

Economics School of Louvain - ESL

Economics School of Namur - ESN

A MULTIDIMENSIONAL APPROACH TO RESILIENCE

Author : Alessia Arcidiacono

Thesis Director : William Parienté

Thesis Reader : Vincent Vandenberghe

Academic Year 2019-2020

Master in Economics – 120 credits – Focus : Labor economics, social policies and evaluation

Ackoweldgements

I would like to express my special thanks of gratitude to my Supervisor, Mr. Wiliam Parientè who gave me the opportunity to deepen these topic of my interest. Thank you for his valuable tips.

I would also like to thank my reader, Mr. Vincent Vandenberghe, for his attention.

Then I would like to thank my family, who have helped me with their guidance and support in various phases of the completion of this thesis.

Abstract

This thesis aims to investigate the resilience of European countries on the occasion of the very recent economic crisis measured in terms of multidimensional wellbeing measures, including the Better Life Index (BLI) by OECD. In so doing, this work departs from common practice using income and employment. The analysis is augmented with the effects of expenditures, as measured by the IMF's Fiscal Decentralization dataset. The empirical analysis is based on a panel of 22 European countries, over the period 2004-2017, adopting pooling regression (POLS) approach and Fixed Effect (FE) and Random Effect(RE) approach. The analysis shows that the decentralization measure can mitigate the shock and that both during the shock and the recovery, the multidimensional approach for the determination of wellbeing has been impacted by purely economic elements. The empirical evidence shows also that the link between the expenditure by sector and related BLI categories is rather case-specific; During the financial distress the elements that concur to the determination of "resilience" are, both the wealth and work conditions of the households and the relevance of the European institutions. Whereas, the response to the recessionary shock shows that the personal security and the evolution of purely economy elements to adverse events, in this case, the economic recessions, contribute to the achievement of the "growth path".

Contents

Abstract	iii
List of Figures	vii
List of Tables	ix
Introduction	1
1 Literature review	5
1.1 The resilience's notion	5
1.2 How does decentralisation affect resilience?	6
1.3 Multidimensional reasoning approach	8
2 The empirical analysis	11
2.1 Data section and methodology	11
2.2 General framework	15
2.3 A Country effect-model	15
3 Results	19
3.1 Preliminary analysis	19
3.2 Resilience's impact and Recovery to the recessionary shock	21
3.3 Case-specific-sectors	21
4 Concluding remark	25
A Descriptive Statistics	27
B Estimated models	31
Bibliography	41

List of Figures

1.1	The ‘Plucking Model’	6
1.2	The Experience in decentralization over years 2004-2012	7
1.3	The Experience in decentralization over years 2013-2017	8
3.1	The ‘Countries resilience’	19
3.2	The ‘Shock Response’	20

List of Tables

2.1	Sustainable Development Indicators, 2004-2012	12
2.2	Better-life indicators, 2013-2017	12
2.3	Decentralized Expenditures,2004-2017 (Source IMF)	14
A.1	Descriptive Statistics of variable <i>WELLBEING</i> by country	27
A.2	Descriptive Statistics of expenditure variable over years 2004-2012 by country	28
A.3	Descriptive Statistics of variable <i>BLI</i> by country	29
A.4	Descriptive Statistics of expenditure variable over years 2013-2017 by country	30
B.1	Pooling Regression of the Expenditure over Wellbeing	31
B.2	Regression model of the expenditure over the Wellbeing's dimensions . . .	32
B.3	Pooling Regression of the Expenditure over Wellbeing with the shock . . .	33
B.4	Regression model for 'Income'	34
B.5	Regression model for 'Job'	35
B.6	Regression model for 'Civic-Engagment'	36
B.7	Regression model for 'Safety'	37
B.8	Regression model for 'Work-life-Balance'	38
B.9	Data Source and Variables Definition	39

Introduction

The notion of resilience has been gaining both theoretical and empirical attention in recent years, from different disciplinary fields. Specifically, *Resilience* has enjoyed significant following catastrophic events in all social and economic fields. The global financial crisis of 2007-2009 exposed flaws and weaknesses in the global economic architecture and Resilience analysis has allowed both a function of planning for and preparing for future crises. During the crisis, the resilience of local economies has been discussed from a variety of points of view, by determining it shall be studied as a multi-faceted notion. In general terms, the economic crisis has had a serious impact on the wellbeing and in the quality of life. The main serious implications, often, are due to wrong choices taken by leaders, which undermine the advantages of decentralization. In this thesis, decentralization is seen as a good policy and a useful strategy for recovering from the crisis or for mitigating its effects. Indeed, all strategies based on local self-government are crucial to achieving social progress and economic growth. The economic, fiscal, and financial crisis has led to many countries' risk of "recentralisation" by the central government, reversing the process of decentralization. This process has led, since the mid-1980s for more than 60 governments, mainly in developing countries, to experiment with some form of decentralization, such as administrative decentralization, fiscal decentralization, and democratic decentralization. In particular, these are achieved when agents in higher levels of government move to lower levels, when higher levels of government cede influence over budgets and financial decisions to lower levels and finally, when resources, power, and often tasks are shifted to lower-level authorities. The global economy cannot only be explored in a whole because all items start at the grass-root level and are therefore local. The local economic development plays an important role in global ones. Issues related to different areas of social, economic, political, and cultural life require a national-level action that provides a huge aid to control the social and economic crisis.

The ability of an economic system to retain its organization structure following a shock define its degree of resilience. The notion of resilience focuses on the assumption that different states of a system involve different equilibria. The switch, from a stable

domain to another one, shapes the evolution of systems. Furthermore, many systems are progressively inspected from a multidimensional perspective, and discourse questions like evolutionary behavior, endogenous growth, and resilience.

Originally, the concept of resilience was applied only to the ecosystem, distinguishing between “engineering” and “ecological” resilience, and today exists a vast literature on resilience applicable to all socio-economic systems, including the recent definition of “adaptive resilience”. The conceptual description is based, on two main assumptions such as the existence of local stability for these equilibria and the existence of sudden “exogenous” perturbation. We observe that resilience depends on the strength of perturbation and the size of a stable domain, and for this reason, from an empirical viewpoint, arises difficulties to measure it empirically. However, the problem of measuring resilience is an interesting topic to explore. Several measures have been proposed in the literature, such as time of recovering from shocks, size of the stability domain absorbing the shocks, potential, and transition probabilities; however, this topic remains at a formal-theoretical level.

The resilience concepts are attractive for spatial economic systems. In the context of measuring resilience, in this paper, I have investigated the possibility of using decentralization measures, since the level of political decentralization of a country is a relevant factor in shaping the resilience behavior. Indeed, the decentralization process involves greater flexibility and more resilience. Decentralization is among the dominant means to renew governance towards the possibility of “tailor-made policies”, which are based on the co-operation with other local actors. The diffusion of these policies through the EU has determined a new paradigm of development. In particular, as part of their recovery strategy, many countries have used decentralization projects to help their government.

A country would be more resilient if it can manage a proper change under changed circumstances while mitigating and accommodating the impact of current shocks. Such resilient countries would suffer less in an economic downturn and are likely to experience greater growth during a positive economic environment. Specifically, resilience depends on its degree of persistence, indeed from the perspective of ecosystem management, to make the ecosystem more resilient we need to focus on persistent factors. Also, ecosystem resilience is inversely proportional to the expected length of time between ecosystem breakdowns. The time between breakdowns corresponds in part to periods, in which a system manager has taken precautionary actions to safeguard the system from the adverse effects of continued economic activity. (Batabyal,1999).

Moreover, in this paper, I underline an important source of multidimensionality, which is that of well-being measure. According to ‘The Commission on the Measurement of Economic Performance and Social Progress’, the Gross Domestic Product(GDP) or any other aggregate computed per capita may not provide an accurate measure of the level of well-being, since the measurement process may be imperfect involving a distorted view of each economic phenomena. Therefore, another perspective is developed in the last years, the so-called *beyond-gdp* analysis. The Commission suggests the need to improve some measure of economic performance which, from one side, is explained by measuring production such as employment level or the GDP but, on the other side, the need to take account other many other factors which have a subjective interpretation and whose measurement is complex, multi-dimensional and subject to change. Hence, the need to go beyond the maximization of production and consumption has developed other composite indicators. I use the *Better Life Index (BLI)*, recently introduced by the Organization for

Economic Co-operation and Development (OECD).

Fingleton et al. (2012) and Martin (2012) allow us to understand that resilience can provide useful information about differences across the countries. In particular, Fingleton et al (2012) propose a simple regression analysis approach, to evaluate whether regions react to, and recover from, shocks in different ways. Cellini et al. (2014) study the resilience focussing on the main economic measure GDP and employment for an Italian-case study. This analysis departs from these common economic measures using BLI.

Following two main and general empirical approaches, that have been undertaken by the existing regional economics literature to "measure" economic resilience, I perform my analysis. Firstly, descriptive analysis and secondly, applying panel data econometric models, aiming to detect and explain resilience, also introducing spatial interactions across and within countries.

