2008). Selection and network effectsMigration flows into OECD countries 19902000. European Economic Review, 52(7), 1160-1186.

[190] Pesaran and Shin (1998). Generalised Impulse Response Analysis in Linear Multivariate Models. Economics Letters, Vol.58, Issue 1, pp. 17-29. January.

[191] Pesaran, M. H., and Smith, R. (2006). Macroeconometric modelling with a global perspective. The Manchester School, 74(s1), 24-49.

[192] Pesaran, M. H., Schuermann, T., and Weiner, S. M. (2004). Modeling regional interdependencies using a global error-correcting macroeconometric model. Journal of Business and Economic Statistics, 22(2), 129-162.

[193] Pesaran, M. H., Shin, Y., and Smith, R. J. (2000). Structural analysis of vector error correction models with exogenous I (1) variables. Journal of Econometrics, 97(2), 293-343.

[194] Piketty, T. (2014). Capital in the 21st Century.

[195] Poirson, H., and Weber, S. (2011). Growth spillover dynamics from crisis to recovery.

[196] Popova, Daria (2014): Distributional impacts of cash allowances for children: A microsimulation analysis for Russia and Europe, EUROMOD Working Paper, No. EM2/14.

[197] Probabilistic forecasting of output growth, inflation and the balance of trade in a GVAR framework. Journal of Applied Econometrics, 27(4), 554-573.

[198] Raffo, C., Dyson, D., Gunter, H M., Hall, D., L Jones, Kalambouka, A. (2007). Education and poverty: A critical review of theory, policy and practice. Joseph Rowntree Foundation.

[199] Ravallion, M. (1997). Good and bad growth: The human development reports. World Development, 25(5), 631-638.

[200] Ravallion, M. (1998). Poverty lines in theory and practice (Vol. 133). World Bank Publications.

[201] Ravallion, M. (2001). Growth, inequality and poverty: looking beyond averages. World development, 29(11), 1803-1815.

[202] Ravallion, M. (2004). A poverty-inequality trade off. World Bank Development Economics Research Working Paper (Washington: World Bank).

[203] Ravallion, M. (2011). On multidimensional indices of poverty. Journal of Economic Inequality, 9(2), 235-248.

[204] Ravallion, M. (2012). Mashup indices of development. The World Bank Research Observer, 27(1), 1-32.

[205] Ravallion, M., and Chen, S. (1997). What can new survey data tell us about recent changes in distribution and poverty?. The World Bank Economic Review, 11(2), 357-382.

[206] Ravallion, M., and Chen, S. (2011). Weakly relative poverty. Review of Economics and Statistics, 93(4), 1251-1261.

[207] Ravallion, M., and Lokshin, M. (2001). Identifying welfare effects from subjective questions. Economica, 68(271), 335-357.

[208] Reinhart, C. M. and Rogoff, K. S. (2009). The Aftermath of Financial Crises. The American Economic Review, Vol. 99, No. 2, Papers and Proceedings of the One Hundred Twenty-First Meeting of the American Economic Association, pp. 466-472. May.

[209] Rippin, N. (2010). Poverty severity in a multidimensional framework: the issue of inequality between dimensions (No. 47). Courant Research Centre: Poverty, Equity and Growth-Discussion Papers.

[210] Rippin, N. (2011). A response to the weaknesses of the multidimensional poverty index (MPI): The Correlation Sensitive Poverty Index (CSPI). DIE Briefing Paper, 19, 2011.

[211] Robeyns, I. (2003, September). The capability approach: an interdisciplinary introduction. In Training course preceding the Third International Conference on the Capability Approach, Pavia, Italy.

[212] Romer, C. D., Romer, D. H. (2007). The macroeconomic effects of tax changes: estimates based on a new measure of fiscal shocks (No. w13264). National Bureau of Economic Research.

[213] Salt, J. (1992). The future of international labor migration. International Migration Review, 1077-1111.

[214] Sargent, T. J., and Sims, C. A. (1977). Business cycle modeling without pretending to have too much a priori economic theory. New methods in business cycle research, 1, 145-168.

[215] Schierup, C. U., Hansen, P., Castles, S. (2006). Migration, citizenship, and the European welfare state: a European dilemma. OUP Catalogue.

[216] Schokkaert, E. (2007). Capabilities and satisfaction with life. Journal of Human Development, 8(3), 415-430.

[217] Schokkaert, E., and Van Ootegem, L. (1990). Sens concept of the living standard applied to the Belgian unemployed. Recherches conomiques de Louvain/Louvain Economic Review, 56(3-4), 429-450.

