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The evolution of the OECD countries after the 2008 financial crisis

Simultaneous data analysis of the "How's Life" datasets between 2009 and 2015

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PROJECT

Dissertation report presented as a partial requirement for obtaining the Master's degree in Information Management

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação
Universidade Nova de Lisboa

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THE EVOLUTION OF THE OECD COUNTRIES AFTER THE 2008 FINANCIAL CRISIS

SIMULTANEOUS DATA ANALYSIS OF THE "HOW'S LIFE" DATASETS BETWEEN 2009 - 2015

by

João Pedro Pires dos Reis Muralha Delgado

Dissertation report presented as a partial requirement for obtaining the Master's degree in Information Management, with specialization in Knowledge Management and Business Intelligence

Advisor: Professor Paulo Jorge Mota de Pinho Gomes

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DEDICATION

To my girls and brother, with my parents in mind.

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With thanks to Professor Paulo Gomes.

ABSTRACT

The financial crisis of 2008 affected virtually every country in the World due to the connectivity of the global markets. Despite the significant contrasts in the starting points, there is the common perception that different economies recovered at distinct paces at least in part due to the policies and methods adopted by the authorities to address the financial crisis. In this context, the OECD "How's Life" datasets were analyzed with the objective of trying to detect trajectories in countries that could partially be explained by the macroeconomic measures adopted after the crisis. With the support of the OECD secondary data for the period 2009-2015, this novel study involved not only univariate, bivariate, and cluster evaluations but also a three-way data analysis based on the STATIS method. Among the existing multivariate methodologies, STATIS is the most comprehensive and flexible method to assess the evolution of a large (and possibly varying) number of individuals and variables over several years. With the identification of country trajectories in association with the evolution of variables, the findings may be relevant for business organizations with regard to defining strategic directions and making operational decisions.

KEYWORDS

OECD How's Life/Better Life;

PCA;

Three-Way Data Analysis;

STATIS;

2008 Financial Crisis.

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LIST OF ABBREVIATIONS AND ACRONYMS

CTA	Absolute Contribution
CTR	Relative Contribution
DPCA	Double Principal Component Analysis
FCA	Factorial Correspondence Analysis
GDP	Gross Domestic Product
ISI	International Statistical Institution
MCA	Multiple Correspondence Analysis
MFA	Multiple Factorial Analysis
MTSA	Multivariate Time-Series Analysis
OECD	Organization for Economic Cooperation and Development
PCA	Principal Component Analysis
PESTEL	Political, Economic, Social, Technological, Environmental, and Legal
STATIS	Structuration des Tableaux A Trois Indices de la Statistique
SWOT	Strengths, Weaknesses, Opportunities, and Threats
WSC	World Statistic Congress

1. INTRODUCTION

Although the financial crisis of 2008 was not an entire surprise for people from within the industry with a critical mindset, the reality is that the large majority of the insiders and outsiders perceived the developments as a "Black Swan": something totally unpredictable and thus, unavoidable. Regardless of the differences in perspectives, the 2008 crisis started in the USA but quickly propagated and contaminated not only the European but also the Asian markets due to the global connectivity and scale of the financial and business operations (Crotty, 2009; Erkens, Hung, & Matos, 2012; Taleb, 2007).

The global financial crisis affected several countries in different ways and to varying extents. Furthermore, the impacted countries were in different positions in terms of macroeconomic aspects among other dimensions, which resulted in a multitude of different starting points for the post-crisis recovery. Nonetheless, the analysis of the growth path of the OECD countries based on the "How's Life" datasets unveiled a number of distinct progressions associated to the different evolution of variables dependent on the policies adopted by governments and authorities to address the critical financial circumstances (Boarini, Murtin, & Schreyer, 2015; Naudé, 2009; Reinhart, & Rogoff, 2009).

The identification of different recovery trajectories and variables' evolution may provide valuable information for the processes of business decision-making. In fact, the insights resulting from the multivariate analysis of the OECD datasets over time can provide indications in support of efficient decisions related to business strategies and operations. Moreover, the recognition of the insights associated with different approaches might permit to not only adopt the most appropriate methods at an organization level, but also target the most promising countries and geographies for expansion and achievement of the required returns on investments (Clench-Aas, & Holte, 2017; Helliwell, 2003; Krishnamurthy, & Vissing-Jorgensen, 2011).

1.1. BACKGROUND AND PROBLEM IDENTIFICATION

At the request of the President of France in 2010, a team led by Joseph Stiglitz produced a report on the measurement of social and economic progress. This seminal paper represented a breakthrough in relation to the traditional and common way of gauging progress based on GDP alone, which reinforced the OECD initiative related to the collection of data associated to multiple types of variables linked to the quality and conditions of life. Since 2005, the OECD "How's Life" program has been gathering data and information in relation to the member countries (currently 35) and some partner countries (some six at the moment) (OECD, 2017; Stiglitz, Sen, & Fitoussi, 2010; Yılmaz, 2017).

From 2011 onwards, the "How's Life" program has been supporting the "Better Life Index" initiative that permits the individual weighting of the different variables to generate results that are tailored to meet the priorities of each user. Although the OECD approach permits to depart from a narrow and limited GDP perspective as discussed by a variety of authors in several papers, the evolution of the multiple variables in the 35 member countries (plus six partners) allows producing a space analysis over time. In addition to a global and intra-country assessment, a multivariate three-way data analysis provides trajectories for the evolution of the various OECD countries in the context of the selected variables (Abdi, & Valentin, 2007; Dolan, Peasgood, & White, 2008; Durand, 2015).

The available OECD data relates to the current well-being variables (25) in the period from 2005 to 2015 (or 2016 in some cases) but presents several gaps for a few countries and in some years. This secondary data is credible, consistent, and reliable which permits to have confidence in the results obtained through a multivariate spatial analysis. Even though the OECD "How's Life" reports are frequently used as an important reference for the 11 covered dimensions of well-being, the datasets permit to develop a multivariate analysis at three dimensions in order to characterize the evolution of the current well-being variables and assess the recovery of the countries after the 2008 crisis (Dazy, Le Barzic, Saporta, & Lavallard, 1996; Veneri, & Murtin, 2016).

1.2. STUDY OBJECTIVES

The objective of this study is to produce a multivariate three-way analysis of the OECD "How's Life" data related to most of the member countries in the period from 2009 to 2015. This innovative approach permits the identification of some trends and patterns among the countries as the result of the well-being variables in the aftermath of the financial crisis. The progress and recovery of the countries are initially assessed based on univariate, bivariate, and cluster analysis. However, these methods do not permit to obtain an integrated perspective given the fairly large number of involved countries, variables, and years (Abdi, Williams, Valentin, & Bennani-Dosse, 2012; OECD, 2014).

Likewise, the study discusses the existing multivariate methods in order to justify the STATIS method as the preferred choice for this sort of statistical analysis. In fact, the STATIS method is a comprehensive technique that permits the simultaneous analysis of several data tables through a number of steps: interstructure (for the global tables), compromise (with weights based on the variations of the individual distance), intrastructure (from the principal components for the compromise table), and trajectories (for the individuals). This method was developed by l'Hermier des Plantes under the supervision of Yves Escoufier and is flexible to variations on the number of variables or the number of individuals over time (Dazy, Le Barzic, Saporta, & Lavallard, 1996; Des Plantes, 1976; Escoufier, 1987; Lavit, 1988).

From a business perspective, the results of the STATIS method complemented by the univariate, bivariate, and cluster analysis reveal some patterns and evolving trends in the OECD countries. In the context of different starting points, the various trajectories are partially associated with distinct macroeconomic and financial policies which might provide insights for business decisions. With this information, an organization may decide to focus its efforts and investments in geographies that will be more promising in terms of achieving its strategic goals and obtaining the aspired financial returns (Allin, & Hand, 2015; Chaya, Perez-Hugalde, Judez, Wee, & Guinard, 2004; Teece, 2010).

Overall, the main goal of the study is the identification of countries with a differentiated evolution since the 2008 financial crisis. As the impact of the crisis was experienced at a global scale, a three-way data analysis reveals the countries with different recovery patterns given the impact of the adopted policies and measures on the well-being variables. In the context of its business values and objectives, an organization should be able to select and implement the policies that match its mission and goals while targeting the countries and regions that will permit to obtain the aspired results (Bénasséni, & Dosse, 2012; Helliwell, 2006; Kroonenberg, 1997).

1.3. STUDY RELEVANCE AND IMPORTANCE

To the best of the author's awareness, the integrated and three-way analysis of the OECD "How's Life" datasets over time (from 2009 to 2015) has not been produced before and so, there are a gap and an opportunity in terms of expanding the existing knowledge. The study helps to clarify the differences in the recovery paces of the various OECD countries and identify some of the possible underlying reasons associated to the selected well-being variables (Dazy, Le Barzic, Saporta, & Lavallard, 1996; OECD, 2017).

In addition, the study analysis might provide useful insights and perspectives for businesses that are considering the possibility of either initiating or expanding their operations in overseas markets. Although the study is not conclusive in all possible aspects and relevant dimensions, the outcome of the study may provide beneficial and interesting indications to organizations in relation to not only creating knowledge and having an additional lens to access international markets and opportunities but also providing some signs in relation to the most desirable internal policies and decision criteria (Hill, 2008; Kotter, 1996).

As such, the STATIS analysis of the OECD countries' evolution since 2009 supports the creation of a new perspective with the potential to be applied in practice. Moreover, the study attempts to build on the existing data and knowledge, which represents a contribution to move away from the mainly intuitive expectations and perceptions while reinforcing, challenging, or complementing the available reports and indicators. With the obtained views regarding the impact of more forward or restrictive policies on relevant variables, it might be possible to achieve some indications for the benefit of business organizations (Abdi, Williams, Valentin, & Bennani-Dosse, 2012; Stiglitz, Sen, & Fitoussi, 2010; Veneri, & Murtin, 2016).

1.4. DATA SOURCES

As discussed, the overriding purpose of the study is the generation of additional insights in relation to the OECD datasets to support the senior management decision-making processes, namely in terms of international operations and even the implementation of certain degrees of change (e.g., policies, methods, and criteria) within an organization. The new information results primarily from the application of the STATIS model to most of the OECD "How's Life" datasets in the period from 2009 to 2015 (seven years). At this stage, it is not considered necessary to enter in a marketing research process which is a limitation of the study that can be addressed in the future (Dazy, Le Barzic, Saporta, & Lavallard, 1996; Hill, 2008; OECD, 2017).

In this context, the study employs quantitative secondary data that was originally produced for a different (but connected) purpose. Although the latest set of the OECD data (in the 2017 report) relates to 2015, the source of data is reliable and credible and therefore, the datasets can be used in a dependable and consistent way. The source of data is obviously external and the numeric data was obtained through the OECD published materials (namely reports and websites). At this stage, there is no need to employ a descriptive or casual research (Helliwell, 2003; OECD, 2017).

Moreover, the study uses an exploratory research designed to discover tentative insights (based on the variable relationships) in a flexible way that might prompt further research in the future. With regard to data preparation and analysis, the study employs a multivariate technique in complement

to univariate, bivariate, and cluster analysis techniques as previously described. The study presents the main findings and results alongside the identification of the areas for further work, investigation, and possible research (Bénasséni, & Dosse, 2012; Kroonenberg, 1997). A summary of the study was submitted as a contributed paper for the biannual WSC (World Statistic Congress) of ISI (International Statistical Institute) that is going to be held in Malaysia during August 2019 (ISI, 2018).

2. LITERATURE REVIEW

2.1. GLOBAL FINANCIAL CRISIS

The global financial crisis of 2008 was perhaps the worst financial crisis since the Great Depression of the 1930s. The crisis started with defaults in the USA subprime mortgage market in 2007 and grew into a global banking crisis due to excessive risk-taking that magnified the financial impact in a highly interconnected global industry. With the collapse of the investment bank Lehman Brothers in September 2008, the central banks (namely the Federal Reserve and the European Central Bank) had to implement a large bail-out program addressed at many financial organizations in combination with extensive monetary and fiscal policies to avoid the probable collapse of the global financial system. The combination of the USA crisis with the European debt crisis shortly afterwards resulted in a large downturn and recession of the global economy in association with severe restrictions imposed in the banking system from 2009 onwards (Blanchard, 2009; Crotty, 2009; Havemann, 2009; Rudd, 2009; Taylor, 2009; Verick & Islam 2010).

2.2. GOVERNMENT POLICIES

In this context, the investors and families had justified fears of a major global recession that were addressed by the macroeconomic policies implemented in many countries, such as vast monetary easing through major cuts in interest rates and quantitative easing. Apart from programs of extensive fiscal stimulus in some countries, it was necessary to not only bail-out the private financial institutions but also implement the nationalization of some banks. These policies of extremely low interest rates and large quantitative easing conducted to private debt, increasing real estate prices, growth in commodities consumption, and preservation of economically unviable industries. As an almost unavoidable consequence, many countries experienced a surge in fiscal deficits and national debts which conducted to difficulties related to sustainability and restrictions in combination with challenges regarding the reversion of nationalizations and even ethical behaviors (Blanchard, Akerlof, Romer & Stiglitz, 2014; Brumby & Verhoeven, 2010; Claessens, Dell'Ariccia, Igan, & Laeven, 2010; Eubanks, 2010; Litan, 2012; OECD, 2009; Reinhart & Rogoff, 2009; Taylor, 2013).

2.3. ECONOMIC MODELS

Among other economic theories, there are two contrasting perspectives (Keynesian and Austrian) on the roles and policies to be adopted by a government in particular during a crisis. In essence, the Keynesian views advocate that the private sector conducts to inefficiencies and so, the governments must intervene through active monetary policies implemented by the central banks. However, the designated Austrian school argues that the governments should have a limited intervention (mainly related to private property and individual rights) and should use the gold standard in order to avoid large volatility cycles resulting from the artificial stimulus. Despite the Austrian calls for a self-correction of the markets, the governments initially adopted a Keynesian approach in terms of lowering interest rates and injecting money (in addition to public spending and labor-intensive investments) to stimulate the economy, maintain demand, and bail-out the private sector which was followed by austerity measures and public/private deficit reductions (plus banking regulations and structural competitive reforms) that are perhaps more in line with the Austrian school (Maurel & Schnabl, 2012; Snowdon, Vane & Wynarczyk, 1994).

2.4. NATIONAL STIMULUS

In accordance with the OECD, most governments implemented economic stimulus packages after the 2008 crisis to raise not only short-term demand but also supply and innovation. In particular, the stimulus packages targeted (1) modern infrastructure, (2) research and development, (3) innovation, (4) small to medium enterprises, (5) education, and (6) green technologies to create growth and achieve the long-term objectives. With regard to the sizes and features of the packages, the fiscal initiatives in the OECD countries during the initial three years represented some 3.5% on average of the 2008 GDP of those countries but with significant differences at country level (ranging from 0.1% to 5%). The countries with the largest fiscal packages were Australia, Canada, Germany, Japan, Korea, New Zealand, Spain, and the United States while Hungary, Iceland, and Ireland were even increasing the fiscal positions immediately after the subprime crisis (OECD, 2009).