Bearing in mind that higher levels of decentralization can potentially improve the resilience due to the design and implementation of better-tailored policies at the local level, and because of better knowledge of territories can lead us to better policy implementation, the following research questions can be addressed in term of *(i)* To test to what extent countries are' resilient among the different dimensions of wellbeing; *(ii)* the effects of the different levels of decentralization that have affected European economic resilience. Besides, a third research question arises because of the trade-off between the potential beneficial effects of decentralization in limiting the tendency (from the central government) to adopt a one-size-fits-all approach and the potential cons related. Given that, however, between levels of governments, there are higher transaction costs, loss of economies of scale, lower local bureaucracy quality, and rent-seeking behavior, the above arguments can be reversed thus I will investigate about *(iii)* the identification of potential specific aspects of resilience notion used in regional development context that has been affected by the shocks. How the regions do respond to shocks? And under these which circumstances and dimension, what are the factors that can improve the national development?

The remainder of the paper is as follows. Section 1 sets the ideas behind the notion of resilience, with specific reference to the link between resilience and decentralization, and makes close reference to the issues presented in Bartolini et al., (2018) concerning the fiscal decentralization case for 19 OECD countries, and finally, a focus on the multidimensional approach is done. Section 2, presents the European data that are used in this analysis; in particular, the present study relies on a data bank of International Monetary Found (IMF) and OECD. Section 3, presents the main results; Section 4 concludes.

Chapter 1

Literature review

1.1 The resilience's notion

The word resilience, from Latin “resilire”, “to recoil or rebound”, meaning “the act of rebounding, springing back”. The idea of “resilience” refers to the ability of a system to adapt to change, following a disturbance or disruption of some kind. Specifically, resilience is the ability of a system to survive with a series of shocks in all aspects of its functioning. Several definitions of resilience found in the literature. Recently uses of the term in regional analysis, spatial economists and economic geographers, see resilience as “*The ability of a region to recover successfully from shocks to its economy that either throw it off its growth path or have the potential to throw it off its growth path*” (Hill et al.,2008). Or again, Martin(2012) defines the resilience as “ *The capacity of a regional economy to reconfigure, that is adapt, its structure (firms, industries, technologies, and institutions) to maintain an acceptable growth path in output, employment and wealth over time*”. This latter notion is the so-called “adaptive resilience”, in which the term ‘adaptive’ refers to the whole region’s economic structure. The most commonly invoked definition of the concept is that of so-called ‘engineering resilience’, which focuses on the ability to return to the steady-state following a perturbation, as Walker et al.,(1969) define it as “*the magnitude of disturbance that can be absorbed before the system changes its structure by changing the variable and processes that control behavior*”. This interpretation of resilience is used in the regional development context and is strictly linked to the well-known “Plucking Model” of economic fluctuation by Friedman. (Friedman, 1993; Kim and Nelson, 1999). According to the “Plucking Model”, shocks tend to be transitory and do not affect long-term growth. Specifically, the path of an economy’s output is ‘plucked’ downward because of shocks, but the model predicts that the output will recover to the upward initial level. This scenario, depicted in figure 1, shows on the vertical axis the regional output and on the horizontal axis the time. Besides, the slope output’s path reflects a steady rate of growth. Therefore, the economies system will search to come back at least to their stationary state, or they will try to improve their pattern through the re-allocation of resources, which be influenced by region’s human, capital, and environmental resources.

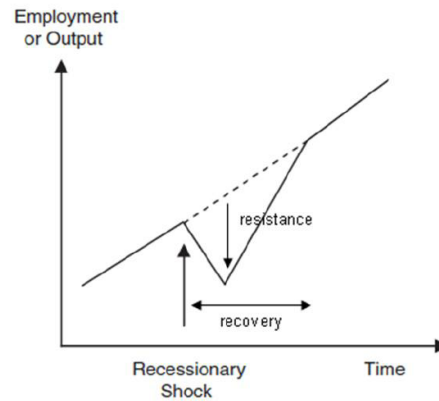


Figure 1.1: The ‘Plucking Model’

The general aim of this process is that of increasing the well-being and welfare of their population. The consideration that countries differ in their ability to cope with shocks prompt us to investigate and to analyze resilience notion in the regional development context. As OECD report suggests (2016), the concept of resilience is inflected in terms of adaptive capacity, robustness, redundancy, flexibility, resourcefulness, inclusiveness, and integration.

Another interesting definition is the so-called “ecological resilience”, where the measurement of resilience is “*measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables*” (Holling,1973). According to this definition, the systems are categorized by multiple stability domains, and by the size of the shock, a system absorbs, we can measure how much resilient is the system in question. Very interesting is, indeed, the “elasticity threshold” of the system before that it passes to a new domain.

1.2 How does decentralisation affect resilience?

In both developed and developing countries, there exists a debate on the nature and merits of decentralization. On a very general level, decentralization is the transfer of responsibilities from the nation to the subnational level. A relevant factor in shaping the resilience behavior in a country is the level of political decentralization. As Oates’s theorem (1972) suggests in the presence of various geographical preference, different arrangements for the supply of local public goods is always preferable to a uniform solution.

In principle, this could apply also the reallocation of resources in response to an economic shock. Furthermore, decentralization is a way to promote more efficient markets (Marks and Hooghe 2004). Besides, it is a also way to increase participation, transparency, accountability in policymaking.

More recently, Rodriguez-Pose et al. (2011) argue that the global drive towards decentralization has been increasingly justified on the basis that greater transfers of resources to subnational governments are expected to deliver greater efficiency in the provision of public goods and services and greater economic growth. Decentralization is among the dominant means to renew governance towards the possibility of “tailor-made policies”, which are based on the co-operation with other local actors.

This theoretical background justifies my interest to study how the different levels of decentralization have influenced resilience in Europe. As Tibeout (1956) suggests: “*decentralization leads to greater variety in the provision of public goods, which are tailored to better suit local populations*”. A decentralized economy holds sufficient flexibility to deal with macroeconomic tasks during a financial crisis, such as efficiency, growth, and quality of life. There is evidence that decentralization is not an obstacle during a financial crisis (Bartolini, Davide, et al. 2018). Therefore, the research approach, in this analysis, is focused to investigate about what strategies could be used at the local level to fight the economic crisis and to understand what is the strength of local governments and the impact of fiscal decentralization in stimulating economic growth.

The underpinning of my analysis is the study of decentralization’s evolution. To analyze and compare the evolution of decentralization for each country of my interest, a crucial point is its measurement. Because of multilevel nature, concerning fiscal, political, and administrative dimensions is not simple for us to identify an optimal criterion, which incorporates all measures into unique metrics.

The measurement of decentralisation used in this paper is the functional breakdown of expenditures. Indeed, it is an useful tool in analyzing sectoral aspects of decentralization within and across economies. The disciplinary role of expenditure decentralization is stronger during financial crises. Indeed, through a number of functions delegated to a lower level, the central government can find it easier to face the economic shock.

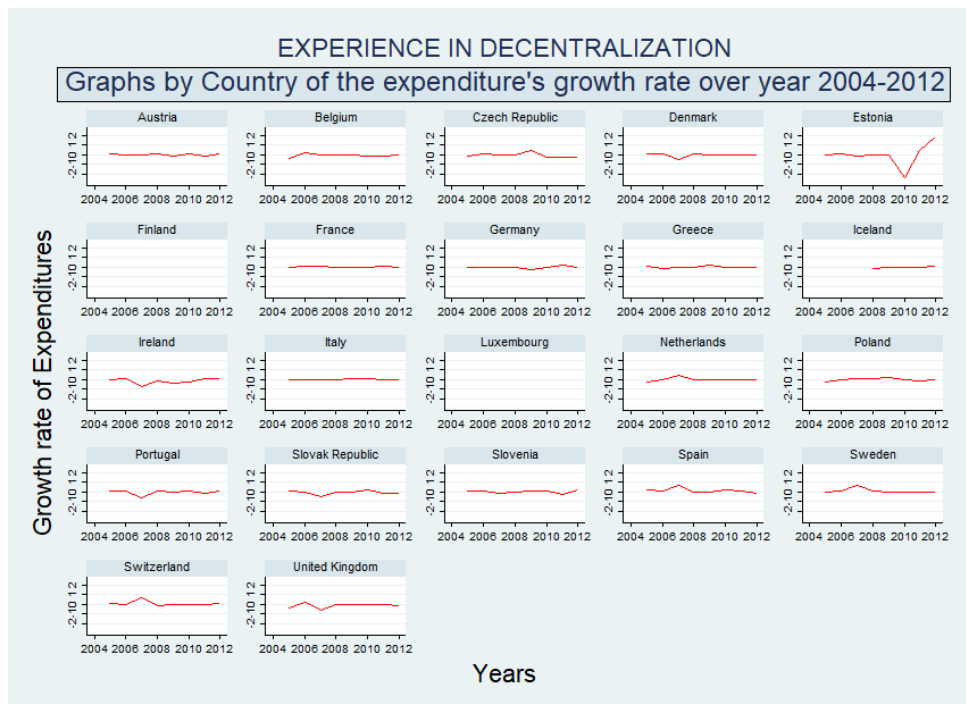


Figure 1.2: The Experience in decentralization over years 2004-2012

The figure 1.2 shows the trend of expenditure between 2004-2012, for each country of my interest. It is measured in term of growth rate. In particular, we see that the countries with an higher experience in decentralization policy are those with a positive growth rate. As we see in the figure, they are: Belgium, Germany, Czech Republic, Spain, Sweden,

Netherlands and Switzerland.