[218] Schularick, M. and Taylor, A. M. (2012). Credit Booms Gone bust: Monetary Policy, Leverage Cycles, and Financial Crises, 1870-2008. American Economic Review, Vol. 102, No. 2, pp.1029-1061. April.

[219] Sen, A. (1976). Poverty: an ordinal approach to measurement. Econometrica: Journal of the Econometric Society, 219-231.

[220] Sen, A. (1977). On weights and measures: informational constraints in social welfare analysis. Econometrica: Journal of the Econometric Society, 1539-1572.

[221] Sen, A. (1982). Rights and agency. Philosophy and Public Affairs, 3-39.

[222] Sen, A. (2004). Elements of a theory of human rights. Philosophy and Public Affairs, 32(4), 315-356.

[223] Sgherri, S., and Galesi, A. (2009). Regional financial spillovers across Europe: a global VAR analysis (No. 9-23). International Monetary Fund.

[224] Silber, J. (2011). A comment on the MPI index. Journal of Economic Inequality, 9(3), 479-481.

[225] Stack S, (1978). The effect of direct government involvement in the economy on the degree of income inequality: a cross national study, American Sociological Review, 43, 880-8.

[226] Stiglitz, J. (2013). The price of inequality. Penguin UK.

[227] Stock, J. H., and Watson, M. W. (2005). Implications of dynamic factor models for VAR analysis (No. w11467). National Bureau of Economic Research.

[228] Stolper, W. F., and Samuelson, P. A. (1941). Protection and real wages. The Review of Economic Studies, 9(1), 58-73.

[229] Swiston, A. J. (2008). A US financial conditions index: putting credit where credit is due.

[230] Tobler W,(1979), Cellular geography. In Philosophy in geography (pp. 379-386). Springer Netherlands.

[231] Trani, J. F., Kuhlberg, J., Cannings, T., and Chakkal, D. (2016). Multidimensional poverty in Afghanistan: who are the poorest of the poor?. Oxford Development Studies, 44(2), 220-245.

[232] Tsakloglou, P., and Papadopoulos, F. (2002). Poverty, material deprivation and multi-dimensional disadvantage during four life stages: Evidence from the ECHP. Poverty and Social Exclusion in Europe, Edward Elgar Publising Limited.

[233] Tsui, K. Y. (2002). Multidimensional poverty indices. Social choice and welfare, 19(1), 69-93.

[234] Venables, A. J. (1994). Economic integration and industrial agglomeration. Economic and Social Review, 26(1), 1. Journal of the Japanese and International Economies, 17(4), 404-431.

[235] Wade, M. (2014). The Human Development Index Calculated with Fuzzy Weights.

[236] Wagstaff, A., and Van Doorslaer, E. (2000). Measuring and testing for inequity in the delivery of health care. Journal of Human Resources, 716-733.

[237] Walsh, D. (2014). An analysis of the extent to which socio-economic deprivation explains higher mortality in Glasgow in comparison with other post-industrial UK cities, and an investigation of other possible explanations (Doctoral dissertation, University of Glasgow).

[238] Wang, C., Wodon, Q. T. (1999). Microdeterminants of consumption, poverty, growth, and inequality in Bangladesh. World Bank Policy Reseach Working Paper, (2076).

[239] Whelan, C. T., Layte, R., and Maitre, B. (2002). Multiple deprivation and persistent poverty in the European Union. Journal of European Social Policy, 12(2), 91-105.

[240] Whelan, C. T., Layte, R., Matre, B., and Nolan, B. (2001). Income, deprivation, and economic strain: An analysis of the European Community Household Panel. European sociological review, 357-372.

[241] Whelan, C. T., Nolan, B., and Maitre, B. (2014). Multidimensional poverty measurement in Europe: An application of the adjusted headcount approach. Journal of European Social Policy, 24(2), 183-197.

[242] White, H. and Anderson. E. (2001). Growth versus Distribution: Does the Pattern of Growth Matter?, Development Policy Review, 19: 267289.

[243] World Bank. (2016). Poverty and Shared Prosperity 2016: Taking on Inequality. Washington, DC: World Bank.

[244] Yalonetzky, G. (2013). Stochastic dominance with ordinal variables: conditions and a test. Econometric Reviews, 32(1), 126-163.

[245] Zimmerman C, Kiss L, Hossain, M,. (2011). Migration and health: a framework for 21st century policy-making. PLoS Medicine, 8(5), e1001034.