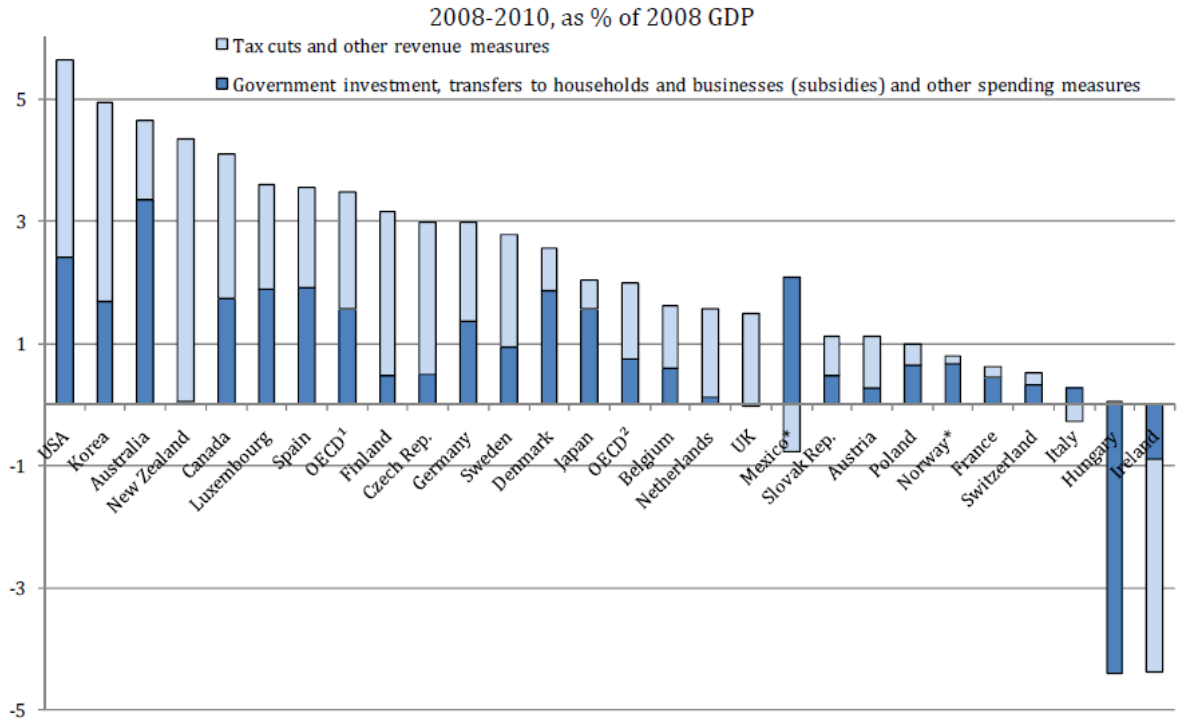


Figure 2.1 – OECD (2009): The size of fiscal packages (revenue and spending measures)

Although most countries have implemented tax adjustments and investment programs, the countries that favored investments over taxation were mainly Japan, France, Australia, Denmark, and Mexico. In particular, Australia, Poland, Canada, and Mexico anticipated more significantly the public spending but Denmark, France, and Japan also presented a clear focus in this regard. There was widespread support to households and the Czech Republic, Japan, Korea, Portugal, Mexico, and Slovak Republic also provided assistance to some businesses. Apart from financial measures (such as bail-outs), there was a need to inject liquidity in the economy and protect employment through the packages that stimulated short-term demand but, in addition, the various governments presented varying degrees of focus on the supply side with longer-term objectives in mind (OECD, 2009).

So, the initiatives of the various governments related to (i) measures to protect the banking system, (ii) policies to support businesses through tax reductions, credit guarantees, reductions of labor costs, and employment incentives, (iii) protection of some sectors (e.g., banking and construction),

and (iv) help to families and households based on tax reduction, cash payouts, unemployment subsidies, and low health costs. Last but not least, the different countries implemented (v) programs (i.e., stimulus packages in line with the Appendix 1) targeting innovation and long-term growth such as infrastructures, research and development, human investments, green technologies, innovation, and entrepreneurship with the clearly stated objective of coming out stronger from the crisis and being more competitive and prosperous afterwards (OECD, 2009).

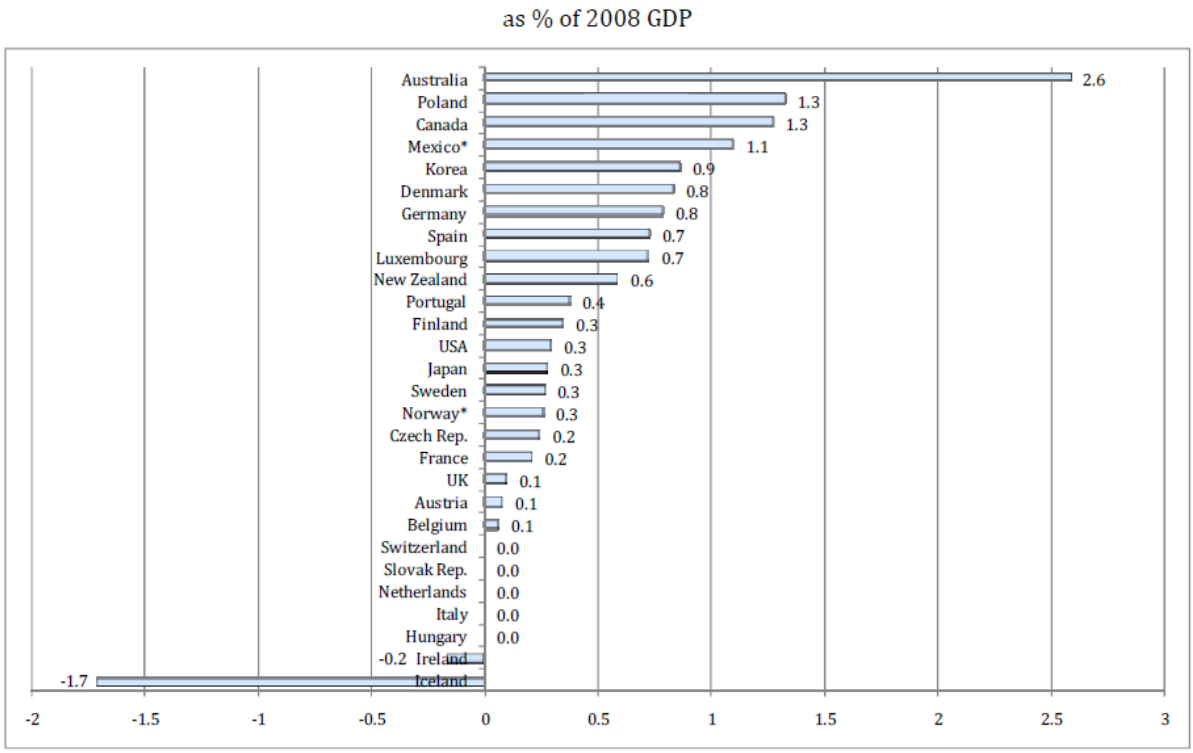


Figure 2.2 – OECD (2009): Government investment in stimulus packages in 2008-2010

2.5. THREE-WAY DATA MODELS

Apart from the literature and papers on the circumstances surrounding the 2008 financial crisis and the policies implemented by the governments of the various countries, the literature review addressed not only the OECD "How's Life" program and circumstances, but also the simultaneous analysis of datasets. With a clear focus on the implementation of the STATIS method, the revision of the literature related to models for the analysis of three-way data (addressed in section 3.) covered an extensive range of techniques that included PCA and DCPA (plus generalizations), FCA and MFA, and MTSA in complement to STATIS (and related variations) in order to assess the merits and benefits of each method for multivariate analysis. The review was produced with the ultimate objective of analyzing the OECD countries' evolution in the context of the different variables and national policies implemented during the aftermath of the global financial crisis (Abdi, Williams, Valentin, & Bennani-Dosse, 2012; Allin, & Hand, 2015; Benzécri, 1992; Clench-Aas, & Holte, 2017; Dazy, Le Barzic, Saporta, & Lavallard, 1996; Escoufier, 1987; Kroonenberg, 1997; OECD, 2017).

3. METHODOLOGY

With the objective of assessing the evolution of the OECD countries after the 2008 global financial crisis, the "How's Life" data tables were analyzed based on the STATIS method. However, there are several other methods for the joint analysis of multiple data tables as discussed in the following subsections. In addition to the STATIS study, the set of data tables was initially evaluated based on a cluster analysis complemented by a univariate and bivariate assessment.

The study of the OECD "How's Life" data tables during the period between 2009 and 2015 involved a three-way data analysis. With application to many different sectors and fields of activity, the method was created by Tucker for application to psychology data with the development of models (i.e., three-mode components and factor analysis) and algorithms to estimate the involved parameters. This work has been progressively expanded by other authors to multidimensional scaling, multi-sample common PCA, STATIS technique, three-mode clustering, constrained three-way analysis, three-way contingency tables, and three-way variance analysis among other techniques.

The main classes of data are profile data (most common), similarity data (relevant for certain fields), and preference data (seldom used due to issues with analysis) which can be derived to obtain means, covariances, frequencies, etc. Data can have a dependence structure (with profile data being split into groups to predict certain variables) or an interdependence structure (to study the relations among variables). In addition, three-mode data involves three types of entities (including time, for instance) while multiple-set data are usually two-mode three-way data (cross-product matrices, covariance matrices, etc.) derived from raw data that cannot be analyzed in its initial form (i.e., it requires a pre-analytical transformation).

In terms of three-way methods, the data-analytic techniques address populations and identify individual differences, unlike the stochastic frameworks that rely on distribution assumptions. The modeling techniques either model directly the three-way data or model indirectly with the view of fitting multi-set data into derived three-way matrices (covariance, correlation, and cross-product among others).

For profile data, the dependence techniques are general linear models (two-block multiple regressions, three-mode redundancy analysis), interdependence techniques are components methods (three-mode component analysis, parallel factor analysis, three-mode correspondent analysis, latent class analysis, spatial evolution analysis), mixed techniques (multi-set canonical correlation analysis, procrustes analysis, multi-set discriminant analysis), and clustering methods (three-way mixture method).

There are also covariance models for profile data, namely the stochastic covariance models (invariant factor analysis, three-mode common factor analysis, additive and multiplicative modeling of multivariate and multi-occasion matrices, simultaneous factor analysis) and exploratory covariance model methods (three-mode component analysis, simultaneous component analysis, indirect fitting with component analysis).

With regard to similarity and preference data, it is possible to employ multidimensional scaling models (individual differences scaling, general Euclidean models, three-way multidimensional

scaling), clustering methods (individual differences clustering, three-way ultra-metric trees, synthesized clustering), and unfolding models (three-way unfolding).

3.1. PCA AND DPCA

The purpose of PCA (principal component analysis) is to present the information contained in large data tables of variables related to individuals in a graphic way. Although the theoretical concepts of this essentially descriptive method are not recent, the current computing capabilities permit to fully benefit from this statistical method. With application to numeric data in many different areas, a PCA study unveils the structure involved with the system of variables in terms of associations and oppositions while revealing the existing groups of individuals/objects relative to the considered variables.

The PCA method is applied to tables X_o with n individuals and p variables and data of different type (continuous, discrete, or ordinal). The lines are the vectors of individuals while the columns are the vectors of variables. To obtain the "distances" between variables, it is necessary to attribute a defined weight to each individual (weights matrix D) and ensure that the sum of weights is equal to one. Moreover, the center of gravity (g) is a vector obtained by applying the weights matrix to the data table to obtain the weighted average of the individuals for each variable ($g=X_oD1_n$). With this information, it is possible to obtain the centered data table X and, if necessary, also the standardized data table through $X_s=X(diagV)^{-1/2}$, with V being the variance and covariance matrix ($V={}^tXDX$) while R is the correlations matrix ($R={}^tX_sDX_s$) and summarizes the structure of linear dependence among the variables.

With regard to the individuals, it is necessary to define a metric Q for the space in order to calculate the distances between individuals. The most common metrics tend to be either $Q=I_p$ or, in case of standardization, $Q=(diagV)^{-1}$ and the cluster inertia I_g is either equal to the sum of the variance of the variables (for $Q=I_p$) or equal to p (for standardized variables). As the metric for the variables space is the matrix D, the study of a data table is characterized by the set of matrices (X,Q,D) and the associated object $W=XQX^t$ or $V={}^tXDX$.

The objective of the method is to obtain a similar representation of the individuals' cluster on a sub-space of lower dimensionality (i.e., q<p) which involves the least possible deformation of the projected distances and thus, the maximization of the projected cluster inertia. In this context, the sub-space of q dimension is defined by the q orthogonal eigenvectors μ_k of VQ associated to the largest q eigenvalues λ_k whose sum equals the retained inertia (from $VQ\mu_k=\lambda_k\mu_k$). In addition to the principal axes μ_k of inertia, the associated principal factors are obtained through $z_k=Q\mu_k$ (from $QVz_k=\lambda_kz_k$) and the orthogonal principal components result from $Y^k=XQ\mu_k=X\underline{z}_k$. (i.e., the principal components are a linear combination of the initial centered variables).

So, the principal components are variables with zero mean and uncorrelated, have variances equal to the associated eigenvalues, and permit a reduction in dimensionality in the interest of interpretation. The decision on the number of q principal components to be selected results from a combination of criteria: Pearson (retain at least 80% of the total inertia), break-point in the plot of eigenvalues (scree plot), and Kaiser (retain at least the eigenvalues above the average value). In the case of standardized data, the diagonalization of R provides vectors with coordinates that represent the loadings to generate the principal components.

To interpret the axes, the correlations between the principal components and the variables of the initial tables are represented in correlation circles which permits to infer the main aspects associated with each axis. The absolute and relative contributions of individuals and variables in relation to the principal components permit to identify the individuals and variables that are relevant for the interpretation of axes (i.e., CTA above average) and well represented (i.e., CTR above 0.5, which is the percentage of inertia associated to individuals or variables explained by each axis).

Once the principal components have been established, it is possible to position supplementary variables and individuals (either additions to the data set, or excluded data to avoid the loss of detail resulting from the standardization process) in the graphic representations. In fact, the coordinate of a supplementary individual represented by the vector $\underset{\sim}{x}i$ on axis k is $\langle \underset{\sim}{x}i \mid \underset{\sim}{\mu}k \rangle_Q = {}^t\underset{\sim}{x}i Q \underset{\sim}{\mu}k$ while the coordinate of a supplementary variable $\underset{\sim}{x}^j$ on axis k is obtained through $\langle \underset{\sim}{x}^j \mid \frac{\underset{\sim}{Y}^K}{\|\underset{\sim}{Y}^K\|} \rangle_D = \frac{1}{\|\underset{\sim}{Y}^K\|_D} s(\underset{\sim}{x}^j, \underset{\sim}{Y}^K)$ $= {}^t\underset{\sim}{x}_j D \underset{\sim}{Y}^k / \left\| \underset{\sim}{Y}^k \right\|_D$.

A DPCA (double principal component analysis) involves the “cubic” data related to the same variables and same individuals at various moments in time. Although the third dimension can be different from time, the results will probably be difficult to interpret. The objective of DPCA is to compare the evolution of both the variable relations and the individuals through a process with three phases: analysis of the global evolution, study of the data deformations around the centers of gravity, and representation of the individuals’ evolution over time on a common space to be defined.

The global evolution of the individuals (interstructure) is based on the PCA (principal component analysis) of the centers of gravity of the various data tables, which produces the Euclidean image of the tables on a space with the required dimensions. The first axis of this image is usually related to the continuous evolution of the centers of gravity over time. Then, it is possible to center the data to eliminate the previous evolution effect and study (based on the PCAs of the tables) the variations of the individuals around their centers of gravity. The PCAs of the tables can be interpreted based on graphic representations, and provide the principal components as orthogonal axes that permit the definition of a common space for the representation of the individuals.

The third phase of the PCA (intrastructure) results in the identification of a space of reduced dimensionality where it is possible to project and represent the evolution of the individuals over time. Although different methods can be used, the selection of the axes for the representation of the individuals is often based on the maximization of the inertia associated to the projections which involves the selection of the eigenvectors associated to the biggest eigenvalues based on a criteria such as Pearson (>=80%), scree plot (“elbow”), and Kaiser (at least above average). This process involves the PCA of an extended data table with the juxtaposition of the centered initial tables. The trajectories of the individuals are projected on the selected axes which can be interpreted based on their correlation with the compromise position of the variables (correlation circle).

3.2. PCA GENERALIZATIONS

PCA is a common method to investigate the existing structure in a large data set in order to identify the relationships between the variables. However, there are instances where the data can be classified in various types (or modes) which requires an extension of the standard PCA method. It is

possible to address these situations based on a three-mode principal component analysis as an adaptation of the common PCA that introduces significant levels of complexity.