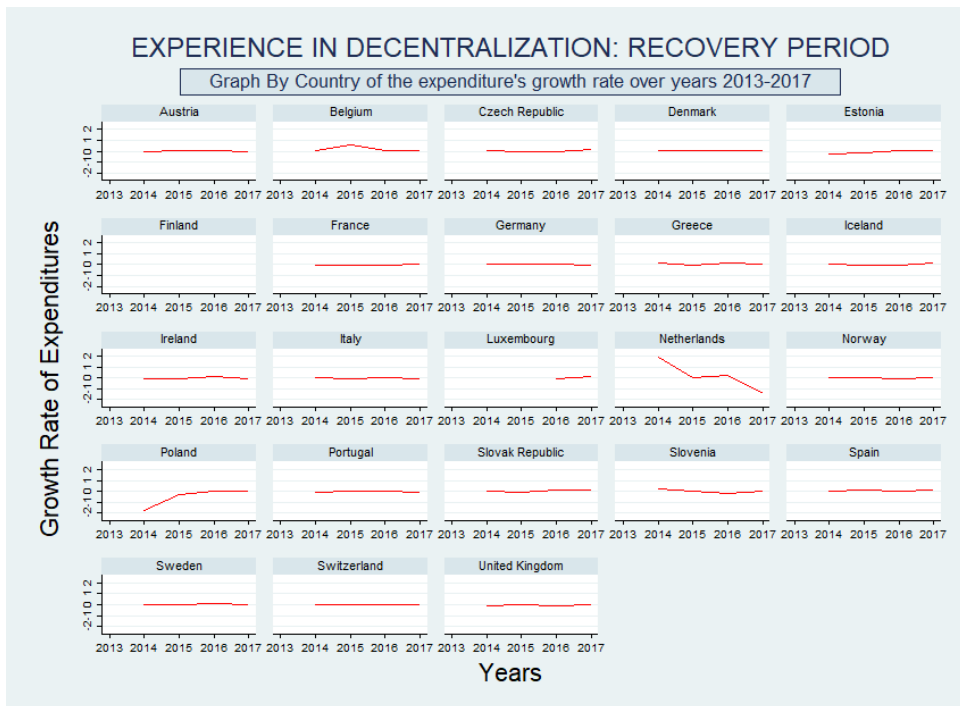


Figure 1.3: The Experience in decentralization over years 2013-2017

The figure 1.3, instead, shows the trend of expenditure between 2013-2017, for each country of my interest. In particular, we observe that Belgium, Germany and Spain continue their path toward decentralization policies. In addition, in this range of time, we note there is an increasing growth rate of the expenditure for all countries, which reach a stable growth path.

The effects of decentralization in a dynamic context is very interesting since it shows us that decentralization is not a one-off change but rather a process that develops and matures over time.

1.3 Multidimensional reasoning approach

Social and economic phenomena are characterized by a multiplicity of dimensions, some of which are not easy to evaluate. “*The Commission on the Measurement of Economic Performance and Social Progress*” (Stiglitz., Sen., Fitoussi., 2009) remarks the important progress in statistical measurement that has occurred in recent years, based on the multidimensional nature of some phenomena, such as the wellbeing of a country. As Mazziotta suggests (2017) “*a universally accepted definition of well-being does not exist (yet)*”. Specifically, each country defines the well-being taking into account risks and benefit for social, economic, and political dynamics. However, the measurement of wellbeing is an important prerequisite for the implementation of effective welfare policies. Currently, institution and researchers elaborate the so-called “composite index”, which are

a collection of several indicators including the multidimensionality of phenomena. Actually, as Bandura (2008) suggests there exist 178 composite indices for evaluating the countries' performance and for ranking them in term of political, social and economic measures. Constructing a composite index is a strong challenge. The best composite index does not exist since there is a list of choices that researchers have to make. Firstly, the choice of the theoretical framework. Secondly, the availability of data and thirdly, the methodology to apply to aggregate and compare them (Franchette 1974). As Mazziotta and Pareto (2012) suggest, the construction of the index involves the selection of a group of individual indicators, which is an extremely important phase to avoid overlapping information and redundancy. Besides, two other important steps are based on the normalization of the individual indicators, to make them comparable and, finally, their aggregation, applying some mathematical functions, additive methods, and multivariate techniques, such as Principal Component Analysis. Examples of well-defined indices are the United Nations' *Human Development Index* (HDI), the Italian *Equitable-Sustainable-Wellbeing* (Italian acronym BES), and the *Better life index*(BLI).

The multidimensional measurement has many advantages for policy-making. It presents an important theoretical and statistical progress of the last years, and mainly, it represents an additional aid for government policies, compared to GDP and employment level, which can only provide some limited information. Following Hill et al. (2008) and Cellini et al.,(2014), I apply a multidimensional approach to resilience, since the regional performance can be characterized by multiple equilibria “not all of which are efficient (in a static and/or dynamic sense)”.

Chapter 2

The empirical analysis

2.1 Data section and methodology

The aim of this analysis is investigating whatever the decentralization mitigates the shock. The channel that I use is based to test whatever the realization of policy and the dislocation into subnational government level affects the wellbeing.

The empirical analysis is based on a panel analysis of 22 European countries over the years 2004-2017.

The empirical strategies consist of estimating well-specified models, comparing the outcomes until at the end of the year 2012 and at the end of 2017s. Specifically, I perform several panel data models with a lag of order one, under both fixed and random effects specifications, and the estimated prediction proposes the Hausman type specification test. As a result, taking into account the significant role of the crisis on the 2008s, arises the interest to investigate about countries resilience which could led to significant savings, efficient utilization of resources and investment decisions through risk management and expeditious recovery. Therefore, we focus on '*the resilience*' impact and '*the recovery*' period, through a multidimensional approach and bridging a gap. Indeed, consistently considering additional dimensions concerning the mainstream GDP/employment measures, several variables potentially affecting the wellbeing at the regional level have been included in this analysis. Although the wellbeing measurement is electively done with BLI indicators, during the crisis years it is not available; hence, I use *Sustainable Development Indicators* provided by EUROSTAT(as you see in 2.1).

INDICATORS	DEFINITION	POLARITY
HOUSING	<i>Average number of rooms per person by tenure status and dwelling type</i>	+
INCOME	<i>Adjusted gross disposable income of households per capita</i>	+
JOB	<i>Employment rate (%)</i>	+
COMMUNITY	<i>Person employed in Human resources(Thousand)</i>	+
EDUCATION	<i>Adult participation in learning by sex (%)</i>	+
ENVIRONMENT	<i>Greenhouse gas emissions per capita</i>	-
CIVIC ENGAGEMENT	<i>Population with confidence in EU institutions by institution (%)</i>	+
HEALTH	<i>Life expectancy by age and sex (year)</i>	+
SATISFACTION	<i>People at risk of poverty or social exclusion (%)</i>	-
SAFETY	<i>Death rate due to homicide by sex (%)</i>	-
WORK-LIFE BALANCE	<i>People who work on weekends by sex, age, professional status and occupation (%)</i>	-

Table 2.1: Sustainable Development Indicators, 2004-2012

BLI is, instead, entirely used over the recovery phase. It is a set of 11 social indicators, of “housing, income, jobs, community, education, environment, governance, health, life satisfaction, safety, work-life balance”. In recognition of the limitations of GDP and employment measure, as indicators of social progress, I use this multidimensional measure of wellbeing provided by OECD. Each indicator is computed, as you see in the table 2.2.

INDICATORS	DEFINITION	POLARITY
HOUSING	<i>The average number of rooms shared per person</i>	+
INCOME	<i>Total wealth of both financial and non-financial and net of liabilities (e.g. Loans) held by households.(€)</i>	+
JOB	<i>Employment rate, aged 15 to 64 (%)</i>	+
COMMUNITY	<i>People who believe social network support (%)</i>	+
EDUCATION	<i>People, aged 25 to 64, having at least an upper secondary degree (%)</i>	+
ENVIRONMENT	<i>People reporting to be satisfied with the quality of local water(%)</i>	-
CIVIC ENGAGEMENT	<i>Percentage of the registered population that voted during recent election.</i>	+
HEALTH	<i>Life expectancy by age and sex (year)</i>	+
SATISFACTION	<i>Average self-evaluation of life satisfaction, on a scale from 0 to 10</i>	-
SAFETY	<i>Death rate due to homicide by 100,000 people (%)</i>	-
WORK-LIFE BALANCE	<i>Time devoted to leisure and personal care</i>	+

Table 2.2: Better-life indicators, 2013-2017

This strategy allows us to build two composite indicators to explain the multidimensional measure of wellbeing. The first, called ‘*WELLBEING*’, which is the dependent variable from the years across the crisis to investigate about the resilience’s impact. The

second, called '*BLI*', which is the dependent variable for the following years until 2017s for focussing on the response to the recessionary shock. The analysis is augmented with the effects of expenditures, as measured by Fiscal decetralization dataset by International Monetary Found(IMF). For reasons of simplification and data readability, two additional computations on data were made. Firstly the normalization of the indicators, secondly the inversion of the polarity for those indicators which explain an indirect measure.¹ This technical procedure allows us to delete both units of measurement and the variability effect; in particular, by descriptive statistics post normalization, we can see that all indicators have the standard deviation equal to one and mean equal to zero.

According to Mazziotta-Pareto (2015), the notion of 'polarity' of the indicator refers to the sign of the relation between the indicator and the phenomenon to be measured. This is a useful tool to interpret correctly the coefficients of regressions. If the index is "positive", increasing values of the index correspond to positive variations of the phenomenon. On the contrary, if it is "negative", increasing values of the index correspond to negative variations of the phenomenon. Defining the sign of the polarity for each Sustainable Development (Table 2.1) and for each BLI indicators (Table 2.2) the inversion of polarity may be performed before normalizing.²

The *IMF's Fiscal Decentralization Dataset* contains expenditure data classified by economic type over 2004-2017. Total expenditure, by economic type, is computed by summing up expenses and net investments in non-financial assets. In general, each measure captures the share of expenditures of the different levels of government as a proportion of overall (general) government spending.³

¹There are various normalization methods to transform the range or variance of the indicators to a common basis, I follow the following procedure of standardization(std):

$$std_w_{ij} = \frac{w_{ij} - mean(w_{ij})}{sd} \quad (2.1)$$

Where w_{ij} states for each dependent and independent variable of dimension j and country i

²The basic method for inverting polarity used is the non-linear transformation, which takes the reciprocal of the value as:

$$X'_{ij} = \frac{1}{|X_{ij}|} \quad (2.2)$$

³For example, to establish the proportion of the respective government spending on health activities, the computation is given as follows:

$$health_sng = \frac{XG \text{ spending on health}}{GG \text{ spending on health}} \quad (2.3)$$

Where XG represents a given level of government (central; state/province/region; local) and GG the general government. The other 10 indicators are calculated in the same way.

For this analysis, I take into account the type of expense incurred according to the eleven economic process involved and my contribution is the reorganization of expenditure data following the eleven indicators of BLI (as you see in Table2.3).

BLI'S DIMENSIONS	EXPENDITURE'S TYPE
HOUSING	<i>Housing&community anmenities(hca_sng)</i>
INCOME	<i>Use of good and service (ugs_sng)</i>
JOB	<i>Economic affairs (ea_sng)</i>
COMMUNITY	<i>Recreation (recreation_sng)</i>
EDUCATION	<i>Education (edu_sng)</i>
ENVIRONMENT	<i>Environmental protection (ep_sng)</i>
CIVIC ENGAGEMENT	<i>Social protection (sp_sng)</i>
HEALTH	<i>Health (health_sng)</i>
SATISFACTION	<i>Social benefit (sb_sng)</i>
SAFETY	<i>Public order and safety (pos_sng)</i>
WORK-LIFE BALANCE	<i>General public service (gps_sng)</i>

Table 2.3: Decentralized Expenditures,2004-2017 (Source IMF)

2.2 General framework

The general model can be written as follows:

$$Y_{it} = \beta_i X_{it} + \beta_i X_{it-1} + \epsilon_{it} \quad (2.4)$$

Where the dependent variable Y_{it} is , from time to time and for each estimated models the wellbeing measure, X_{it} is the set of decentralized expenditures, $i = 1, \dots, N$ and $t = 1, \dots, T$, and X_{it-1} is the lag of order one for the decentralized measure. I will consider the estimation of each $\beta_i(X_{it})$ and the resulting efficiency for all X_{it} .

General setup

- In this model for a fixed country i the decentralization measure is given by $\beta_i(X_i)$, each country being independently drawn from a population of countries. In other words $\{\beta_i\}_{i=1, \dots, N}$ are i.i.d random functions.
- The X_{it} are independent random variables.
- $\beta_{it}, X_{it}, \epsilon_{it}$ are independent

I start by estimating the relationship between several measure of government expenditures, using a set of lagged variable as control variables. Over the period 2004-2012 I investigate about the ability of decentralization to mitigate the shock and the existence of case-specific sector. Symmetrically, I estimate the same relationship for the recovery phase, over the period 2013-2017.

2.3 A Country effect-model

Entering on the detail, the models performed to study whether or not the decentralization mitigate the effect reads:

$$\begin{aligned} WELLBEING_{it} = & \beta_0 + \beta_1 EXP_RES_{it} + \beta_3 D \\ & + \beta_4 D \times EXP_RES_{it} + \beta_5 EXP_RES1_{it} + \epsilon_{it} \end{aligned} \quad (2.5)$$

Where *WELLBEING* is the variable of interest provided by normalization of the Sustainable Development Indicators. *EXP_RES* states for decentralization expenditures cover the years from 2004 to 2012 ; *D* is a dummy variable, which assumes value 1 for 2008s year and 0 otherwise; *D × EXP_RES* is the interaction between the dummy and expenditures variable; *EXP_RES1* is the expenditure lagged variable of order 1 of the expenditure for the same years.

Hence, this basic specifications of the model include all the variables that capture the decentralization of spending, the financial crisis and the interaction between the two. The coefficient β_3 captures the potential adverse effect of a financial crisis. When the interaction term is included, the overall effect of fiscal decentralisation on wellbeing is determined by the sum of coefficients β_0 and β_4 , where β_4 represents the difference between periods of financial crisis and period without this shock. If the coefficient β_4 , is statistically different from zero, it means that the impact of decentralisation measure, changes in times of financial distress.

The β s coefficients are estimated by POLS, taking into account a simple additive model. The estimated model consists of a function for each covariate, fixed through the normalization procedure described above, in order to predict the shape of each covariate effects. (Hastie and Tibshirani (1990)). Of course, the additive model is a generalization of the standard linear model and it allows us, as first analysis, an easier interpretation of each X s. The main disadvantage is the loss of multidimensionality, but I will recover it through the performed models dimension by dimension. I am aware that this somehow betrays the spirit of the initiative based on a multidimensional measure of wellbeing, but that it is necessary to proceed with regression analysis in a unitary way at the first stage of my analysis. Therefore, in this case, the procedure is based on the standardization of the 11 well-being indicators and sum up them together by year. Moreover, we are able to verify the existence of a case-specific sector at this stage. Specifically, I suppose that each country in Europe shares some common feature according to the task of the Organisation for Economic Co-operation and Development (OCSE), but that there are considerable differences between them are captured by a location effect a_i . Hence, the following models include a_i which is the individual effect of the i^{th} country. I estimate models using the panel approach, estimating set of models with the Ordinary Least Squares (OLS) fixed effect-estimator with corrected standard errors robust to heteroscedasticity and then, with the OLS random-effect estimator.

For the estimation, I consider both the fixed effects specification (where elements of a_i are treated as fixed parameters) and the random effects specification (where a_i are random components), as you see in the model 2.6 for the study of the resilience's impact and the model 2.7 to investigate about the effects during the recovery period. Indeed, to specify the right direction of causality between the dependent and independent variables I apply different estimation procedures.

$$WELLBEING_{it} = \beta_0 + \beta_1 EXP_RES_{it} + \beta_2 D \times EXP_RES_{it} + \beta_3 EXP_RES1_{it} + \epsilon_{it} + a_i + \tau_i \quad (2.6)$$

$$BLI_{it} = \beta_0 + \beta_1 EXP_REC_{it} + \beta_3 EXP_REC1_{it} + \epsilon_{it} + a_i + \tau_i \quad (2.7)$$

Where BLI is the normalized measure of the Better Life Index over the all range of time available, from 2013 to 2017. EXP_REC states for "expenditures in recovery period" and it is the normalized measure of expenditure decentralised categorised by economic type and summed for years . EXP_REC1 , states for the lagged expenditure variable of order 1, for the same years.