The three-mode PCA (also designated singular value decomposition) is a generalization of the standard PCA that allows identifying the relations between the components of the modes through the simultaneous analysis of the variables and individuals. The interactions between components are captured in a three-mode core matrix that reflects the essential characteristics of the data. The most general three-mode PCA is called Tucker3 (T3) and involves three distinct modes with an unrestricted core matrix. The Tucker2 (T2) model is an alternative model with two unequal modes with an unrestricted extended core matrix.

With the objective of analyzing three-mode data, there are a number of different models that are variations of the Tucker approach. Among the fixed models, there are two classes of component models: models with three-reduced modes (T3, Three-Mode Scaling, PARAFAC1, CANDECOMP, and INDSCAL) and models with two-reduced modes (T2, IDIOSCAL, PARAFAC2, CANDECOMP, and INDSCAL). These models have decreasing levels of generalization, and the most usual technique to solve these models is ALS (alternating least squares).

In brief, the Three-Mode Scaling is similar to T3 but two reduced modes are equal, PARAFAC1 (parallel factor analysis) is the same as CANDECOMP (canonical decomposition) and involves a T3 approach with a three-way identity matrix as the core matrix, IDIOSCAL (individual differences in orientation scaling) is similar to T2 but with the two reduced modes being equal, and INDSCAL (individual differences scaling) is also identical to T2 with the two reduced modes equal and some additional restrictions. Overall, there are methods more adequate for data sets that evolve over time, such as STATIS, MFA, and DPCA.

3.3. FCA AND MFA

The FCA (factorial correspondence analysis) method has the objective of identifying the links between two sets of modalities through the graphical display (with lines and columns on the same representation) of the information contained in a table of measurements. An FCA study can be regarded as a particular case of a PCA employing the metric χ^2 to have the proximity between the lines and columns. The FCA is essentially a descriptive method to possibly be complemented by a classification, and the data tables suitable for FCA are not only contingency tables but also tables with binary data and positive measurements.

With a contingency data table and the associated frequency table, it is possible to perform two PCAs: one for the cluster of row-profiles and another for the cluster of column-profiles that provide parallel results. In addition, the FCA involves the non-centered PCA of two profile clusters (lines and columns) to obtain the principal factors and principal components. The two analysis conduct to the same eigenvalues between 1 (trivial, to be discarded) and 0 and the principal factors of one of the analysis are proportional to the principal components of the other (transitional formulas). The symmetric results of the two PCAs permit to diagonalize only the matrix of the smallest dimension and use transition formulas to obtain the principal components for the other matrix, and also to overlap the principal plan of the row-profiles and column-profiles to represent simultaneously the categories of the two crossed-variables.

Similarly to a PCA, the interpretation of the principal components hinges on the important absolute and relative contributions of the row-profiles and column-profiles. The MCA (multiple correspondence analysis) is an extension of FCA for a number of disjunctive categories (i.e., mutually exclusive) in questionnaires with the interesting property that a number of aspects (e.g., total inertia, mean of eigenvalues, contribution of modalities to total inertia, etc.) are a function of the questionnaire structure (i.e., number of questions and categories).

The MFA (multiple factorial analysis) is suitable to study individuals with a certain number of quantitative or qualitative variable groups that may have been measured at different moments in time or may have resulted from the re-arrangement of variables. The first stage involves the PCA of the different variable groups to obtain the associated eigenvalues and eigenvectors. The first eigenvalues are especially interesting because their inverses are the ponderation factors for the subsequent stages that permit to balance the role of tables during the analysis process.

The next stage (intrastructure) relates to the representation of the individuals in each table on the same space, which is applicable not only to the compromise positions of the individuals but also to the individuals' trajectories over time. The MFA method permits to weight the variables in order to balance the influence of the various variable groups, which can be affected by the number of variables and table structure. This weight is the same for all variables in the same table and is equal to the inverse of the inertia of the first principal component for the table. In order to represent the compromise position of the individuals, it is necessary to produce a weighted PCA (using the inverse of the square root of the first eigenvalue) of the juxtaposed data tables which provides an average Euclidean image.

In the following stage, it is required to project the various clusters and obtain the trajectories of the individuals which can be achieved by treating the clusters as supplementary elements in relation to the previous PCA. Having a representation of the average individuals and trajectories, it is indispensable to also represent simultaneously the set of variables using the previous global PCA. Then, the interstructure study involves the comparison of the variable groups and their representation on a common space using the first eigenvalues of the variable groups as weights that conduct to norms dependent on the structure of the group.

3.4. STATIS

The STATIS (Structuration des Tableaux À Trois Indices de la Statistique) method (Escoufier, 1987; Lavit, 1988) permits to analyze cubes of data and obtain a joint assessment of a set of quantitative tables. In particular, this technique is useful for the analysis of data evolution over time and so, it is related to techniques such as DPCA (double principal components) and MFA (multiple factorial analysis). Unlike the more classical and descriptive statistical methods of analysis (e.g., PCA and FCA) focused on a single table and a few variables at a time, the STATIS approach permits to evaluate multiple tables of the same type simultaneously.

The currently available computing capacity allows the analysts to avoid the complexity resulting from the evaluation of each table and variable by employing an integrated graphic representation of the data collected on periodic occasions. The focus on the relative position of the individuals provided by the STATIS analysis results from the graphic displays that summarize the most important aspects related to large data sets involving multiple variables. Despite the loss of some information detail,

the representations resulting from a multidimensional method (such as STATIS) are easy to interpret visually which permits to unveil the main features of the data.

For a set of S data tables, the STATIS method represents each study by an object W_s and the study is defined by three elements $(X_s, Q_s, D)_s$ with D (observations weight) being constant and with Q_s being equal to either I_p or $(diagV)^{-1}$ (for normalized data). The joint analysis of multiple data tables permits to have a varying number of variables (STATIS, for object relations) or objects (Dual-STATIS, for variable relations) over time and to collect data with or without a defined periodicity (or another type of dimension either than time). This sort of method involves four stages:

1. Global analysis based on the study of an interstructure comparing the data table structures with the support of the existing distances and graphic representation;
2. Identification of a compromise table W representing all the data tables in order to avoid the complexity of analyzing the various tables in an independent and separate way;
3. Detailed analysis resulting from the study of the intrastructure which permits to evaluate the similarities and differences between the tables based on their compromise positions;
4. Analysis of the trajectories presented by each component (objects or variables) of the various data tables over time (or relative to another dimension) to appraise the evolution.

3.4.1. Interstructure

As indicated, the interstructure permits an overall comparison of the data tables based on their representations on a plan. This approach requires the creation of an object for each data table, the definition of a metric for distances, and the development of the Euclidean image of the objects based on the distance criteria. For a table X_s (n x p) (with s = 1, …, S), the representative object is obtained by: $W_s = X_s Q_s X^t_s$ (size n x n) with $Q_s = (diagV)^{-1}$ (covariance from $V = X^t_s D X_s$) given the heterogeneity of the variables' data and units in the study.

In order to obtain distances between objects and represent the tables in a graphical way, the STATIS method uses the Hilbert-Schmidt inner-product which indicates the existing degree of association between data tables: $\langle Ws|Ws'\rangle_{HS} = T_r(DW_sDW_{s'})$, where T_r (trace) is the sum of the diagonal elements. Apart from the distances, this inner-product also permits to obtain the squared norm of an object W_s: $\|Ws\|^2_{HS} = \langle Ws|Ws\rangle_{HS} = T_r(DW_sDW_s) = \sum_{i=1}^{n} (\lambda_i^{(s)})^2$ where $\lambda_i^{(s)}$ is the i-rank eigenvector of W_sD (with $D = \frac{1}{p} I_p$). Moreover, if the norms of the objects W_s are significantly different, it is necessary to use normalized objects $W_s / \|Ws\|_{HS}$ in order to avoid wrong interpretations due to the dominant effect of the high-normed tables on the compromise. In fact, objects with high values affect the compromise structure and can mislead the interpretation of results.

The Hilbert-Schmidt inner-product provides also the table of inner-products between the study tables (W_s and $W_{s'}$): $S = \left[\ddots\ S_{SS'} = \langle Ws|Ws'\rangle_{HS}\ \ddots\right]$ with s= 1, …, k and s'= 1, …, k (with table size k x k) or $\check{S} = \left[\ddots\ \check{S}_{SS'} = \langle \frac{Ws}{\|Ws\|HS} | \frac{Ws'}{\|Ws'\|HS}\rangle_{HS} = \frac{\langle Ws|Ws'\rangle HS}{\|Ws\|\mathrm{HS} * \|Ws'\|\mathrm{HS}}\ \ddots\right]$ (k x k) for normalized objects $W_s / \|Ws\|_{HS}$ and $W_{s'} / \|Ws'\|_{HS}$. The coefficient of sectorial correlation between the tables is used in practice with the

designation $RV_{(S,S')} = \langle \frac{Ws}{\|Ws\|_{HS}} | \frac{Ws'}{\|Ws'\|_{HS}} \rangle_{HS} = S_{SS'} / (S^{1/2}_{ss} * S^{1/2}_{s's'})$. The diagonalization of S and Š permits to obtain the image of the tables, while the RV coefficients (ranging from 0 to 1, and with RV being equal to Š for normed objects) and allow having the distances between the normalized tables.

With a view to obtain the Euclidian image of the objects, it is necessary to produce a PCA (principal component analysis) of matrix S (i.e., the inner-product matrix of the objects) which involves obtaining the eigenvalues and eigenvectors (that generate the Euclidean space) of $S\Delta$, with Δ being the matrix of the weights for each table (i.e., π_k). The coordinates of the points A_s associated to the tables W_s are obtained through $\sqrt{\lambda i} Y^i$, with λ_i and Y^i being the eigenvalue and eigenvector of i-rank associated to matrix $S\Delta$ which permits to represent the k objects on the i-principal axis.

In practice, the representation is limited to the two first axes (the principal plan) and provides a graphic display of the relations in the interstructure (without interpreting the axes). The distance between the A_s points is an approximation of the Hilbert-Schmidt distance between the objects representing the data tables and so, the proximity of two well-represented points on the first plan indicates the existence of a shared structure for the observations in the tables.

With regard to the Euclidean images, the RV coefficient also represent the cosines between vectors OA_s and $OA_{s'}$ (with origin O) as $RV_{(S,S')} = \langle \frac{Ws}{\|Ws\|_{HS}} | \frac{Ws'}{\|Ws'\|_{HS}} \rangle_{HS} = S_{SS'} / (S^{1/2}_{ss} * S^{1/2}_{s's'}) = \cos(OAs, OAs')$ and so, the smaller the angle the higher the correlation of the tables. Moreover, S is a symmetric matrix with all elements positive and thus, all components of its first eigenvector have the same sign according to the theorem of Frobenius. Likewise, the Euclidean representation of the points A_s on the first plane is mainly differentiated by the second axis coordinates because the coordinates on the first axis are all positive and of similar (and large) magnitude (i.e., similar norms and high RVs) in order to ensure the comparison and interpretation of the objects (representing the data tables) based on the plan representation.

So, the analysis of the interstructure permits to verify (without explaining) the existence of structural similarities among the data tables which supports the construction of a compromise table W (with size n x n) as a valid summary of the entire set of the data tables. Depending on the Euclidean representation of the tables, it might be necessary to exclude some structurally distinct tables, use normalized objects, or recognize the inexistence of a common structure because the objects are distinct and present low RV coefficients.

3.4.2. Compromise

The compromise table W is defined as the weighted average of the W_s (or $W_s / \|Ws\|_{HS}$) objects in accordance with $W = \sum_{s=1}^{k} \alpha_s W_s$ (or $W = \sum_{s=1}^{k} \alpha_s W_s / \|Ws\|_{HS}$) with $\alpha_s = \frac{1}{\sqrt{\lambda s}} (\sum_{s=1}^{k} \pi_s \sqrt{S}_{ss}) \pi_s Y^{(s)}_1$ for Ws objects [or $\alpha_s = \frac{1}{\sqrt{\lambda s}} \pi_s Y^{(s)}_1$ for normed objects $W_s / \|Ws\|_{HS}$] with Y_1 being the first eigenvector of matrix $S\Delta$, $S_{ss} = \|Ws\|^2_{HS}$ being the s^{th} diagonal element of matrix S, and λ_s the first eigenvalue of matrix W_sD. In this context, the norm of the compromise is $\|W\|_{HS} = \sum_{s=1}^{k} \pi_s \|Ws\|_{HS}$ for objects W_s (or $\|W\|_{HS} = 1$ for objects $W_s / \|Ws\|_{HS}$) and W is not only a positive semidefinite matrix (i.e., with all eigenvalues non-negative) but also centered for the weights of the objects. Overall, the compromise table W is a common structure for the objects and permits a detailed analysis of the data tables

through the intrastructure and trajectory phases of the STATIS method. The compromise W is a global summary table that permits to avoid the separate analysis of each data table.

3.4.3. Intrastructure

The intrastructure allows obtaining not only the Euclidean compromise image of each individual (i.e., the mean position in the period of analysis) but also the correlation of the variables with the principal components of the compromise in support of interpreting the position of the objects on the compromise plan. In fact, the compromise Euclidean image of the individuals is a set of points B_1, …, B_n with coordinates on axis k obtained through $\frac{1}{\sqrt{\xi_k}}$ (WD) V_k , with ξ_k being the eigenvalues of WD (size n x n) and V_k the associated eigenvectors (k= 1, …, n). With regard to the interpretation of the individuals' positions, it is possible to identify the meaning of the axes through the correlations between the principal components V_k of the compromise and the variables of the data tables (providing the variables on each table are not highly correlated and thus, the evolution of the object points are related to the variables), with the coordinate of variable $(x^j)^{(k)}$ on axis k being obtained with $(V_k,(x^j)^{(k)})_D = {}^tV_k D(x^j)^k$.

3.4.4. Trajectories

To assess the differences and evolution at individual level, it is possible to represent the associated trajectories on the Euclidean image of the compromise through $\frac{1}{\sqrt{\xi_k}}$ (W_sD) V_k [or $\frac{1}{\sqrt{\xi_k}}$ ($\frac{1}{\|Ws\|_{HS}}$$W_s$D) V_k for normed objects] which is similar to the positioning of supplementary elements and provides the coordinates of points B_1^s, …, B_n^s (with s = 1, .., k). The points B_1, …, B_n are the equivalent to the centers of gravity for points B_1^s, …, B_n^s, and the trajectories of the objects are usually interpreted for the first two axes only by taking into account the average evolution (i.e., relative to the plan origin for centered variables).

3.5. STATIS VARIATIONS

Apart from the Dual-STATIS method for a fixed set of variables and their covariance matrices (instead of the cross-product matrices between observations), there are a few other techniques related to STATIS. Among those variations is X-STATIS (or PTA, partial triadic analysis) which is applicable to data tables with always the same individuals and variables over time. The X-STATIS process is similar to STATIS with two simplifications: the inner-product matrix used for the α_s weights is obtained from the initial tables X_r (rather than the W_s tables) and the compromise is the weighted average of the X_r tables (instead of the W_s). As variations of X-STATIS, STATICO and COSTATIS apply a related approach to two sets of tables through the combination of co-inertia analysis with X-STATIS (which is also similar to Double-STATIS).

With the integration of covariance or correlation and distance matrices, the COVSTATIS and DISTATIS are three-way extensions of multidimensional scaling. COVSTATIS is used to analyze covariance or correlation tables instead of the tables resulting from STATIS cross-products with attention to the normalization process in case of different units. In addition, it is necessary to ensure that all covariance or correlation matrices have the same origin which requires a double centered process. The DISTATIS approach transforms the distances matrices for the observations into cross-product matrices that are used for the STATIS cross-product process.

The CANOSTATIS technique involves groups of observations in multiple tables and for each table is performed a linear discriminant analysis. These distance matrices are used as the input to DISTATIS integration and representation process. Power-STATIS is a more generic approach with particular interest for an X-STATIS situation, and ANISOSTATIS permits to avoid the STATIS restriction of applying the same weight for all variables of a table which requires the identification of the most appropriate values to approximate the compromise map to the set of tables. Another extension of STATIS is the (K+1)-STATIS that studies the relationship of the K tables with an external table base on the existing patterns of similarity between the K tables relative to the additional table.