As a first approximation, the choice of the estimator can be made concerning the nature of the dataset and statistical issues, such as the trade-off between robustness and efficiency. Our panel data can capture all unobserved time-invariant country-specific factors, such as geographic area or traditions but it includes many factors that change over time. I have to take into account the important assumption of exogeneity. Indeed, the strong exogeneity is at the basis of fixed effect [FE] and random effects [RE] estimating methods for panel data. Strict exogeneity rules out any feedback from current or past shocks to current values of the variables. Specifically, for the [RE] we assume uncorrelation between the unobserved heterogeneity and the explanatory variables and strong exogeneity. For [FE] we relax random effect, namely, no restrictions are placed on the relationship between heterogeneity and explanatory variables and holding only strong exogeneity. The

consequence is that the fixed effects estimator is always valid as it has a less restrictive set of hypotheses than the random-effects model, but it cannot estimate the parameters related to variables that do not depend on time. The random-effects model, also, allows for a more efficient estimate of the parameters relating to variables that change over time when the process of a_i is correctly specified. In particular, when the individual effects are random and are independent of the exogenous regressors, the estimation under the random effects will be more efficient. The spatial effect in a_i , if allowed, could be considered as the permanent spillover effects. (Baltagi et al. 2007a). I choose the correct econometrics specification according to the Hausman test. In conclusion, both models contain country- and time-fixed effects to control for time-invariant unobserved countries' characteristics and shocks common to all countries. The ϵ_i , normally distributed with zero mean and constant variance is included in the models.

Chapter 3

Results

3.1 Preliminary analysis

From an economic point of view, an important point for the analysis is about countries' potential unobserved factors. The realization of the dependent variable in models described in the previous section depends on many factors. Whether we are not able to fully specify the explanatory, we run the risk of biased estimates due to omitted variables. Specifically, we could omit: (1). Effects, which change by countries but are constant over time (i.e traditions and social background) (2). Effects that change over time only (i.e economic cycle) (3). Effects that change by countries and over time (i.e individual wages, capital stock).

To show how decentralization mitigates the shock the channel that I will use is based to test whatever the realization of policy and the dislocation into subnational government level (SNG) affects the quality of life. The underpinning of the analysis consists to test what extent countries are resilient among the different dimensions of wellbeing.

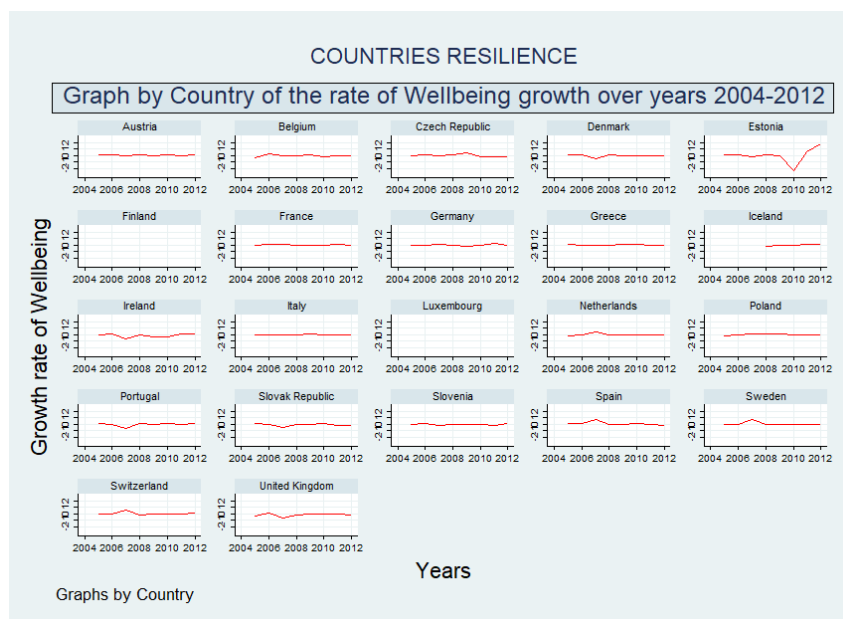


Figure 3.1: The 'Countries resilience'

The line plot in figure 3.1 shows us the more resilient countries over the period 2004-2012. Specifically, observing the rate of wellbeing growth we can note that they were Belgium, Czech Republic, Netherlands, Spain, Sweden, Switzerland which have a positive peak in the growth rate. The empty plots are due to missing data for these years. There is evidence that rural regions are more resistant to recessionary shock than urban region. Specifically, regional resilience is not necessarily associated with more urbanization (Brakman et al., 2015). This result suggests us the agriculture builds a link with the development of the industry.

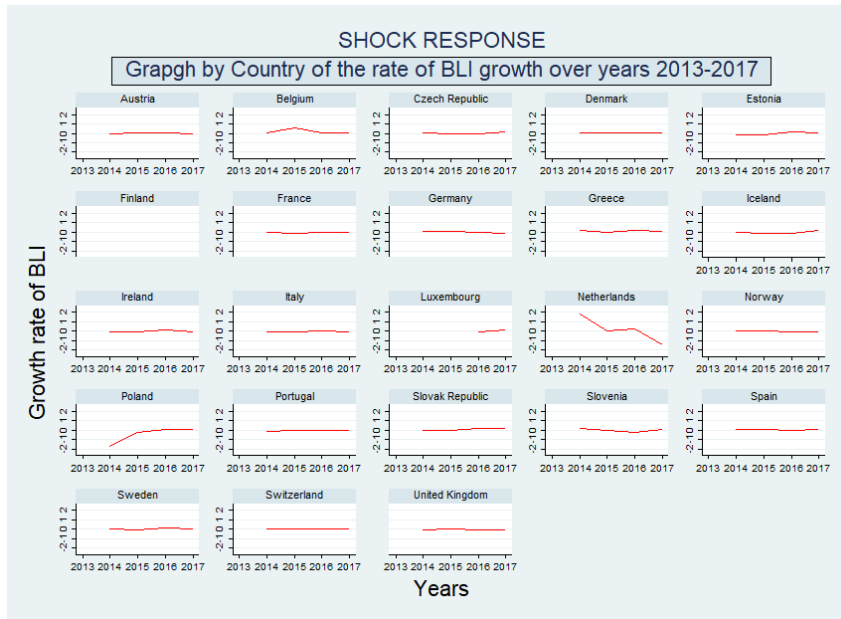


Figure 3.2: The ‘Shock Response’

The line plot in figure 3.2 shows us the responses of national economies to recessionary shocks. The response depends on four features of resilience (The 4R), as Martin (2012) suggests:

- *Resistance* sensitivity of regional systems to economic shock impacts
- *Recovery* the speed and extent of recovery from the disturbance
- *Structural* reorientation the extent and the implications of structural reorientation on region’s output, incomes and jobs
- *Renewal* the resumption of the pre-crisis growth path

We see a stable and positive growth path among almost all European countries under analysis. Specifically, the countries with a positive peak of the better life index growth are Belgium, Estonia, Poland and Netherlands. Getting a comprehensive look at the level of wellbeing for each country, we see that it has grown. A recent study entitled “Decent work in Portugal 2008-2018. From crisis to recovery” finds that by means of a mix of economic and social policies, and mainly, through the social dialogue between the government, workers and employer’s organization the Portugal managed to overcome the period of difficulty and to recover from the crisis.

I begin by formally testing the relationship between the well-being and measure of decentralization described above. Therefore, as viewed, this first regression addresses

the question of whether or not a better tailored decentralized policy is able to improve the overall level of wellbeing in a country. Symmetrically, I perform, the same type of analysis using the Better Life Index. In both case, the models, which are performed with errors clustered on the country level, show that the measure of decentralization is significantly positive, suggesting that the overall level of expenditure is a significant predictor of wellbeing. (Table B.1) Looking at the detail, I run a second regression with the pooled wellbeing measures described previously over the decentralized expenditures measures by economic type. I find that in the first model, expenditures levels that have a statistical significance and a positive impact are those concerning the dimensions of public order and safety, environmental protection and housing with a level of confidence of 0.05 % , and the dimensions of civic engagement with a level of 0.01 % . Whereas, in the second model the same variables continue to be significant except for the variable concerning the dimension of the education, which has a negative effect on BLI.(Table B.2)

3.2 Resilience's impact and Recovery to the recessionary shock

In this section, I formally investigate the resilience impact over the wellbeing. Specifically, I investigate the question of whether the tailored decentralized policy is able to mitigate the shock. For this purpose , I include the dummy variable for the year 2008 in my following models. The most comprehensive specification is as you reads in the model 2.5. The shock is included in the dependent variable, through which I will move backward to 2008s. We expect the decentralization policy mitigates the shock. Hence, the impact of the expenditure on wellbeing measure, in presence of the shock, involves a negative coefficient for the variable made up by interaction between the dummy and the decentralized expenditure variable; Also, we expect a positive coefficient for the simple decentralization measure which, thus, will involve a rebound effect. However, the mitigation of the shock could be better than the centralisation case, if looking to the coefficient of our decentralization's variable it will be positive. Otherwise, if this will be negative the reverse effect occurs and it will determine an amplification of the shocks. The regression result shows what we expect, as you see in Table B.3,

As a result, I can argue that the crisis has influenced the decentralization policy involving a rebound effect.

Symmetrically, about the response to the recessionary shock shows that the decentralization contributes to the achievement of the "growth path".