The Double-STATIS further extends the generalization of (K+1)-STATIS with the objective of obtaining two compromises that are as similar as possible (based on the inner-product of these compromises), which is an approach that has been extended to multiple sets of data matrices. This extension is designed STATIS-4 and involves an interactive process to obtain a compromise for each set of tables and an overall compromise. Finally, STATIS is not only related to other techniques such as GCCA (general canonical correlation analysis), GPA (general Procrustes analysis), and multi-block analysis (MFA, SUM-PCA, consensus PCA, MCA) but also a simplification of INDSCAL (individual differences scaling).

3.6. MTSA

The MTSA (multivariate time-series analysis) is specifically employed to study time-related data in tables with the same individuals and variables. This method is similar to DPCA but adds a variable in each table with the same time value for all individuals. The study of the interstructure is focused on the simultaneous evolution of the time series associated with the variables in order to identify a common polynomial trend. This polynomial expression can be adjusted to the centers of gravity and permits to forecast the evolution of the center of gravity for an additional table.

In addition, the analysis of the intrastructure to obtain the compromise position of the variables and trajectories of the individuals involves the PCA of the juxtaposition of the various data tables adjusted to take into consideration the polynomial trend. The results obtained with this approach tend to be similar to the solutions achieved with DPCA and Dual-STATIS (for not normalized objects) and the existing differences are due to the measurement of the individuals' position relative to the trend instead of their centers of gravity.

3.7. TECHNIQUES COMPARISON

Overall, the STATIS and Dual-STATIS methods have more flexibility than DPCA and MTSA in relation to the structure of the data tables, while the MFA is the only approach that permits the inclusion of qualitative variables. In addition, the STATIS, Dual-STATIS, and DPCA methods allow the use of normalized or non-normalized objects but MFA employs normalized objects and MTSA treats non-normalized objects. With regard to the compromise, the MFA, DPCA, and MTSA techniques take into account the objects that represent each table while the STATIS and Dual-STATIS approaches adopt a linear combination of the objects based on the existing correlations which result in a compromise of the same nature as the objects (i.e., either normalized or non-normalized).

In terms of interstructure, STATIS and MFA provide similar compromise positions of the individuals on the Euclidean space that represent the averages for the period while the trajectories of the

individuals are also similar and obtained through projections relative to the intrastructure axes (as supplementary elements) which allow describing the evolution of the data. The methods Dual-STATIS, DPCA, and MTSA provide only the trajectories of individuals which are interpreted based on the compromise positions of the variables, but the average positions of the individuals can be calculated. The intrastructure axes are interpreted based on the correlation with the initial variables (STATIS and MFA) or with the compromise variables (Dual-STATIS, DPCA, and MTSA).

The interstructure is the aspect that most differentiates the various methods. STATIS and Dual-STATIS produce a PCA of the table from the inner-product of representative objects which provides an indication of proximities without allowing to interpret the axes meaning. The MFA projects the representative object on the axes resulting from the intrastructure which provides easier to interpret images but not of the same quality. DPCA and MTSA assess the general trend of the tables through a PCA of the centers of gravity and a polynomial adjustment relative to the centers of gravity.

The various methods employ different processes to evaluate the quality of the individuals' representations, while MTSA is the only technique that specifically takes into account the time dimension in the interstructure and intrastructure stages of the process. The STATIS solutions are perhaps the most optimized but the interstructure and intrastructure processes do not facilitate the interpretation of results, which does not occur to the same extent with MFA for similar results. DPCA and MTSA appear to have more limitations in terms of their applicability.

3.8. CLUSTERING

Cluster analysis involves the grouping of objects in a way that combines similar objects in the same group (i.e., cluster) while ensuring the groups are as much distinct as possible. This is achieved by ensuring that the total inertia (which is a constant value) is equal to the smallest possible sum of the intraclass inertias (in order to have homogeneous clusters) and so, also the maximum possible sum of the interclass inertias (resulting from to the groups' centers of gravity). A cluster analysis can be used before a factorial method to reduce complexity or afterward to summarize the obtained results.

Among the multiple clustering techniques, it is worth noting the hierarchical clustering and the K-means method of creating groups of objects. The hierarchical approach builds a hierarchy of clusters by progressively identifying pairs of observations or clusters based on a pre-defined similarity criterion which merges all objects (and clusters) in a sequence of new clusters until the complete hierarchy is created. The results can be displayed graphically in a dendrogram with an indication of the links, and the similarities between observations are measured based on a distance criterion (Euclidean, Ward, Manhattan, etc.)

The K-means algorithm allocates all the observations to k clusters based on the distances to the means. The method is randomly initialized with the identification of the initial seeds and the allocation of the observations given the distances to these random seeds. Next, the seeds are replaced by the centers of gravity of the initial clusters and the allocation process is repeated multiple times in an interactive way until a degree of stability is achieved. Despite the good results obtained with K-means, it is not possible to ensure that the best possible clustering result has been achieved, and the algorithm is highly sensitive to outliers.

3.9. STATISTICAL AND DISTRIBUTION ANALYSIS

As an initial assessment and in complement to the subsequent STATIS and global PCA studies, the statistical and distribution analysis of the data tables permits to obtain not only preliminary insights but also some additional information in relation to the data set. As an illustration, this type of analysis allows the identification of outliers that should be addressed in order to avoid a distortion of the results from the multivariate analysis. In this context, it is indispensable to combine and complement the multivariate statistical study with one and/or two-dimensional descriptive statistics.

Likewise, the study takes into consideration some descriptive statistics (minimum, maximum, range, variance, and standard deviation as measures of dispersion; quartiles, median, and mean as measures of central tendency; plus skewness for symmetry, kurtosis for comparison with a normal distribution, and standard error) pertaining to the variables in the annual data tables. Moreover, the analysis is graphical and based on histograms to assess the distribution of the variables' values, boxplots to explore the structure of the variables data (namely in terms of outliers), and scatter-grams to obtain a unidirectional or bidirectional appreciation of the data. It is necessary to consider the different units of the variables to assess the need for standardization and thus, avoid the dominance of a few variables despite the loss of some detail and information.

With regard to the boxplots, it is worth noting that the outliers can be categorized in moderate or severe outliers based on the distance to the lower (25^{th} percentile) or top (75^{th} percentile) quartile exceeding either 1.5 (moderate) or 3 (severe) times the inter-quartile range [i.e., Q1 - (1.5 or 3) x IQR or Q3 + (1.5 or 3) x IQR]. Moreover, it is important to keep in mind that the mean values for the various variables in the descriptive statistics are not necessarily the same as the actual means of the variables for the countries of the OECD because the scale factors (such as the population size, among other criteria) are different for distinct variables and are not being taken into account in this study for the sake of preventing excessive complexity.

4. RESULTS AND DISCUSSION

In line with the objectives of the study, the STATIS method was applied to the OECD "How's Life" datasets for the 2009 to 2015 period. After the description of the data set, a global analysis was produced based on a PCA study before implementing the four stages of the STATIS method (interstructure, compromise, intrastructure, and trajectories). The study had been previously initiated with a cluster, statistical, and distribution analysis.

4.1. DATA DESCRIPTION

The OECD data related to the "How's Life" program for the member and associated countries (35 plus 6 countries in total) involved a varying number of observations and variables during the period from 2009 to 2015. Likewise, it was decided to focus the study on 34 member countries (excluding Chile and the associated countries due to their extensive data gaps) and to use the data for the 15 most complete variables only. Although there were some missing values (c. 5.5% that were imputed through maximum likelihood estimates or correlations), it was possible to produce a joint analysis of the several data tables based on the STATIS and PCA methods with a focus on the various individual countries.

The tables related to quantitative data collected for the same countries (34) and variables (15) in different years (7), and permitted to perform the simultaneous analysis and exploration of the entire set of data tables. The study individuals were the countries (Australia, Austria, Belgium, Canada, Switzerland, Czech Republic, Germany, Denmark, Spain, Estonia, Finland, France, United Kingdom, Greece, Hungary, Ireland, Iceland, Israel, Italy, Japan, Korea, Luxembourg, Latvia, Mexico, Netherlands, Norway, New Zealand, Poland, Portugal, Slovak Republic, Slovenia, Sweden, Turkey, and United States) while the variables involved several of the indicators measured by the OECD initiative (in accordance with the data tables of the "How's Life" report of 2017).

The study variables were: Household net-adjusted disposable income (USD at PPP, per capita, 2015); Employment rate (age 15 to 64, as % population with same age); Average annual gross earnings per full-time employee (USD at 2016 PPP); Labor market insecurity (monetary loss from unemployment, share previous earnings); Long-term unemployment rate (% labor force unemployed more than one year); Rooms per person (average number); Household expenditure on housing (% household gross adjusted disposable income); Dwellings without basic sanitary facilities (% people w/o dedicated flushing toilet); Employees working very long hours (% employees working more than 50h/week); Life expectancy at birth (years); Perceived health status (% adults self-reporting above "good"); Upper secondary education attainment per adults (% people 25-64); Social support (% people that can rely on friends or relatives); Satisfaction with water quality (% people in the population); and Feelings of safety when walking alone at night (% people).

The seven years of analysis ranged from 2009 to 2015, which was the period immediately after the global financial crisis of 2008. In this context, the objective of the study was to analyze the evolution of the various countries relative to the variables in order to identify distinct post-crisis recovery processes in association with different policies applied to a range of differentiated starting positions. Although a Dual-STATIS approach (focused on variables) would have been possible given the same 15 variables throughout the period, it was decided to employ a STATIS method in order to focus on the

same 34 individuals during the seven years of the analysis. In the appendixes to the study, there are several descriptive statistics (without scaling factors, as discussed before) with insights on the variables that justified the decision to use centered and normalized data for the variables. In addition, the same weight was attributed to all the countries in the study.

4.2. GLOBAL ANALYSIS

The analysis produced at a global level permitted to obtain a view on the general evolution and trends with regard to the conditions of life in the OECD countries during the period from 2009 to 2015 (i.e., after the 2008 global financial crisis). For this purpose, each of the years in the analysis period was treated as an observation (center of gravity) and the study variables were the selected indicators (15) of the OECD "How's Life" program. The statistical effect of the outlier observations related to Mexico and Turkey (on four variables each), Korea (on three variable), and Spain and Greece (on two variables each) was attenuated due to the standardization of data given the different units of the study variables.

In this context, the PCA conducted to eigenvalues (and associated eigenvectors) for the correlation matrix indicating that the first two axes largely explained the results given their combined variability (85.6% of the total inertia which was equal to the number of variables, i.e. 15):

	F1	F2	F3	F4	F5	F6
Eigenvalue	9.0	3.9	1.0	0.6	0.3	0.2
Variability (%)	59.8	25.8	6.9	4.3	1.9	1.3
Cumulative %	59.8	85.6	92.5	96.8	98.7	100.0

Table 4.1 – Global analysis: PCA results

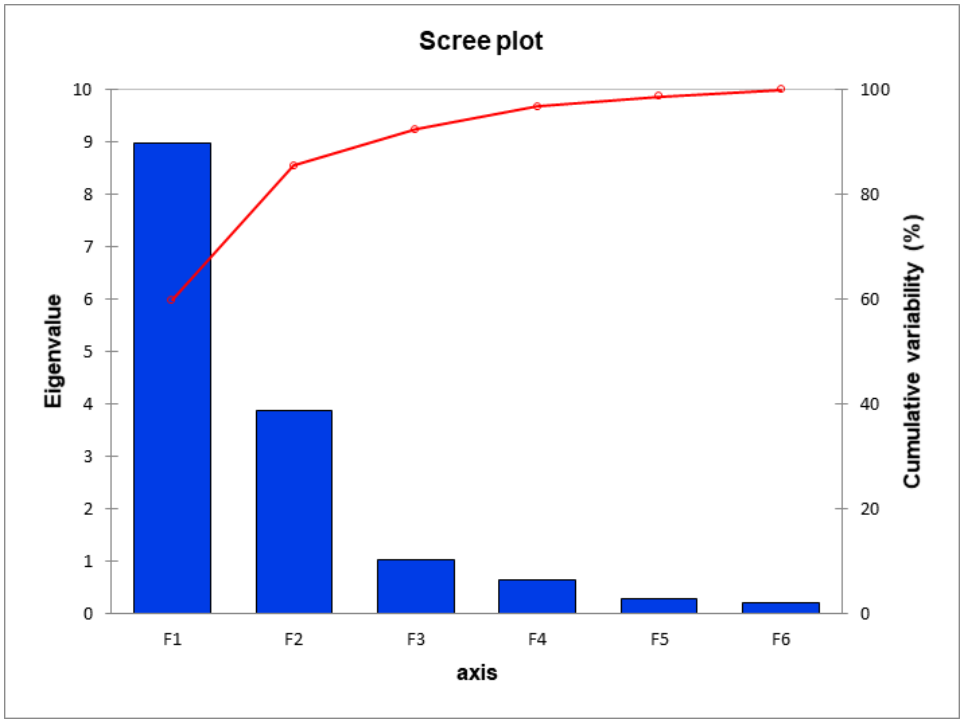


Figure 4.1 – Global analysis: Eigenvalues and variability

For the observations and variables, it was possible to obtain not only the coordinates but also the absolute contributions (CTA) and relative contributions (CTR) in relation to the first two principal components (PC1 and PC2) and first two principal axes (PA1 and PA2) as follows:

	PC1	CTA	CTR	PC2	CTA	CTR	2 CTR
2009	-4.773	0.363	0.776	2.214	0.181	0.167	0.943
2010	-3.220	0.165	0.706	0.717	0.019	0.035	0.741
2011	-0.332	0.002	0.022	-1.698	0.107	0.587	0.610
2012	0.150	0.000	0.003	-2.389	0.211	0.744	0.747
2013	0.802	0.010	0.095	-2.039	0.154	0.611	0.705
2014	2.768	0.122	0.713	0.222	0.002	0.005	0.717
2015	4.605	0.338	0.688	2.973	0.327	0.287	0.975

Table 4.2 – First plan: Observations coordinates and contributions

	PA1	CTA	CTR	PA2	CTA	CTR	2 CTR
HHinc	0.582	0.038	0.339	0.801	0.166	0.642	0.981
Empl	0.803	0.072	0.644	0.552	0.079	0.305	0.949
Salary	0.897	0.090	0.804	0.405	0.042	0.164	0.968
LabSec	-0.827	0.076	0.683	0.016	0.000	0.000	0.684
Unemp	0.689	0.053	0.475	-0.630	0.103	0.397	0.872
NoRms	0.844	0.079	0.712	-0.472	0.058	0.222	0.935
ExpHse	0.587	0.038	0.345	-0.739	0.141	0.545	0.891
BasFac	-0.780	0.068	0.608	0.483	0.060	0.234	0.842
EmpLgHrs	-0.878	0.086	0.771	-0.420	0.046	0.176	0.947
LifeExp	0.962	0.103	0.926	-0.055	0.001	0.003	0.929
HealthSt	0.589	0.039	0.347	-0.113	0.003	0.013	0.360
SecEduc	0.958	0.102	0.918	-0.087	0.002	0.008	0.925
SocSupp	-0.283	0.009	0.080	0.869	0.196	0.755	0.836
SatWater	0.622	0.043	0.387	0.628	0.102	0.394	0.781
FeelSafe	0.965	0.104	0.931	0.076	0.001	0.006	0.936

Table 4.3 – Variables coordinates and correlations

Although the representation of the observations on the first principal plan (explaining 85.6% of the total inertia) and the variables on the correlation circle was essential for the interpretation, the tables with the values relative to PC1, PC2, PA1, PA2, CTA, and CTR permitted to obtain some initial insights. In fact, it was possible to detect the opposition of observations on the first axis (time evolution) and second axis (extreme vs. intermediate years), the relevant contribution of the extreme years to axis 1 and most years (excluding 2010 and 2014) to axis 2, and the quality of the representations on axis 1 (extreme years) and axis 2 (intermediate years) which resulted in a good representation of all years on the first plan.

So, axis 1 was mainly related to the extreme years (2009, 2010, 2014, and 2015) while axis 2 was relevant for the intermediate years (2011, 2012, and 2013). Indeed, the first axis explained most of the inertia associated with the extreme four years and the second axis explained most of the inertia associated to the intermediate years. So, the first two axes explained most of the inertia associated with the individuals with the relative exception related to 2011 (with the explained inertia of 61%). Overall all years were well represented in the first principal plan.

In addition, axis 1 explained most of the variance of nine variables while axis 2 explained most of the variance of three variables and the remaining variables presented most of the variance distributed among the two axes. Likewise, the variables were well represented (with the exception of Health Status) on the first factorial plan. The main oppositions were easier to identify on the correlation circle and there was a complement of the variables in terms of contribution to each axis.

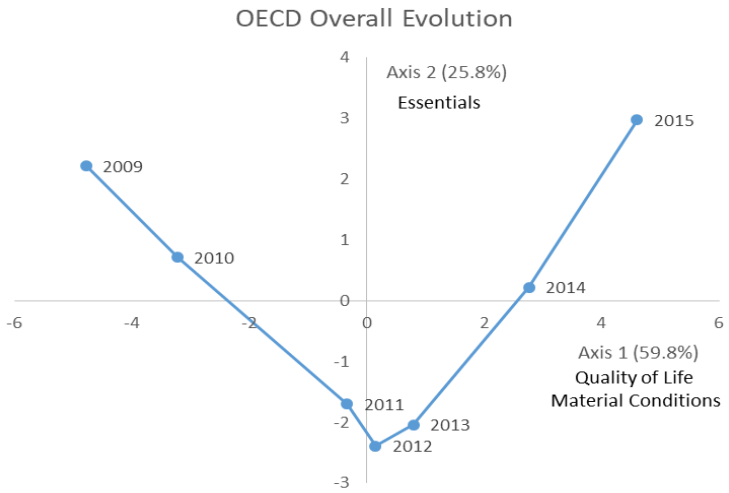
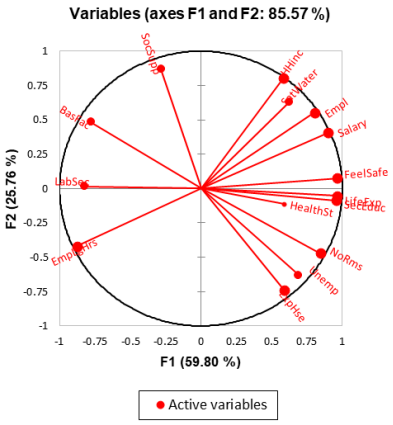


Figure 4.2 – Guttman effect: Observations on the first plan

The first plan representation indicated that the first axis related to the evolution over time of the dimensions associated with the quality-of-life and material conditions of life. In the period 2009 to 2011, the stimulus packages in the OECD countries permitted an evolution of the variables, but there was a stagnation between 2011 and 2013 mainly due to aspects related to unemployment and income. The growth phase was resumed in the years 2014 and 2015.

In relation to axis 2, there was a contrast between the initial and final years (mainly 2009 and 2015) and the intermediate years (2011 to 2013, with 2010 and 2014 almost neutral). This trough (Guttman effect) revealed a decline in essential aspects after the 2008 global crisis until 2012 (pick year for the 2008 crisis and European developments), which was gradually recovered and surpassed by the OECD (as a non-weighted whole) in 2015.



Axis 1	
Labour insecurity	Employment rate
Lack basics fac	Earnings empl
Empl long work	Rooms person
	Life expectancy
	Secondary educ
	Feel safety

Axis 2	
Unemploym rate	HH disposab inc
HH expen home	Social support
	Satisfact water

Figure 4.3 – Variables on the correlation circle and oppositions

The normalization of the data required the representation of the variables on the correlation circle which was obtained through the linear correlation coefficients between the variables and the principal components (factorial plan). In this study, the correlation circle permitted to identify the main oppositions among the variables.

Although most variables correlated fairly strongly with the first principal component, there were exceptions with a stronger contribution and correlation to axis 2. The variables correlated to the time dimension associated with axis 1 presented a stable and linear evolution along the years while the variables more related to axis 2 displayed a wider variation over time. So, most variables increased or stayed stable during the period but the variables related to the individual, family, and government budgets presented a more volatile variation in the correlation with the second principal component.

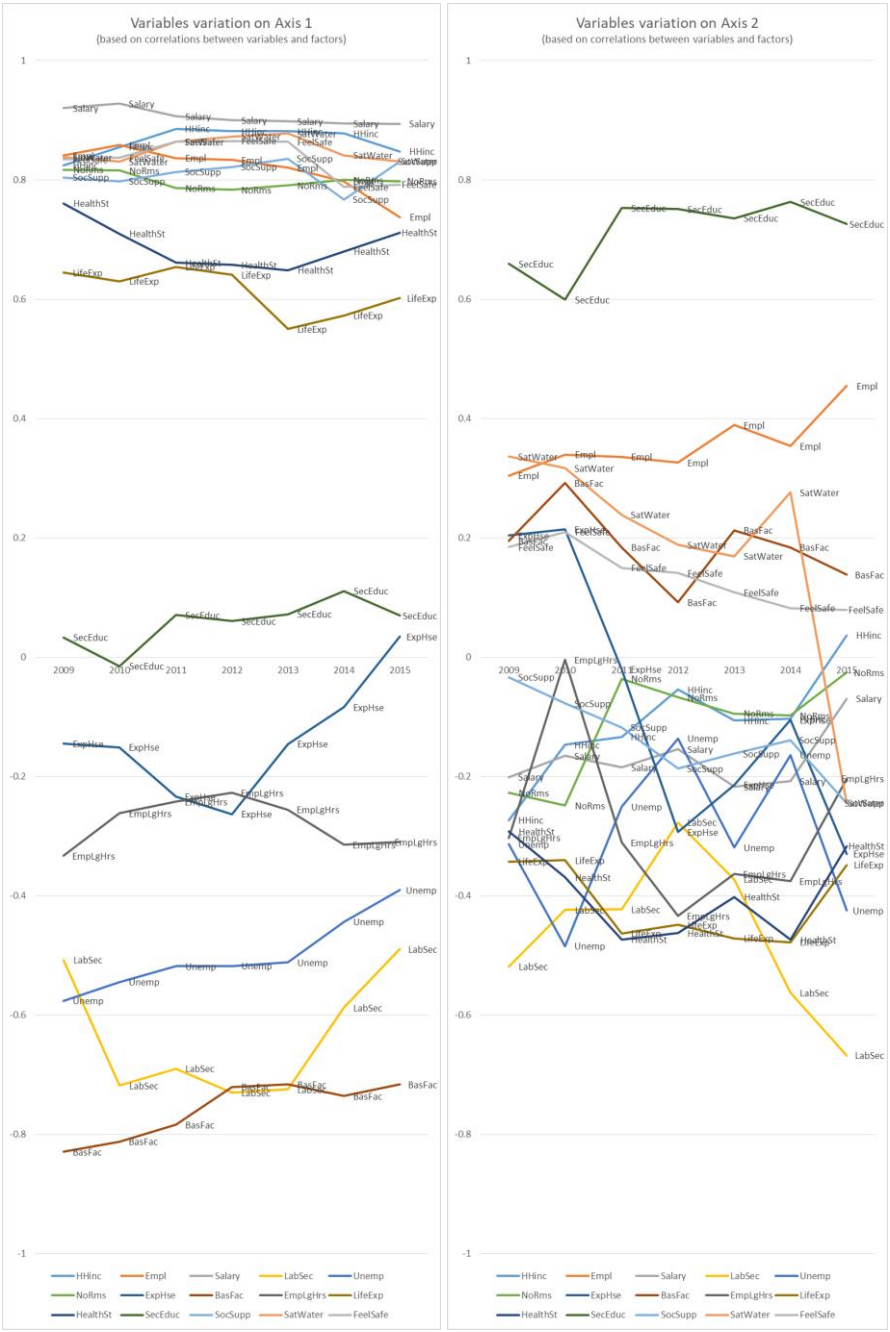


Figure 4.4 – Variables variation based on correlations between variables and factors

4.3. STATIS ANALYSIS

The study tested the use of non-normalized objects W_s and normalized objects W_s / $\|Ws\|_{HS}$ and so, it was decided to diagonalizable both $S\Delta$ (from the non-normalized process) and RV (which is equal to S with normalized objects) to study the interstructure which, of course, resulted in the same eigenvalues and variability, as follows:

S	Y2009	Y2010	Y2011	Y2012	Y2013	Y2014	Y2015
Y2009	66.4	64.3	61.0	59.8	57.9	55.0	52.4
Y2010	64.3	64.9	61.5	60.4	58.5	54.9	52.1
Y2011	61.0	61.5	62.0	61.8	60.1	56.7	53.9
Y2012	59.8	60.4	61.8	62.7	61.3	57.8	55.2
Y2013	57.9	58.5	60.1	61.3	60.5	57.2	54.7
Y2014	55.0	54.9	56.7	57.8	57.2	56.3	54.3
Y2015	52.4	52.1	53.9	55.2	54.7	54.3	54.8
‖Ws‖HS	8.1	8.1	7.9	7.9	7.8	7.5	7.4

RV	Y2009	Y2010	Y2011	Y2012	Y2013	Y2014	Y2015
Y2009	1	0.979	0.950	0.927	0.914	0.900	0.869
Y2010	0.979	1	0.969	0.946	0.934	0.909	0.872
Y2011	0.950	0.969	1	0.991	0.981	0.959	0.924
Y2012	0.927	0.946	0.991	1	0.994	0.972	0.941
Y2013	0.914	0.934	0.981	0.994	1	0.979	0.949
Y2014	0.900	0.909	0.959	0.972	0.979	1	0.977
Y2015	0.869	0.872	0.924	0.941	0.949	0.977	1

SΔ	Y2009	Y2010	Y2011	Y2012	Y2013	Y2014	Y2015
Y2009	9.5	9.2	8.7	8.5	8.3	7.9	7.5
Y2010	9.2	9.3	8.8	8.6	8.4	7.8	7.4
Y2011	8.7	8.8	8.9	8.8	8.6	8.1	7.7
Y2012	8.5	8.6	8.8	9.0	8.8	8.3	7.9
Y2013	8.3	8.4	8.6	8.8	8.6	8.2	7.8
Y2014	7.9	7.8	8.1	8.3	8.2	8.0	7.8
Y2015	7.5	7.4	7.7	7.9	7.8	7.8	7.8

Axis	Eigenvalue	Variability (%)	Cumulative %
1	6.668	95.26	95.26
2	0.217	3.10	98.37
3	0.070	0.99	99.36
4	0.018	0.26	99.62
5	0.014	0.20	99.82
6	0.010	0.14	99.96
7	0.003	0.04	100.00

Table 4.4 – $S\Delta$ and RV diagonalization

4.3.1. Interstructure

In this context, the first two axes represented 98.37% of the inertia (with the first axis alone contributing 95.26%) and so, it was viable to assess the interstructure based on the first plan:

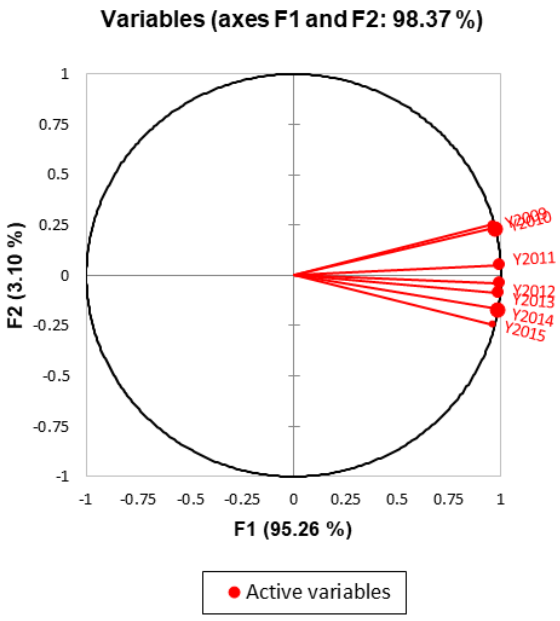


Figure 4.5 – Interstructure results

The representation on the principal plan (Figure 4.5) revealed that there was a common structure for all the objects (representing the data tables) in the period from 2009 and 2015. Apart from being possible to detect a sequential evolution from 2009 to 2015 with a good quality of the representations (the projected norms on the first axis are close to 1), it was interesting to notice that objects 2009 to 2011 were in opposition to the data tables of 2012 to 2015 in terms of axis 2 (despite the reduced inertia).

4.3.2. Compromise

After the analysis of the interstructure, it was necessary to obtain the compromise table W resulting from the weighted average of the various objects (W_s or W_s / $\|Ws\|_{HS}$) in order to represent the compromise position of the countries on the compromise Euclidean image, which was obtained through the diagonalization of the matrix WD. Even though the study tested the use of both normalized and non-normalized objects with identical results, it was decided to adopt the normalized objects W_s / $\|Ws\|_{HS}$ for the purpose of consistency throughout the study. As such, the α_s coefficients (resulting from $\alpha_s = \frac{1}{\sqrt{\lambda s}} \pi_s Y^{(s)}_1$ for normed objects W_s / $\|Ws\|_{HS}$) ranged from 0,0134 to 0,0141 (maximum 5% variation) and so, all objects had a comparable contribution to the compromise which ensured the quality of W.

Axis	Eigenvalue	Variability (%)	Cumulative %
1	15.2	44.6	44.6
2	4.2	12.3	56.9
3	3.0	8.9	65.8
4	2.3	6.9	72.7
5	1.9	5.7	78.3
6	1.5	4.4	82.7
7	1.2	3.5	86.2
8	0.9	2.8	89.0
9	0.7	2.0	91.0
10	0.6	1.7	92.7

Table 4.5 – WD diagonalization

With a view to obtaining the compromise Euclidean image, the PCA of the compromise table produced the above eigenvalues and associated inertias. For the purpose of the study, it was decided to focus on the interpretation of the first two axes which represented a combined 56.9% inertia. The meaning of each axis could be interpreted based on the correlation coefficient between the principal component of compromise and the initial variables.

In terms of axis 1, there was an opposition between variables ranging from the indispensable needs (on the left) to quality and conditions of life (on the right) and so, axis 1 could be understood as the level of development from a social and collective progress point-of-view. The aspects more exposed to axis 1 were the absence of basic facilities, unemployment, and labor security in opposition to employment, water quality, security, salary, and household income.

Axis 1 (44.6%) - Oppositions	
Labour market insecurity	Household net adjusted disposable income
Long-term unemployment rate	Employment rate
Household expenditure on housing	Average annual gross earnings per full-time employee
Dwellings without basic sanitary facilities	Rooms per person
Employees working very long hours	Life expectancy at birth
	Perceived health status
	Upper secondary education attainment per adults
	Social support
	Satisfaction with water quality
	Feelings of safety when walking alone at night

Table 4.6 – Variables opposition on axis 1

In addition, axis 2 addressed aspects that were dependent on personal welfare and wealth and thus, ranged from the requirements that were independent of financial means and capabilities to dimensions that were impacted by the circumstance at an individual level. In particular, the axis 2 presented secondary education, employment, housing expenditures, and water quality in opposition to labor security and unemployment (with negative impact) plus salary, income, health status, and life expectancy (positively affecting the individuals).

Axis 2 (12.3%) - Oppositions	
Employment rate	Household net adjusted disposable income
Household expenditure on housing	Average annual gross earnings per full-time employee
Dwellings without basic sanitary facilities	Labour market insecurity
Upper secondary education attainment per adults	Long-term unemployment rate
Social support	Rooms per person
Satisfaction with water quality	Employees working very long hours
Feelings of safety when walking alone at night	Life expectancy at birth
	Perceived health status

Table 4.7 – Variables opposition on axis 2

4.3.3. Intrastructure

With the interpretation of the axes, it was possible to present the compromise positions of the various countries on the first plan which represented the average positions of the countries during the study period (Figure 4.6). Based on K-means clustering, it was interesting to note a cluster (#1) of Central and Northern European plus North American and Australasia countries. In addition, there was a cluster (#2) of countries including the Southern and some Central European countries, and another cluster (#3) of Eastern European countries plus Korea. Finally, there were three countries (Mexico, Turkey, and Greece) in a cluster (#4) of their own.