3.3 Case-specific-sectors

Decentralization is often seen as a means of improving economic policy because it improves the flexibility of policy-making. According to a study , GDP and employment concur to the determination of "resilience" and that the resilience behavior and the positioning of regions in the income-employment space are shock-specific (Cellini, Di Caro, Torrisi 2014). Taking into account this framework, I formally investigate the presence of case-shock-specific sector, using the different dimensions of wellbeing. This analysis aims

to identify areas in which governments should focus their activities to intensify national development. Further, I perform, symmetrically, other sets of models to investigate about the response to the recessionary shock of European countries. Therefore, the main aim of this evaluation, consists in identifying what are the effects of decentralized expenditure on the wellbeing what dimensions are impacted by the crisis. Furthermore, I test if some of the sectors are case-specific, using the specifications as you read in the model 2.6 and 2.7. Besides, since all the individual indicators must have positive polarity ¹, it is necessary to ‘invert’ the sign of the indicators with negative polarity. As a result, the lower is the coefficient, the higher will be the ratio and we reach the positive interpretation we want. Specifically, in this case, the negative coefficient suggests that the decentralization policy shows that jurisdictions can better internalize negative externalities involving an overall positive effect. The impact, in case of a negative coefficient, has several interpretations. Indeed, the more decentralized policies we adopt, the less the overall effect we achieve. Hence, I estimate a set of multiple regression models by country and year fixed -effects regressions and random- effect with errors clustered on the country level to capture any serial correlation of errors within the country. The choice of the optimal model is done according to the Hausmann specification test, when possible since it cannot be used with robust and cluster standard error.

I find that the level of decentralized expenditure for the dimension concerning the total wealth held by households impacts positively over the corresponding dimension of wellbeing, and it is able to mitigate the shock, under the random effect model, according to the results of Hausman specification test (Table B4). Indeed the marginal positive effect of the expenditure for this specific dimensions is offset by negative sign of interaction variable between the shock and the expenditure variable. Symmetrically, looking at the response to the shock we can confirm that this dimension is case-specific sector. The level of decentralization measure for the economic affairs (Job) is negative and statistically significant under the random-effect model for a level of confidence equal to the 10 %, confirmed by the Hausman test. Hence, since the coefficient of interaction between the dummy and the decentralization measure, is statistically different from zero, it means that the impact of decentralization measure changes in time of financial distress. Specifically, running this analysis and taking into account cluster standard error, the results suggest us that the impact of crisis over the the decentralization measure has led a reverse effect on wellbeing. However, in the recovery phase the dimension concerning the employment rate become a prominent driver for national economics’s development (Table B5).

Moreover, I find that the level of decentralization measure for social protection with respect population with confidence in EU institutions by institutions is statistically significant under fixed-effect model and cluster standard errors, but seems that for this domain the shock has not affected this dimension. Further, with regard the response to the distress period experienced, the analysis suggests the need of the consent and involvement of citizens, which participate actively in political elections.(Table B6).

The level of decentralization measure for public order and safety is affected by the shock, but there is no evidence that the mitigation of the shock emerges in this dimension.Indeed,with

¹Mazziotta et al.,2015

regard the study of resilience impact, in both fixed-effect model and random-model performed with cluster standard error, the evidence suggests this dimension of wellbeing has been negatively impacted by the crisis. However, during the recovery period the performed models show, a positive sign to the coefficient, which given the negative polarity assigned, implies still a negative effect of expenditure on public order and safety over the death rate due to homicide (Table B7).

Finally, the last analysis about the dimension of work-life balance yields some statistically significant results. In particular, the evidence shows that the expenditure for general and public services for work-life balance, does not affect by the financial crisis, but for an overall effect, it impacts positively over the variable of interest, that is the subjective wellbeing based on time devoted by workers to leisure and personal care (Table B8).

Chapter 4

Concluding remark

This thesis aimed to investigate the resilience of European regions in the occasion of the very recent economic crisis measured in terms of well-being using also the novel indicators provided by Better life index, focussing on both the impact period and the response to the recessionary shock. I use a panel data on 22 European countries to investigate what countries are more resilient, and what are the effects of the different levels of decentralization on European economic resilience. Moreover, the analysis focuses to study whatever or not the decentralization policy can mitigate the shock. The first conclusion I can underline, according to a pooling estimation, that a decentralized economy holds sufficient flexibility to deal with macroeconomic tasks during a financial crisis. Therefore, we can argue that decentralized policy represents useful tools that governments have to undertake, as the crisis of 2008 taught, to improve the quality of life. Growing externalities, higher transaction costs, loss of economies of scale, lower local bureaucracy quality, and rent-seeking behavior, especially in macroeconomic configurations, finance, and capital accounts of many countries can reverse this result. Actually, in last year's many countries have undertaken social and economic reform, which, of course, affects their development.

According to the multidimensional approach that I have applied, we can highlight the existence of some case-specific shock sector affecting wellbeing. This analysis states as clearly as possible where the priorities for improvements and reforms lie. There is evidence that the crisis to be more severe towards the dimension of the wellbeing concerning the wealth held by households. Specifically, the main economic policies able to improve the efficiency and development of national economy are those policies on the wealth of households, on the labor market, and finally, on personal security which is a core element for the well-being of individuals. Besides, there is evidence of the importance of the role of institutions. Indeed, restoring the trust in the institution may be a tool to overcome a period of crisis and recover to a stable growth path. Finally, the evolution of purely economy elements, as response to adverse events, in this case the economic recessions, contribute to the achievement of the 'stable growth path'.

The study of regional and multidimensional wellbeing prompt us to further deepen the space-specific ability of some territories and sectors. This knowledge may represent a huge help to government policy to resist and recover from exogenous shocks in the long-run.

Appendix A

Descriptive Statistics

Table A.1: Descriptive Statistics of variable *WELLBEING* by country

<i>Country</i>	<i>N</i>	<i>mean</i>	<i>sd</i>	<i>min</i>	<i>max</i>
Austria	9	1.082	.689	-.33	2.139
Belgium	9	.463	.335	.046	1.07
Czech Republic	8	-3.486	.681	-4.263	-2.639
Denmark	8	4.279	.994	2.611	6.268
Estonia	9	-8.571	1.704	-11.664	-6.604
Finland	9	.934	.839	-.215	2.29
France	9	1.594	.616	.233	2.36
Germany	8	4.163	.528	3.307	4.903
Greece	9	-7.9	2.482	-12.031	-5.424
Iceland	0	.	.	.	.
Ireland	9	-1.388	1.911	-4.509	1.619
Italy	8	-3.244	.654	-4.019	-2.148
Luxembourg	9	2.914	1.502	.783	4.838
Netherlands	7	3.253	.409	2.555	3.937
Poland	8	-8.938	1.497	-11.13	-6.965
Portugal	9	-1.677	1.715	-3.59	1.659
Slovak Republic	8	-7.305	.857	-8.594	-6.132
Slovenia	7	-1.788	1.06	-2.621	.271
Spain	7	-1.09	1.572	-3.586	.985
Sweden	8	7.98	.327	7.46	8.292
Switzerland	0	.	.	.	.
United Kingdom	7	4.489	.44	3.909	5.228

Table A.2: Descriptive Statistics of expenditure variable over years 2004-2012 by country

<i>Country</i>	<i>N</i>	<i>mean</i>	<i>sd</i>	<i>min</i>	<i>max</i>
Austria	9	-.861	.41	-1.244	.021
Belgium	9	9.551	.815	8.193	10.501
Czech Republic	9	-1.867	.889	-3.014	-.604
Denmark	9	3.125	.806	1.374	3.999
Estonia	9	-5.434	1.55	-8.137	-4.148
Finland	0	.	.	.	.
France	9	-.707	.511	-1.547	-.173
Germany	9	11.77	.52	11.163	12.455
Greece	9	-11.264	1.414	-13.479	-9.446
Iceland	6	-4.362	1.301	-5.996	-2.353
Ireland	9	-5.632	2.549	-8.741	-2.5
Italy	9	-.003	.344	-.362	.68
Luxembourg	0	.	.	.	.
Netherlands	9	2.166	2.156	-.791	3.866
Poland	9	.097	1.167	-1.397	1.649
Portugal	9	-5.174	.481	-5.973	-4.578
Slovak Republic	9	-6.049	.577	-6.77	-4.945
Slovenia	9	-6.748	.522	-7.382	-5.621
Spain	9	8.641	1.319	6.42	9.837
Sweden	9	2.671	.993	1.333	4.03
Switzerland	9	13.338	1.035	11.773	14.551
United Kingdom	9	-.989	1.036	-2	1.373

Table A.3: Descriptive Statistics of variable *BLI* by country

<i>Country</i>	<i>N</i>	<i>mean</i>	<i>sd</i>	<i>min</i>	<i>max</i>
Austria	14	3.348	1.036	1.874	5.104
Belgium	13	2.281	.341	1.839	2.849
Czech Republic	12	-1.849	1.596	-3.608	.985
Denmark	13	5.944	1.627	3.768	9.522
Estonia	13	-5.036	1.771	-7.764	-1.975
Finland	12	3.079	1.22	1.897	6.315
France	13	2.436	.546	1.257	3.294
Germany	12	5.227	1.219	3.413	6.879
Greece	13	-3.406	2.033	-7.345	-.815
Iceland	5	6.363	3.043	1.913	9.077
Ireland	13	1.231	1.352	-.837	3.348
Italy	12	.316	.714	-.707	1.618
Luxembourg	12	4.425	1.429	2.718	7.343
Netherlands	11	4.691	1.578	2.097	8.544
Norway	5	1.404	.642	.388	1.997
Poland	13	-5.044	2.174	-7.707	-1.417
Portugal	13	-3.195	2.581	-7.187	-.264
Slovak Republic	12	-3.944	2.561	-6.243	1.868
Slovenia	11	-.56	1.447	-2.251	3.117
Spain	11	.598	1.567	-1.746	2.801
Sweden	13	4.867	.986	3.094	6.53
Switzerland	5	6.693	.652	5.661	7.225
United Kingdom	11	5.582	1.798	3.275	8.572

Table A.4: Descriptive Statistics of expenditure variable over years 2013-2017 by country

<i>Country</i>	<i>N</i>	<i>mean</i>	<i>sd</i>	<i>min</i>	<i>max</i>
Austria	14	-.776	1.276	-4.717	.583
Belgium	13	10.208	1.384	8.193	12.707
Czech Republic	13	-1.758	.736	-3.014	-.836
Denmark	14	2.91	1.841	-2.781	5.007
Estonia	13	-5.123	1.378	-8.137	-3.746
Finland	0	.	.	.	.
France	13	-.535	.484	-1.547	.26
Germany	13	12.464	1.045	11.163	14.046
Greece	13	-10.583	1.405	-13.479	-8.677
Iceland	10	-3.624	1.263	-5.996	-2.067
Ireland	13	-7.125	3.114	-11.567	-2.5
Italy	13	-.026	.329	-.475	.68
Luxembourg	4	-5.454	3.61	-8.192	-.256
Netherlands	13	1.566	3.172	-7.128	4.106
Norway	5	.149	1.635	-2.737	1.27
Poland	14	-1.313	2.438	-5.025	1.927
Portugal	13	-5.374	.673	-6.282	-4.113
Slovak Republic	13	-5.882	.532	-6.496	-4.823
Slovenia	13	-6.364	.821	-7.382	-4.598
Spain	13	8.91	1.168	6.42	9.837
Sweden	14	3.015	1.369	.175	4.472
Switzerland	14	13.707	1.177	11.773	15.096
United Kingdom	13	-1.279	.998	-2.474	1.373

Appendix B

Estimated models

Table B.1: Pooling Regression of the Expenditure over Wellbeing

	(1)	(2)
	WELLBEING	BLI
Expenditure_res	0.111 ⁺ (0.0632)	
Expenditure_res _{t-1}	0.0794 ^{**} (0.0267)	
Expenditure_rec		0.272 ^{**} (0.0763)
Expenditure_rec _{t-1}		0.0288 (0.0488)
_cons	0.0539 (0.565)	1.607* (0.680)
<i>N</i>	104	101
<i>R</i> ²	0.092	0.244
adj. <i>R</i> ²	0.074	0.229
F	6.741	6.451

Standard errors in parentheses

⁺ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.2: Regression model of the expenditure over the Wellbeing's dimensions

	(1) WELLBEING	(2) BLI
Expenditure_Income	0.0618 (1.096)	1.087 (0.784)
Expenditure_Satisfaction	-2.673 ⁺ (1.277)	-2.051 ⁺ (0.981)
Expenditure_Work-life-balance	0.303 (1.070)	0.633 (0.782)
Expenditure_Safety	2.926* (1.305)	3.278** (0.976)
Expenditure_Job	-1.098 (1.500)	-0.509 (0.999)
Expenditure_Environment	1.187* (0.455)	0.641 ⁺ (0.332)
Expenditure_Community	0.259 (1.314)	-0.906 (0.855)
Expenditure_Education	-2.013 (1.222)	-2.531** (0.852)
Expenditure_Civic Engagement	5.461*** (1.301)	4.520*** (1.011)
Expenditure_Housing	1.351* (0.512)	1.211** (0.358)
Expenditure_Health	1.035 (1.617)	0.0435 (0.951)
_cons	-0.404 (0.940)	0.938 (0.636)
<i>N</i>	134	134
<i>R</i> ²	0.602	0.687
adj. <i>R</i> ²	0.566	0.658
F	7.904	12.68

Standard errors in parentheses

⁺ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.3: Pooling Regression of the Expenditure over Wellbeing with the shock

	(1)	(2)
	WELLBEING	BLI
Expenditure_RES	0.437** (0.114)	
D	-0.102 (0.488)	
D×Expenditures_RES	-0.105+ (0.0598)	
Expenditure_RES _{t-1}	-0.0383 (0.0319)	
Expenditure_REC		0.376*** (0.0934)
Expenditure_REC _{t-1}		-0.0229 (0.0314)
_cons	-0.861 (1.015)	0.617 (0.798)
<i>N</i>	131	116
<i>R</i> ²	0.280	0.303
adj. <i>R</i> ²	0.257	0.291
F	4.553	8.103

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.4: Regression model for 'Income'

	(1)	(2)	(3)	(4)
	res_Income Fixed effect	res_Income Random effect	rec_Income Fixed effect	rec_Income Random effect
Expenditure_Income_res	0.0841+ (0.0459)	0.0864+ (0.0459)		
D	-0.00623 (0.0345)	-0.00632 (0.0345)		
D × Expenditure_Income_res	-0.0569 (0.0339)	-0.0568+ (0.0340)		
Expenditure_Income_res _{t-1}	0.0145 (0.0155)	0.0145 (0.0154)		
Expenditure_Income_rec			0.0492+ (0.0272)	0.0528+ (0.0271)
Expenditure_Income_rec _{t-1}			0.00331 (0.0154)	0.00296 (0.0155)
_cons	0.0121** (0.00409)	-0.0120 (0.218)	-0.0233+ (0.0138)	-0.0178 (0.213)
N	174	174	159	159
R ²	0.080		0.024	
adj. R ²	0.058		-0.134	
F	1.579		1.668	

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.5: Regression model for 'Job'

	(1)	(2)	(3)	(4)
	res_Job	res_Job	rec_Jobs	rec_Job
	Fixed effect	Random effect	Fixed effect	Random effect
Expenditure_Job	0.140 (0.0899)	0.137 (0.0879)		
D × Expenditure_Job	-0.113* (0.0434)	-0.118** (0.0450)		
Expenditure_Job_rest _{t-1}	0.00670 (0.0219)	0.00842 (0.0222)		
D	0.0335 (0.0383)	0.0356 (0.0385)		
Expenditure_Job_rec			0.130* (0.0524)	0.127* (0.0511)
Expenditure_Job_rec _{t-1}			0.0116 (0.0264)	0.0133 (0.0263)
_cons	-0.00468 (0.00590)	0.00895 (0.212)	-0.00120 (0.0226)	0.0130 (0.213)
<i>N</i>	160	160	160	160
<i>R</i> ²	0.061		0.043	
adj. <i>R</i> ²	0.037		-0.110	
F	2.123		3.091	

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.6: Regression model for 'Civic-Engagement'

	(1)	(2)	(3)	(4)
	res_Civicensagement	res_Civicensagement	rec_Civicensagement	rec_Civicensagement
	Fixed effect	Random effect	Fixed effect	Random effect
Expenditure_Civicensag_res	1.048** (0.276)	0.276 (0.199)		
D	0.000689 (0.0796)	0.00192 (0.138)		
D × Expenditure_Civicensag_res	-0.0824 (0.0521)	-0.0702 (0.137)		
Expenditure_Civicensag_rest - 1	0.0750 (0.0703)	0.0245 (0.0903)		
Expenditure_Civicensag_rec			1.076*** (0.259)	0.288+ (0.160)
Expenditure_Civicensag_rec - 1			0.0956+ (0.0479)	0.00420 (0.0629)
_cons	0.0214 (0.0205)	-0.0362 (0.216)	0.0327+ (0.0171)	-0.0310 (0.202)
N	155	155	154	154
R ²	0.055		0.062	
adj. R ²	0.030		0.050	
F	4.789		11.49	

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.7: Regression model for 'Safety'

	(1)	(2)	(3)	(4)
	res_ip_Safety	res_ip_Safety	ip_rec_Safety	ip_rec_Safety
	Fixed effect	Random effect	Fixed effect	Random effect
Expenditure_Safety_res	-0.0758 (0.252)	0.0886 (0.187)		
D	0.0168 (0.127)	0.0157 (0.130)		
D× Expenditure_Safety_res	-0.172+ (0.0898)	-0.171+ (0.0914)		
Expenditure_Safety_res _{t-1}	-0.00509 (0.0399)	-0.00951 (0.0394)		
Expenditure_Safety_rec			0.245 (0.172)	0.239* (0.116)
Expenditure_Safety_rec _{t-1}			0.0566 (0.0381)	0.0597 (0.0379)
_cons	0.00145 (0.0152)	0.0151 (0.191)	1.259*** (0.0356)	1.295*** (0.150)
<i>N</i>	171	171	170	170
<i>R</i> ²	0.019		0.028	
adj. <i>R</i> ²	-0.005		-0.118	
F	3.886		2.087	