On axis 1, there was a clear progression of the compromise positions (from cluster #4 towards cluster #1) in terms of the social progress and development (with cluster #2 being positioned in a somewhat more neutral position). In particular, countries as Turkey, Mexico, Greece, and Latvia were positioned on the "Basics" and "Elementary" quadrants of the indispensable aspects in terms of social progress. On the other hand, countries as Switzerland, Norway, Canada, and the USA were located on the "Essentials" and "Aspirational" quadrants of social progress relative to the society quality-of-life and material conditions.

Clusters (k-means)			
1	2	3	4
AUS	BEL	CZE	GRC
AUT	ESP	EST	MEX
CAN	FRA	HUN	TUR
CHE	IRL	KOR	
DEU	ISR	LVA	
DNK	ITA	POL	
FIN	PRT	SVK	
GBR	SVN		
ISL			
JPN			
LUX			
NLD			
NOR			
NZL			
SWE			
USA			

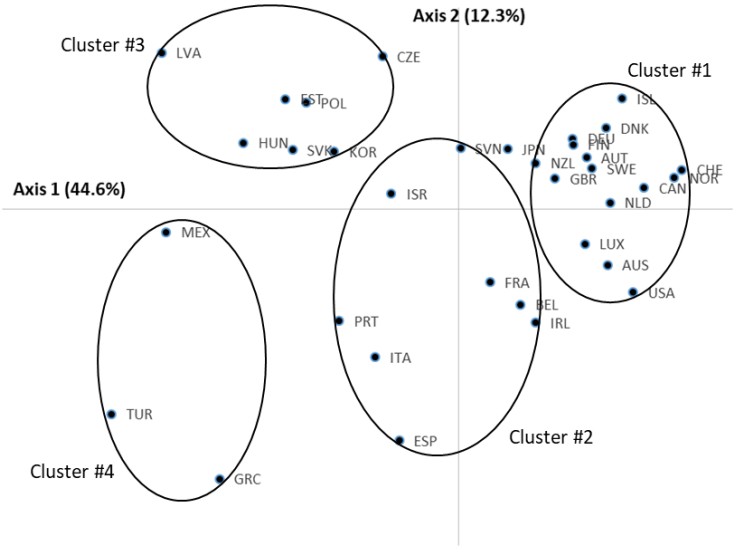


Figure 4.6 – Compromise positions

In terms of axis 2, cluster #3 appeared to be located at the level of assurance of the basic aspects regardless of individual wealth circumstances while cluster #4 seemed to be facing conditions where the personal welfare was decisive. Although clusters #1 and #2 were located in a more intermediate position in relation to axis 2, there were some significant country oppositions within each of these two clusters. In fact, there were countries with compromise positions indicating that the quality of individual life was more independent from the personal circumstances (perhaps due to the existing government policies) while others were more impacted by the wealth at an individual level.

In particular, Latvia and Czech Republic ("Basics" quadrant) plus Iceland and Denmark ("Essentials" quadrant) displayed positions that were the least dependent on personal wealth despite the significant opposition at a social level, which could reflect insipid vs. developed social mechanisms

where the individual welfare either could not be achieved with or did not require private financial means. At the other extreme of axis 2, Turkey and Greece (even more than Spain and Italy) were countries where the personal wealth was decisive in terms of the impact on the circumstances and welfare at the individual level, which suggested that the physical infrastructure could exist but was available only to those whom could afford the associated costs.

4.3.4. Trajectories

The trajectories of the various countries permitted to have a more detailed appreciation of the evolution of each country during the seven-year period of the analysis. A long trajectory indicated a country that had developed more in terms of the variables structure than the non-weighted average of the variables for the OECD countries, while a short trajectory revealed that the country had progressed in line with the variables' averages for the countries in the OECD. In this context, it was relevant to note that the countries with the most differentiated evolution were part of cluster #4 (Turkey, Greece, and Mexico) while two countries in cluster #2 (Spain and Italy) and three countries in cluster #3 (Estonia, Latvia, and Slovakia) also presented a significant evolution. In addition, there were seven countries in cluster #1 (Germany, Iceland, Netherlands, New Zealand, Norway, UK, and the USA) and one country in cluster #2 (Ireland) that presented a noticeable evolution.

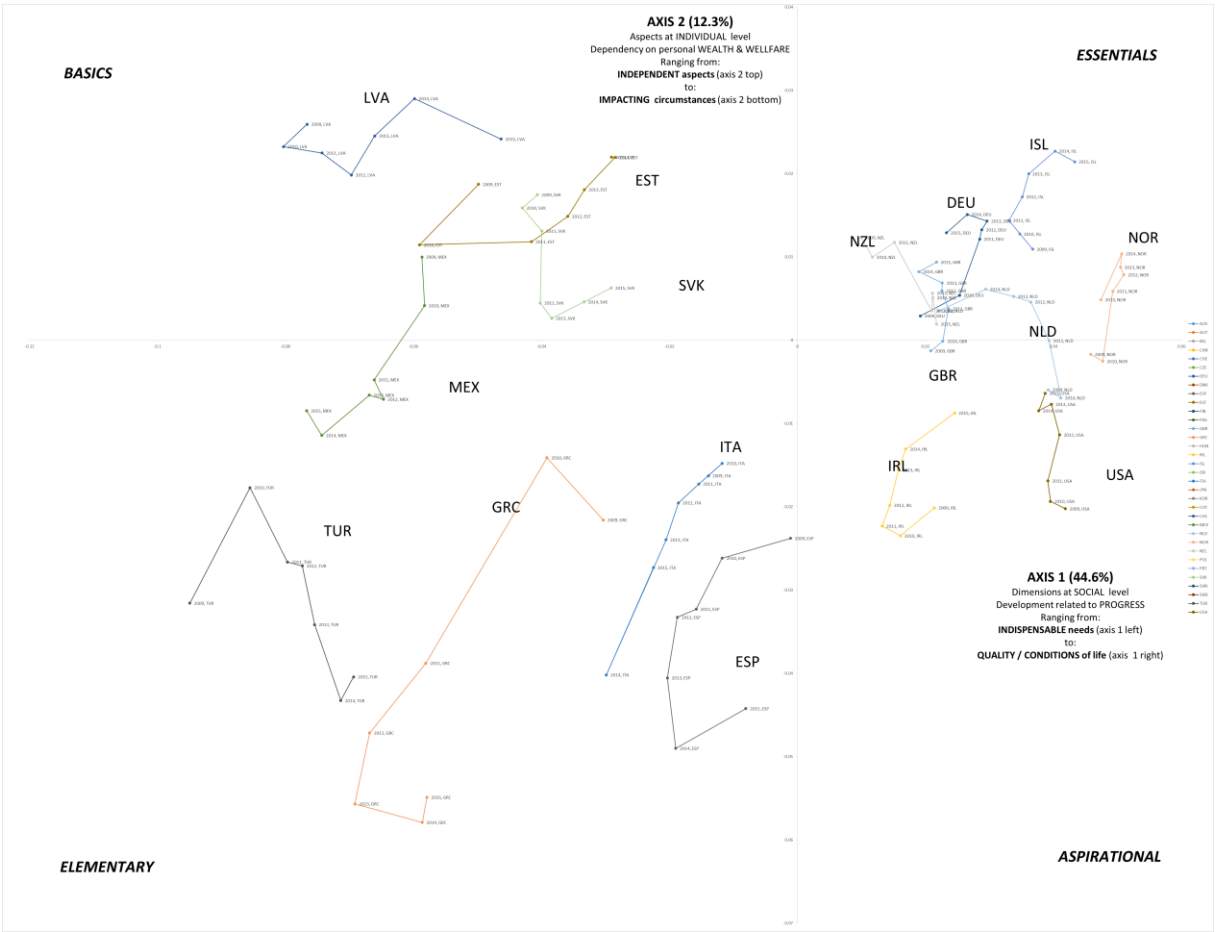


Figure 4.7 – Noticeable country trajectories

However, it was worth noting that the cluster #1 countries (plus Ireland) evolved primarily along axis 2 in the direction of reducing the dependency on individual wealth to ensure the essential

dimensions at a personal level (except for New Zealand). At the same time, the countries with the most significant evolutions in clusters #2, #3, and #4 displayed progression along not only axis 2 but also axis 1. Having said that, some of these countries (Latvia, Estonia, Slovakia, and Turkey) developed towards a higher quality and conditions of life at the society level (axis 1) which did not occur in Mexico, Greece, Italy, and Spain. With regard to axis 2, these countries displayed a trend towards an increased dependency on personal wealth to secure the necessary dimensions at the individual level (with the exception of Latvia and Estonia).

Overall, the cluster #1 countries were located in the "Essentials" quadrant and reinforcing this position (with the USA and Ireland in the "Aspirational" quadrant but moving in the "Essentials" direction). Similarly, the Cluster #3 countries (Latvia, Estonia, and Slovakia) were in the "Basics" quadrant and progressing towards the "Essentials" area while the cluster #2 and #4 countries were located in the "Elementary" area but moving away from the "Essentials" (with the exception of Turkey and the recent recovery of some countries such as Italy, Spain, and Greece).

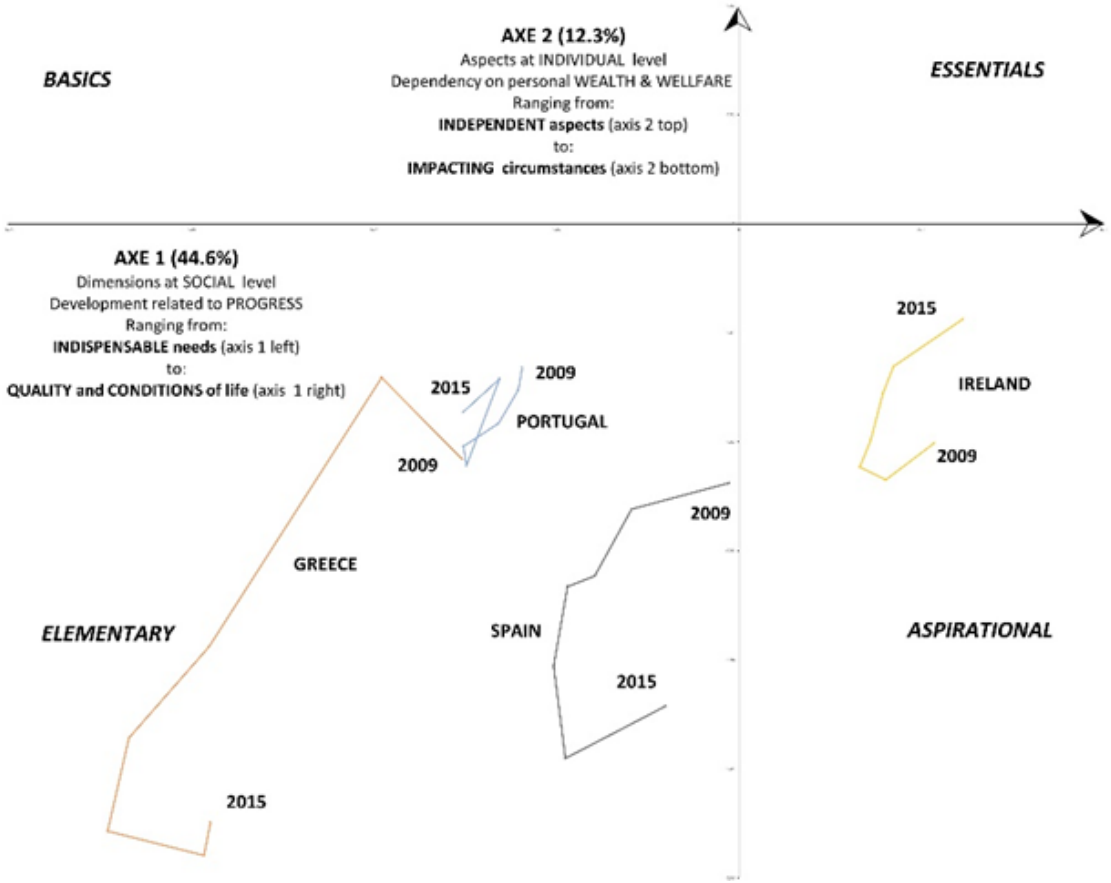


Figure 4.8 – Trajectories of bailed-out countries

The trajectories of Ireland, Greece, Portugal, and Spain were of particular interest given the bail-out programs and associated restructuring plans plus austerity measures implemented in these countries during the course of the study period (in addition to the initial stimulus packages adopted by the OECD countries after 2008). The trajectories were complemented by an analysis of the variables' variation in each country to appreciate the impact and extent of the local government and European measures and policies. In the case of Ireland, there was a trajectory inflection from 2010 onwards mainly based on the favorable movement of variables as labor insecurity, unemployment, house

expenses, working long hours, and secondary education. At the same time, Greece and Spain presented long trajectories with inflections from 2014 resulting from favorable employment, unemployment, working long-hours, secondary education, and water satisfaction (in Greece) plus household income, employment, labor insecurity, unemployment, water satisfaction, and feeling safe (in Spain). Although Portugal also benefited from a bail-out program, the country trajectory was much shorter and presented an inflection from 2013 onwards which was mainly due to favorable (but limited) movements in relation to employment, labor insecurity, unemployment, house expenses, secondary education, and feeling safe.

4.4. Cluster Analysis

In terms of clustering, the K-means algorithm applied to the interstructure permitted the identification of four clusters of countries providing a framework for the analysis of the countries' trajectories. In addition, the K-means method and hierarchical clustering were also applied to each of the data tables with a view to detecting the over time evolution of the countries in relation to the prevailing country groups.

It was interesting to notice that both methods identified a fairly stable cluster (#1) of approx. 18 (to 20) countries that were located on the quality and conditions of life ("Essentials" and "Aspirational") side of the axis 1. Then, there were 2 countries (Mexico and Turkey) with the opposed location relative to axis 1 but the composition of this cluster (#4) became more unstable towards the end of the study period with the new positions presented by some countries (mainly Spain, Italy, Greece, and Portugal).

According to the hierarchical clustering, the remaining countries presented fairly similar attributes even though it was possible to split (based on axis 2) this extended group in two clusters with the K-means algorithm. The involved countries were primarily located in Eastern Europe (cluster #3) and in Southern Europe (cluster #2). Nonetheless, there was a contrasting stability of the Eastern European countries (as a group) in relation to the countries in the South of Europe that were joined by the two countries (Mexico and Turkey) with the greatest evolution in terms of the axis 1 at the end of the study period.

4.5. Statistical and Distribution Analysis

From a statistical perspective, the main observation was relative to contrasting differences in the units of two variables (Household net-adjusted disposable income, and Average annual gross earnings per full-time employee) which made indispensable to implement a normalization of the data in particular for the global PCA study (but also employed for the STATIS study). As an indication, it was interesting to notice the distinct skewness and kurtosis values of a few variables in some years (e.g., Labor market insecurity, Long-term unemployment rate, Dwellings without basic sanitary facilities, and Employees working very long hours) which revealed a clear trend in a non-normal distribution.

With regard to data distribution, the histograms exposed the same differences in profiles and some evolution for the different variables. As such, it was possible to find variables with the data mostly distributed towards the center or either end of the range (as Labor market insecurity, Dwellings without basic sanitary facilities, and Employees working very long hours distributed towards the

lower levels while Life expectancy at birth, Upper secondary education attainment per adults, and Social support had distributions towards the higher levels). As expected, the histograms presented some evolution and changes over time but did not permit to fully appreciate the underlying structure and dynamics.