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.8: Regression model for 'Work-life-Balance'

	(1)	(2)	(3)	(4)
	WorkLifeBalance_res	WorkLifeBalance_res	WorkLifeBalance_rec	WorkLifeBalance_rec
Expenditure_Worklifebalance_res	0.227 ⁺ (0.124)	0.127 (0.106)		
D	-0.0381 (0.143)	-0.0396 (0.143)		
D×Expenditure_worklifebalance_res	-0.0447 (0.141)	-0.0460 (0.141)		
Expenditure_worklifebalance_res _{t-1}	0.0308 (0.0483)	0.0284 (0.0482)		
Expenditure_worklifebalance_rec			0.00329 ⁺ (0.00167)	0.00144 (0.00116)
Expenditure_worklifebalance_rec _{t-1}			0.0000185 (0.000703)	-0.0000291 (0.000689)
_cons	-0.0669 (0.0477)	-0.0532 (0.183)	0.0417 ^{***} (0.0000503)	0.0418 ^{***} (0.00233)
N	169	169	169	169
R ²	0.025		0.020	
adj. R ²	-0.137		0.008	
F	0.937		2.022	

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B.9: Data Source and Variables Definition

<i>Variable</i>	<i>Description</i>	<i>Data Source</i>
Res_Housing	Wellbeing for dimension "Housing" over years 2004-2012	EUROSTAT: Sustainable Development Indicators
Res_Income	Wellbeing for dimension "Income" over years 2004-2012	EUROSTAT: Sustainable Development Indicators
Res_Community	Wellbeing for dimension "Community" over years 2004-2012	EUROSTAT: Sustainable Development Indicators
Res_Education	Wellbeing for dimension "Education" over years 2004-2012	EUROSTAT: Sustainable Development Indicators
Res_Civic Engagement	Wellbeing for dimension "Civic Engagement" over years 2004-2012	EUROSTAT: Sustainable Development Indicators
Res_Health	Wellbeing for dimension "Health" over years 2004-2012	EUROSTAT: Sustainable Development Indicators
Res_LifeSatisfaction	Wellbeing for dimension "Life Satisfaction" over years 2004-2012	EUROSTAT: Sustainable Development Indicators
Res_WorkLifeBalance	Wellbeing for dimension "WorkLifeBalance" over years 2004-2012	EUROSTAT: Sustainable Development Indicators
Rec_Housing	Wellbeing for dimension "Housing" over years 2013-2017	EUROSTAT: Sustainable Development Indicators
Rec_Income	Wellbeing for dimension "Income" over years 2013-2017	EUROSTAT: Sustainable Development Indicators
Rec_Community	Wellbeing for dimension "Community" over years 2013-2017	EUROSTAT: Sustainable Development Indicators
Rec_Education	Wellbeing for dimension "Education" over years 2013-2017	EUROSTAT: Sustainable Development Indicators
Rec_Civic Engagement	Wellbeing for dimension "Civic Engagement" over years 2013-2017	EUROSTAT: Sustainable Development Indicators
Rec_Health	Wellbeing for dimension "Health" over years 2013-2017	EUROSTAT: Sustainable Development Indicators
Rec_LifeSatisfaction	Wellbeing for dimension "Life Satisfaction" over years 2013-2017	EUROSTAT: Sustainable Development Indicators
Rec_Safety	Wellbeing for dimension "Safety" over years 2013-2017	EUROSTAT: Sustainable Development Indicators
Rec_WorkLifeBalance	Wellbeing for dimension "WorkLifeBalance" over years 2013-2017	EUROSTAT: Sustainable Development Indicators
Expenditure_Housing_res	Decentralized measure for measure "Housing" over years 2004-2012	EUROSTAT: Sustainable Development Indicators
Expenditure_Income_res	Decentralized measure for measure "Income" over years 2004-2012	IMF:Fiscal decentralization dataset
Expenditure_Community_res	Decentralized measure for measure "Community" over years 2004-2012	IMF:Fiscal decentralization dataset
Expenditure_Education_res	Decentralized measure for measure "Education" over years 2004-2012	IMF:Fiscal decentralization dataset
Expenditure_CivicEngag._res	Decentralized measure for measure "Civic Engagement" over years 2004-2012	IMF:Fiscal decentralization dataset
Expenditure_Health_res	Decentralized measure for measure "Health" over years 2004-2012	IMF:Fiscal decentralization dataset
Expenditure_LifeSatisfaction_res	Decentralized measure for measure "LifeSatisfaction" over years 2004-2012	IMF:Fiscal decentralization dataset
Expenditure_Safety_res	Decentralized measure for measure "Safety" over years 2004-2012	IMF:Fiscal decentralization dataset
Expenditure_WorkLifeBalance_res	Decentralized measure for measure "WorkLifeBalance" over years 2004-2012	IMF:Fiscal decentralization dataset
Expenditure_Housing_rec	Decentralized measure for measure "Housing" over years 2013-2017	IMF:Fiscal decentralization dataset
Expenditure_Income_rec	Decentralized measure for measure "Income" over years 2013-2017	IMF:Fiscal decentralization dataset
Expenditure_Community_rec	Decentralized measure for measure "Community" over years 2013-2017	IMF:Fiscal decentralization dataset
Expenditure_Education_rec	Decentralized measure for measure "Education" over years 2013-2017	IMF:Fiscal decentralization dataset
Expenditure_CivicEngag._rec	Decentralized measure for measure "Civic Engagement" over years 2013-2017	IMF:Fiscal decentralization dataset
Expenditure_Health_rec	Decentralized measure for measure "Health" over years 2013-2017	IMF:Fiscal decentralization dataset
Expenditure_LifeSatisfaction_rec	Decentralized measure for measure "LifeSatisfaction" over years 2013-2017	IMF:Fiscal decentralization dataset
Expenditure_Safety_rec	Decentralized measure for measure "Safety" over years 2013-2017	IMF:Fiscal decentralization dataset
Expenditure_WorkLifeBalance_rec	Decentralized measure for measure "WorkLifeBalance" over years 2013-2017	IMF:Fiscal decentralization dataset

Bibliography

- [1] Bartolini, D., Sacchi, A., Salotti, S., & Santolini, R. (2018), «*Fiscal decentralization in times of financial crises*», CESifo Economic Studies, 64(3), 456-488.
- [2] Batabyal, A. A., & Beladi, H. (1999)., «*The stability of stochastic systems: The case of persistence and resilience.* »*Mathematical and Computer Modelling*, 30(7-8), 27-34.
- [3] Cellini, R., & Torrìsi, G., (2014), «*Regional resilience in Italy: a very long-run analysis*», *Regional Studies*, 48(11), 1779-1796.
- [4] Director, P. C. S., & Farro, A. L. «*Composite Indicators for Measuring Well-being of Italian Municipalities*».
- [5] Fingleton, B., Garretsen, H., & Martin, R. (2012). «*Recessionary shocks and regional employment: evidence on the resilience of UK regions.*» *Journal of regional science*, 52(1), 109-133.
- [6] International Labour Organisation (ILO)., (2018), *Decent work in Portugal 2008-18: from crisis to recovery.*
- [7] Martin, R.(2012)., «*Regional economic resilience, hysteresis and recessionary shocks.*» *Journal of economic geography*»,12(1), 1-3
- [8] Mazziotta, M., & Pareto, A. (2016). «*On a generalized non-compensatory composite index for measuring socio-economic phenomena*». *Social indicators research*, 127(3), 983-1003.
- [9] Lee, L. F., & Yu, J. (2010). «*Some recent developments in spatial panel data models.*» *Regional Science and Urban Economics*, 40(5), 255-271.
- [10] Klapper, L., & Love, I. (2011). emph«*The impact of the financial crisis on new firm registration.*» *Economics Letters*, 113(1), 1-4.
- [11] Kneip, A., & Simar, L. (1996). emph«*A general framework for frontier estimation with panel data.*» *Journal of Productivity Analysis*, 7(2-3), 187-212.
- [12] Rodríguez-Pose, A., & Tselios, V., «*Well-being, political decentralisation and governance quality in Europe*»,*Journal of Human Development and Capabilities*, 20(1), 69-93.

- [13] Reggiani, A., De Graaff, T., & Nijkamp, P. (2002). «*Resilience: an evolutionary approach to spatial economic systems*». *Networks and Spatial Economics.*, 2(2), 211-229.
 - [14] Stiglitz, J. E., Sen, A., & Fitoussi, J. P. (2009).,«*Report by the commission on the measurement of economic performance and social progress.*».
 - [15] Torrisi, G., Pike, A., Tomaney, J. and Tselios, V.,(2011) *Defining and measuring decentralisation: a critical review.*.
 - [16] Schulze, P. (Ed.). (1996)., *Engineering within ecological constraints.* National Academies Press..
-