In terms of the boxplots, it was insightful to appreciate that although some variables displayed a somewhat more balanced profile (such as Household net-adjusted disposable income, Average annual gross earnings per full-time employee, Rooms per person, and Feelings of safety when walking alone at night), there were other variables that tend to present narrow second and/or third quartiles at times (but not always) combined with short first and/or fourth quartiles and the presence of distinct outliers (namely Labor market insecurity, Dwellings without basic sanitary facilities, Employees working very long hours, Upper secondary education attainment per adults, and Social support). There was not a general or predominant profile because the boxplots displayed different and evolving characteristics for the various variables, namely in terms of moderate (Q3+ or Q1- 1.5xIQR) and severe (Q3+ or Q1- 3xIQR) outliers.

It was important to take into account that the means presented for the variables were not weighted by any scale factor (e.g., population) and so, the real OECD means had distinct values. On reflection, it was decided to avoid the different weight criteria for the various variables because of the significant complexity that this approach would have brought to the study. Nonetheless, the statistical and distribution analysis permitted to have an understanding of the data sets and develop the perception that there was a significant degree of heterogeneity across the different variables involved in the study. Apart from the distinct magnitudes, the variables presented significant contrasts in relation to the distribution profiles and outliers for the set of countries involved in the multivariate analysis.

4.6. VARIABLES EVOLUTION PER COUNTRY

The correlation between the principal components of the compromise and the initial variables of the data set permitted to interpret the meaning of the first-plan axes through the position of the variables on the compromise Euclidean plan. This process revealed the existence of four groups of variables located on each quadrant: (V1 - Essentials) Employment, Secondary Education, Social Support, Water Satisfaction, and Feeling Safe; (V2 - Aspirational) Household income, Salary, Number Rooms, Life Expectancy, and Health Status; (V3 - Basics) House Expenses, and Basic Facilities; and also (V4 - Elementary) Labor Security, Unemployment, and Employed Long Hours.

From a social perspective (along axis 1), the V1 (Essentials) and V2 (Aspirational) variables were associated to the “Quality-of-Life” and “Material Conditions”, and the V3 (Basics) plus V4 (Elementary) variables represented the “Indispensable” aspects. Similarly in relation to individual dimensions (on axis 2), the combination of the V1 (Essentials) and V3 (Basics) variables represented the aspects somewhat more “Independent” from personal wealth, while the V2 (Aspirational) and V4 (Elementary) variables were associated with the “Impact” of the individual welfare (in a positive and negative way, respectively).

4.6.1. Variable Perspective

In terms of variable trends along axis 1 (social related, with 44.6% of total inertia), there were groups of countries with the greatest numbers (U1: EST, FIN, JPN, LVA, NZL, POL, and TUR) and the lowest numbers (U2: AUT, CHE, DNK, GBR, GRC, IRL, ISL, NLD, PRT, and USA) of upward variable trends related to "Quality and Conditions of Life" (V1 plus V2 variable groups). There were also groups of countries with the greatest numbers (U3: BEL, DNK, ESP, FIN, IRL, ITA, NZL, and PRT) and the lowest numbers (U4: CAN, CZE, DEU, EST, HUN, ISR, JPN, KOR, MEX, NOR, POL, SVN, SWE, TUR, and USA) of upward variable trends relative to "Indispensable" aspects (variables in V3 plus V4) (see Annex 9.62).

With regard to axis 2 (individual aspects, with 12.6% of total inertia), there were groups of countries with the greatest numbers (U5: FIN, ITA, LVA, NZL, JPN, and TUR) and lowest numbers (U6: CHE, DNK, HUN, LUX, NOR, SVK, SWE, and USA) of upward movements in terms of "Independence" (groups of variables V1 and V3) from personal welfare. In a similar way, there were groups of countries with the greatest numbers (U7: BEL, DNK, EST, FIN, FRA, LUX, NOR, NZL, POL, and SVK) and lowest numbers (U8: AUT, GBR, GRC, IRL, ISL, ISR, JPN, MEX, and NLD) of upward movements related to "Impacted" by individual wealth (variables in groups V2 and V4).

An identical analysis could be produced based on the downward trends of the variables. In relation to social aspects (axis 1), there were groups of countries with more (D1: CZE, DNK, ESP, GRC, HUN, IRL, ITA, KOR, LUX, NLD, and PRT) and less (D2: CHE, EST, FIN, JPN, LVA, NZL, and SVK) downward trends in the variables from a "Quality-of-Life" perspective (V1 and V2). Also, there were groups with more (D3: DEU, ISR, KOR, MEX, SVN, and TUR) and less (D4: BEL, CAN, CHE, DNK, GRC, IRL, ISL, ITA, LUX, PRT, and SVK) downward trends in relation to the "Indispensable" social aspects (V3 and V4).

In relation to the individual dimensions (axis 2), there were also groups with more (D5: CZE, DEU, GRC, HUN, KOR, LUX, MEX, NOR, PRT, SVN, and USA) and less (D6: BEL, CHE, and ISL) downward trends in the variables associated to "Independence" from personal wealth (V1 and V3). At the same time, there were groups of countries with more (D7: AUT, ESP, ISR, KOR, NLD, and TUR) or less (D8: CHE, EST, FIN, HUN, ISL, JPN, LUX, NOR, NZL, POL, SVK, and USA) downward trends in the variables related to the aspects "Impacted" by the individual welfare (V2 and V4).

Although these merely indicative trends were certainly influenced by the starting positions of the countries, the U1 countries (EST, FIN, JPN, LVA, NZL, POL, and TUR) and U3 countries (BEL, DNK, ESP, FIN, IRL, ITA, NZL, and PRT) had improved their relative social positions (on axis 1) during the study period in terms of the "Quality and Conditions of Life" and "Indispensable" aspects, respectively. At the same time, the U5 countries (FIN, ITA, LVA, NZL, JPN, and TUR) and U7 countries (BEL, DNK, EST, FIN, FRA, LUX, NOR, NZL, POL, and SVK) had improved their relative positions in relation to "Independence" and "Impacted" by personal welfare, respectively (along the axis 2 related to individual dimensions).

In a similar fashion, the D1 countries (CZE, DNK, ESP, GRC, HUN, IRL, ITA, KOR, LUX, NLD, and PRT) and D3 countries (DEU, ISR, KOR, MEX, SVN, and TUR) had downgraded the most their relative social position (based on the number of variables with downward trends) during the period with regard to "Quality-of-Life" and "Indispensable" aspects, respectively. Furthermore, the D5 countries (CZE, DEU, GRC, HUN, KOR, LUX, MEX, NOR, PRT, SVN, and USA) and D7 countries (AUT, ESP, ISR, KOR, NLD, and

TUR) had eroded more their relative position associated with individual aspects in terms of the "Independence" and "Impacted" by personal welfare, respectively.

With regard to general variable trends, the countries with the longest trajectories over time were TUR, GRE, and MEX (cluster #4); EST, LTV, and SVK (cluster #3); ESP, ITA, and IRE (cluster #2); and DEU, GBR, ISL, NLD, NOR, NZL, and USA (cluster #1). These countries tended to evolve towards the "Essential" quadrant, with cluster #1 progressing mainly along axis 2 and cluster #3 developing primarily in relation to axis 1. So, the following were the underlying behaviors of the variables for these countries (which were the most differentiated, given that the short trajectories indicated an evolution more in line with the average of the variables in the countries of the OECD):

		ESSENTIALS					ASPIRATIONAL					BASICS		ELEMENTARY		
		Employm	SecEduc	SocSupp	SatWater	FeelSafe	HHincom	Salary	NoRms	LifeExp	HealthSt	ExpHse	BasFac	LabSec	Unemp	EmpLgHr
C#1	DEU	up	up	flat	down	up	up	up	up	flat	flat	down	down+	down+	down+	vary
	GBR	up	up	flat	flat	up	vary	down	up	flat	down	up	down+	down+	vary+	up
	ISL	up	up	flat	flat	up	vary	up	flat	flat	down	up	flat	vary+	up+	vary
	NLD	down	up	down	flat	up	down	flat	down	flat	vary	up	flat	down+	up+	down+
	NOR	down	up	flat	flat	up	up	up	flat	up	up	down	down+	vary+	up+	vary
	NZL	up	up	flat	up	up	up	up	up	flat	up+	up	down+	down+	up+	up
	USA	up	flat	down	vary	down	up	up	up	flat	flat	down	down	down+	vary+	up
C#2	ESP	down	up	flat	up	up	down	down	down+	up	up	up	down+	up+	up+	down+
	IRL	down	up	flat	vary	up	down	down	flat	flat	flat	up	up+	vary+	up+	up+
	ITA	down	up	up	vary	up	down	down	flat	up	up	up	up+	vary+	up+	down+
C#3	EST	up	flat	up	up	up	up	vary	up	up	up	vary	down+	down+	vary+	up
	LTV	up	up	up	up	up	vary	vary	up	up	vary	up	down+	down+	up	down+
	SVK	vary	flat	vary	vary	up	vary	up	up	up	up	down	up	vary+	up+	vary
C#4	GRC	down+	up	down	up	vary	down+	down+	flat	flat	flat	up	down+	vary+	up+	vary
	MEX	up	up	down	up	vary	up	down	flat	flat	up	down	down+	down+	down+	vary
	TUR	up	up	up	up+	up	down	vary	up	up	up	down	down+	down+	down+	down

Table 4.8 – Behavior of variables for the long-trajectory countries in clusters

Among the "Essential" variables, it was clear that variables "Adult secondary education" and "Feeling safe at night" had predominantly increased for the long-trajectory countries (with the exception of "Feeling safe at night" in the USA). Although "Social support" and "Water satisfaction" were perhaps less determinant in the perhaps more mature clusters #1 and #2, they appeared to have contributed to the evolution of cluster #3 and #4 countries (including the decline trajectories of GRC and MEX). However, the dominant variable in the "Essentials" quadrant appeared to naturally be "Employment" which had increased in most of the long-trajectory countries (with some exceptions, namely the cluster #2 countries and GRC that had deteriorating trajectories with movements away from the "Essentials" quadrant). Moreover, "Employment" was also related to variables in other quadrants (namely, in "Aspirational").

In fact, variables "Household income" and "Salary" in "Aspirational" appeared to be related not only to one another but also to "Employment" in "Essentials" and "Number of rooms" in "Aspirational". The trends of "Household income", "Salary" and "Number of rooms" (plus "Employment") were most certainly determinant and associated to the generally improving trajectories of the cluster #1 and #3 countries and the globally deteriorating trajectory of the highlighted countries in clusters #2 and #4. In addition to this useful (and expectable) insight, it looked as if the variable "Life expectancy" was more relevant in the intermediate clusters #2 and #3 given that these countries were approaching the cluster #1 levels, which might not have been entirely achievable for the cluster #4 countries at this stage. In a possible association with "Life expectancy", variable "Perceived health status" displayed a somewhat similar pattern (mainly upwards) in the four clusters (with the exception of GBR and ISL).

With regard to the “Basics” variables, the variable related to the “Lack of basic sanitary facilities” presented a predominantly downward trend with a few exceptions (i.e., BEL, DEN, IRL, ITA, and SVK). Moreover, variable “Housing expenditure” seemed to present a somewhat more complex and intriguing behavior that could be resulting from a combination of different factors interacting with distinct weights in the specific context of each country. For instance, the cluster #2 countries could have been forced to face housing expenses (rather than mortgages) in the context of the deteriorating trajectory while (for instance) the USA could be experiencing the effect of a large number of mortgage defaults.

The variables in the “Elementary” quadrant appeared to be important for the long-trajectories of the countries. In fact, variable “Labor security losses” was associated with the anticipated losses of work-related income and so, a downward trend was favorable to the working people. Overall, the countries were expected to either recover work-related income or go through some fluctuation (with the exception of ESP). However, this trend was (at least) partially offset by the trend in variable “Unemployment” which tended to increase (or at best fluctuate) in all countries (except in DEU, MEX, and TUR). The last variable “Work long hours” presented a mixture of different patterns in the various clusters and so, it could be not only a consequence of other variables but also a reflection of the (lack of) existing market opportunities and needs of the population to make “ends meet”.

4.6.2. Country Perspective

From a country point-of-view, it was interesting to appreciate which variables were behind the identified trajectories. In fact, the evolution of a country during the study period could result from the contribution of either a fairly large or a relatively small number of variables and their associated trends. It was worth pointing out that the center of the compromise Euclidean space was a position that resulted from the combined evolution of the average of the variables for the OECD countries and thus, the individual country trajectories were specific variations in relation to the dynamic center of the space. In this context, the differentiated trajectory of a country in relation to the progressive center of the compromise Euclidean space resulted from the behavior of specific variables which could reveal some useful insights in relation to the country evolution.

In terms of trajectories, there were countries with an (1) upward trend (AUS, AUT, CAN, CHE, DEU, GBR, FIN, ISL, NLD, NOR, and USA), (2) downward trend (KOR, NZL, and MEX), (3) horizontal trend (EST and LVA), (4) mostly neutral trend (BEL, CZE, DNK, FRA, HUN, ISR, JPN, LUX, POL, PRT, SVN, and SWE), and (5) inflection trend (ESP, GRC, IRL, ITA, SVK, and TUR). For each of these five groups of countries, there were different variables that appeared to have been more influential and so, had performed a more decisive contribution to the trajectories of the countries during the study period.

The analysis of the variations permitted to notice that the most influential variables for each type of trajectory were associated with the following quadrants:

- (1) Upward and (3) Horizontal trends: “Essential” and “Aspirational” quadrant variables;
- (2) Downward trajectories: variables in the “Basics” and “Elementary” quadrants;
- (4) Neutral and (5) Inflection: mainly “Elementary” and “Essential” quadrant variables.

In fact, the countries with an upward or horizontal trend in their trajectories had been mainly influenced by movements in the variables associated to the "Essential" and "Aspirational" quadrants which appeared to be supporting the progression towards (or the reinforcement of) the "Essential" position. At the same time, the countries with a downward trajectory revealed an exposure mainly to the movements of the variables related to the "Basics" and "Elementary" quadrants. In addition, the countries with a fairly neutral trajectory or a trajectory that presented an inflection during the study period had been exposed to a wider range of variables with significant movements. Nonetheless, the neutral and inflection trajectory countries presented a predominant exposure to the "Elementary" and most of the "Essential" variables.

	ESSENTIALS					ASPIRATIONAL					BASICS		ELEMENTARY		
	Employm	SecEduc	SocSupp	SatWater	FeelSafe	HHincom	Salary	NoRms	LifeExp	HealthSt	ExpHse	BasFac	LabSec	Unemp	EmpLgHr
Upward															
AUS		✓		✓		✓	✓	✓							
AUT		✓			✓						✓				
CAN		✓		✓	✓	✓									
CHE					✓	✓	✓	✓				✓			
DEU	✓					✓	✓	✓							
FIN		✓			✓		✓	✓	✓		✓				
GBR	✓	✓			✓			✓							✓
ISL	✓	✓			✓		✓				✓				
NLD		✓			✓		✓				✓		✓		
NOR					✓	✓	✓								✓
USA						✓	✓	✓					✓		✓
Downward															
KOR			✓	✓						✓	✓	✓	✓	✓	
NZL												✓	✓		
MEX			✓		✓		✓				✓	✓	✓	✓	
Horizontal															
EST	✓		✓	✓	✓	✓	✓	✓							✓
LVA	✓		✓	✓	✓	✓	✓	✓	✓		✓				
Neutral															
BEL		✓		✓	✓						✓	✓		✓	
CZE	✓				✓		✓	✓				✓	✓	✓	✓
DNK		✓				✓	✓						✓	✓	✓
FRA		✓		✓	✓		✓					✓	✓	✓	✓
HUN	✓		✓		✓	✓			✓		✓	✓	✓	✓	✓
ISR	✓	✓		✓	✓		✓			✓		✓	✓	✓	✓
JPN	✓	✓		✓	✓	✓		✓		✓		✓	✓	✓	
LUX		✓			✓			✓		✓		✓	✓	✓	✓
POL	✓	✓		✓	✓	✓		✓		✓		✓	✓	✓	
PRT		✓			✓	✓	✓	✓			✓	✓	✓	✓	✓
SVN		✓		✓	✓					✓	✓	✓	✓	✓	✓
SWE	✓				✓	✓	✓						✓	✓	
Inflection															
ESP		✓		✓	✓	✓		✓			✓	✓	✓	✓	✓
GRC	✓	✓		✓	✓	✓	✓		✓		✓	✓	✓	✓	✓
IRL	✓	✓		✓	✓	✓					✓		✓	✓	✓
ITA		✓		✓		✓					✓		✓	✓	✓
SVK				✓	✓	✓	✓			✓	✓	✓	✓	✓	
TUR	✓	✓	✓	✓	✓						✓	✓	✓	✓	✓

Table 4.9 – Variables with more variation per country

Although it was possible to distinguish types of trajectories and identify the more relevant variables per country, there were groups of countries that had improved (U1 and U3 on axis 1 - Social, plus U5 and U7 on axis 2 - Individual) or deteriorated (D1 and D3 on axis 1 – Social, plus D5 and D7 on axis 2 – Individual) their positions in relation to the non-weighted average of the variables for the OECD countries. These countries experienced greater numbers of variables with upward or downward

trends, but the reality was that these variable movements did not necessarily relate to the long trajectories experienced during the period of the study.

At the country level, there were long trajectories with different patterns: upward trend (DEU, GBR, ISL, NLD, NOR, and USA), downward trend (MEX and NZL), horizontal trend (EST and LVA), and inflection trend (ESP, GRC, IRL, ITA, SVK, and TUR) that suggested the beginning of a recovery phase. Apart from a closer inspection at the variables contributing more to the inflections, the trajectories of IRL (with a clear recovery pattern from 2011 onwards) and NZL (with a slight degradation in performance over time) were worth a closer inspection in terms of trends and behaviors of the underlying variables.

With regard to ESP (Spain), there was an improvement in “Household income”, “Employment”, “Salary”, “Secondary education”, “Satisfaction with water”, and “Feeling safe” at the end of the period. For ITA (Italy), the improving variables at the end of the period were “Household income”, “Employment”, “Salary”, “Employment long hours”, “Secondary education”, and “Satisfaction with water”. In GRC (Greece), the variables with late improvement were “Household income”, “Employment”, “Employment long hours”, “Health status”, “Social support”, “Satisfaction with water”, and “Feeling safe”. The TUR (Turkey) variables improving towards the period end were “Household income”, “Salary”, “Secondary education”, “Satisfaction with water”, and “Feeling safe”.

In SVK (Slovakia), the end period improving variables were “Household income”, “Employment”, “Salary”, “Social support”, “Satisfaction with water”, and “Feeling safe”. With regard to IRL (Ireland, a true case study on its own), it was important to notice the favorable developments in relation to “Household income”, “Employment”, “Labor security losses”, “Unemployment”, “House expenses”, “Employment long hours”, “Secondary education”, “Satisfaction with water”, and “Feeling safe” (i.e., 60% of the variables in a kind of virtuous cycle effect) since 2011. The behavior of NZL (New Zealand) was somewhat puzzling in the sense that the slight downward trend appeared to be mainly the result of an increase in the levels of “Unemployment”, but this was a critical variable that affected not only economic and financial dimensions but also social aspects.

Moreover, it was also relevant to take into account the importance of the variables that supported, in general, the group of countries with the longest trajectories. In line with the previous discussions, it appeared that the most decisive variables to explain distinct trajectories were perhaps not equally applicable to most of the countries (unlike “Labor Security”, “Life expectancy”, and “Adult secondary education” that are almost universal). Based on the variables with more impact on the long trajectory countries, it might be appropriate considering the following variables among the most decisive: “Household income”, “Employment”, “Salary”, “Unemployment”, “Number of rooms”, “House expenses”, “Work long hours”, “Social support”, “Water satisfaction”, and “Feeling safe”.

5. CONCLUSIONS

Although the OECD "How's Life" datasets were not complete for all member and partner countries nor the entire set of variables, it was possible to select 34 countries and 15 variables over a period of seven years with reduced data gaps. The global analysis of the datasets permitted to detect a Guttman effect in the evolution of the OECD countries given the general progress (with a stagnation phase from 2011 to 2013) in terms of quality and conditions of life over time (axis 1). At the same time, there was a decline in relation to essential aspects (due to the volatility of the variables associated to the individual, family, and government budgets) until 2012 but the general recovery afterward permitted the overall non-weighted OECD to exceed the 2009 levels by 2015 (axis 2).

In this context, the STATIS interstructure revealed not only the existence of a common structure for the objects representing the annual data tables, but also a sequential evolution with a good representation of the years. However, it was insightful to notice the contrasting interstructure opposition of the years 2009-2011 relative to 2012-2015. The correlation coefficients of the compromise principal components and the initial variables permitted to interpret the meaning of the axes based on the variables' oppositions. So, axis 1 related to the social quality and conditions of life while axis 2 was associated with the dependency on the wealth circumstances at an individual level.

In addition, the compromise positions revealed the countries with more prominent positions. With regard to axis 1 (social aspects), the countries with a more distinctive position in terms of the "Basic" and "Elementary" aspects were TUR, MEX, GRE, and LVA while the most differentiated countries with regard to the "Essentials" and "Aspirational" dimensions were CHE, NOR, CAN, and USA. In a similar way, the most noticeable positions along axis 2 (individual dimensions) were presented by LVA and CZE ("Basics") complemented by ICE and DEN ("Essentials") in opposition to TUR and GRE (and to a lesser extent, also ESP and ITA) located in the "Elementary" quadrant.

The compromise positions (complemented by annual data evaluations) of the countries permitted to identify the existence of four main clusters. In fact, the clusters presented a progression mainly along axis 1 (related to social aspects) given that TUR, MEX, and GRC were positioned at the "Elementary" quadrant (cluster #4), some Eastern European countries (plus KOR) were fairly stable in the "Basics" quadrant (cluster #3), most Southern European countries (plus IRE and ISR) were dynamically located closer to the center of the compromise space (cluster #2), and the Northern European countries (plus the USA, CAN, AUS, and JPN) were positioned in the "Essentials" and "Aspirational" quadrants with different evolution paces (cluster #1).

Moreover, the longest trajectories and the most differentiated evolutions over time were presented by TUR, GRE, and MEX (cluster #4); EST, LTV, and SVK (cluster #3); ESP, ITA, and IRE (cluster #2); and DEU, GBR, ISL, NLD, NOR, NZL, and USA (cluster #1). Based on the graphic representation of the trajectories, it was interesting to observe that most countries tended to evolve towards the "Essentials" quadrant and so, the cluster #1 countries progressed mainly along axis 2 and the cluster #3 countries had a somewhat more predominant evolution in relation to axis 1, while the clusters #2 and #4 countries displayed a more mixed evolution combining both axes.

So, the compromise positions revealed the countries with the more prominent positions. With regard to axis 1 (social aspects), there were countries with a more distinctive position in terms of not only the "Basic" and "Elementary" aspects but also with regard to the "Essentials" and "Aspirational"

dimensions. The compromise positions and annual data permitted to also identify the existence of four main clusters with a distribution along axis 1 ranging from the “Elementary” (cluster #4) and Basics” quadrants (cluster #3) to the more central positions (cluster #2) and the “Essentials” and “Aspirational” quadrants (cluster #1). There were countries with long trajectories in all clusters but most countries tended to evolve towards the “Essentials” quadrant (i.e., cluster #1 countries along axis 2, cluster #3 countries along axis 1, and clusters #2 plus #4 countries along both axes).

Although the OECD “How’s Life” program departed from an economic and financial perspective mainly rooted on GDP, many of the decisive variables with regard to the longest country trajectories appeared to be directly (or at least semi-directly) related to the income and revenues generated at the individual, family, and government levels. On its own, this was a reassuring confirmation of the methods and criteria commonly employed at a business level for the purpose of decision making and definition of strategic priorities (e.g., analysis of PESTEL, SWOT, and Porter´s market forces).

Nonetheless, the identified critical variables (“Household income”, “Employment”, “Salary”, “Unemployment”, “Number rooms”, “House expenses”, “Work long hours”, “Social support”, “Water satisfaction”, and “Feeling safe”) revealed the importance of complementary aspects for efficient business operations and results, namely in relation to social aspects and environmental priorities. In this context, it was relevant to highlight the identified impact of the “Unemployment” variable on the downward trajectory of NZL.

It was worth noting that the countries with the largest stimulus packages in 2008-2010 with the objective of emerging stronger from the crisis (i.e., AUS, CAN, DEU, DNK, KOR, MEX, and POL) were mostly not among the countries that had the longest trajectories or had seen improvements in the greatest numbers of variables at social and individual level (i.e., U1 countries for “Quality-of-Life”, U3 countries for “Indispensable” aspects, U5 countries for welfare “Independence”, and U7 countries for welfare “Impacted”). With some exceptions, the countries with initial investments in modern infrastructure, research and development, innovation, small to medium enterprises, education, and green technologies did not appear to have started to benefit yet from these investments which could be a reflection of their starting positions and/or an indication of the insufficient elapsed time.

Apart from the fiscal and financial stimulus, government investments and expenditures, and support to families and businesses, some individual countries (e.g., GRC, PRT, IRL, and ESP) benefited from international bail-out programs (over and above the stimulus packages of 2008-2010) from approx. 2011 onwards. The impact of these separate programs was captured in the OECD “How’s Life” datasets and was reflected on the countries trajectories and variables evolution, but the study of the full extent and details of these different initiatives exceeded the scope of this study. Nonetheless, Ireland was the only bailed-out country able to surpass the pre-crisis level before the end of the study period (i.e., around 2014).

Moreover, it was clear from the results that the bailed-out countries (ESP, GRC, IRL, and PRT) and some other nations (such as ITA, SVK, and TUR) had been able to inflect their downward trajectories (albeit to distinct extents) and thus, had started to make some progress towards the “Essentials” quadrant at different paces. In this process, the variables identified as being the most important and decisive represented a compromise and required a well-judged balance involving aspects of an economic, financial, social, and environmental nature.

6. LIMITATIONS AND RECOMMENDATIONS FOR FUTURE WORKS

The study was based on the secondary data related to the OECD "How's Life" program. This program involved 35 member countries plus six associated countries and captured annual data in relation to 25 current (plus 23 future) well-being variables. The current study was based on the current well-being variables but there were multiple data gaps that limited the analysis to 34 countries (excluding Chile and the six associated countries) and 15 current variables.

In order to extend the future scope and reach of the multidimensional analysis, it would be valuable to obtain and process data in relation to not only more OECD related countries but also more variables associated to both current and future well-being dimensions. To overcome the existing data gaps, it might be possible to consider the use of primary data obtained through appropriately structured processes addressing the relevant entities.

Moreover, it would be valuable to analyze in detail the inflections in the trajectories of the countries that received specific additional support (e.g., bail-outs) in the period after the immediate post-crisis phase (i.e., from 2011 onward). In fact, some countries benefited from individual bail-out programs with results that were reflected in the country trajectories and evolution of the variables. Apart from evaluating the effectiveness of each program, it would also be beneficial to understand the efficiency of the different countries in the use of these resources, definition of priorities, and implementation of the associated policies.

An important improvement would relate to adopting specific factors for each variable in the various countries. This process might lead to degrees of complexity exceeding the scope of the current study but would permit to weigh the different variables in distinct ways in order to capture a more realistic picture at the level of the total OECD. A clear illustration of this limitation in this study is the fact that there are variables related to population (for instance, "Unemployment") that should be pondered in order to obtain more meaningful statistical results for the whole of the OECD countries.

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8. APPENDIX

8.1. APPENDIX 1

Main objectives and targets of OECD country budgetary stimulus packages excluding measures aimed at the financial system (2009)[1].

Country	Measures
Australia	Large infrastructure investments (road, rail, housing, and education infrastructure); tax measures; support to construction sector; financial support to pensions, workers, families, home owners and others; support to small enterprises (*e.g.* temporary business investment tax breaks); and training measures.
Austria	Infrastructure (thermal renovation of public buildings, schools); investment incentives through tax measures; support to SMEs (loan guarantees, direct loans, promoting export competitiveness, etc.); regional employment programme; additional R&D spending; and measures relating to day-care.
Belgium	Speeding up of public infrastructure projects and encouraging housing investment; measures to help firms (in particular small ones) to maintain their operations (alleviate financial burden of companies, facilitate payments); safeguarding purchasing power of households; and green technology and energy cost-cutting measures.
Canada	Investments in roads, bridges and public transport, investments in clean water as well as in knowledge and health infrastructure (including post-secondary institutions, research equipment, digitisation of health records, extension of access to broadband services and green energy infrastructure); investments in the renovation and retrofit of social housing and support for home ownership and the housing sector; personal and business tax relief; access to financing, support and training to citizens affected by the crisis; and support to most affected sectors and communities (*e.g.* targeted funding for the auto, forestry, agriculture, and manufacturing industries).
Czech Republic	Increase in public expenditure; lowering of taxes and social insurance contributions and direct assistance to households; and improving the functionality of the sickness insurance system. *A more comprehensive package is currently being debated.*
Denmark	Current measures mostly focused on bank aid and financial measures (beyond the scope of this analysis).
European Union	Infrastructure projects (trans-European transport projects, high-speed Internet); employment support initiative (including for the low-skilled, apprenticeships, training, reduction of social charges, etc.); investment in R&D, innovation and education; access to financing for business; reduction of administrative burdens and promotion of entrepreneurship; increase of climate change and energy security investments; improvement of the energy efficiency in buildings; and promotion of "green products" and the development of clean technologies for cars and construction.
Finland	Measures aimed at the infrastructure (transport construction and broadband); energy and mining sectors; education, research, and training; and others as part of the Finnish Innovation strategy.
France	Mainly investment in public enterprises (post, energy and railways), defense, investments in strategic areas (sustainable development and clean technologies, higher education and research and the digital economy); investment for regional and local authorities (in partnership investment in hospitals, childcare facilities and other social institutions); support to employment, housing, the financing of firms (in particular SMEs), health, and some measures for the environment. Special measures targeted at the automobile sector.
Germany	Infrastructure (particularly schools and universities, also measures to foster broadband); measures to help businesses and households retain employment and overcome the crisis (secure funding, government guarantees, reduction of non-wage labour costs, income tax cut and other means to ease burden on households – *e.g.* payments for children); training and upgrading grants (raising levels of education); fostering innovation and R&D; green technologies. Special measures targeted at the automobile sector.
Hungary	Accelerating construction projects of national importance; simplifying the application system of the National Development Plan; simplifying construction regulation, financial measures to ease financing of (small) firms (including microfinance, venture capital and interest subsidies); easing the administrative burden of firms; and R&D and Innovation support.
Iceland	Despite heavy impact of crisis, the full operation of automatic stabilizers is guaranteed; measures for unemployed and benefits to the self-employed; improving the financial capacity of households, mortgage payment adjustment for homeowners; payment adjustments for businesses (*e.g.* postponing the payment of VAT); and measures to stimulate employment, including through the acceleration of labour-intensive transportation investment projects.
Italy	Stimulating investments on infrastructures and research (including broadband); supporting low-income households (tax cuts for poorer families and pensioners); reducing the tax burden for SMEs; focus on greening the automobile sector and support to methane systems and the purchase of ecological cars.
Japan	Support for household consumption; tax reductions on mortgages; benefits for dependent persons; cutting of healthcare costs; creation of new public-sector jobs in nursing, retirement homes and childcare, and jobs relating to the protection of the environment; raising the self-sufficiency ratio of food; funds on a priority basis to research in advanced technologies and related research; and reduction of taxes for eco-friendly cars.
Korea	Focus on sustaining green technology and value-added services to build new engines of growth (including sustainable energy, technologies to reduce greenhouse gas emissions, information technologies as well as healthcare and tourism).

[1] OECD (2009). *Policy responses to the economic crisis: Investing in innovation for long-term growth*.

8.2. APPENDIX 1 (CONT.)

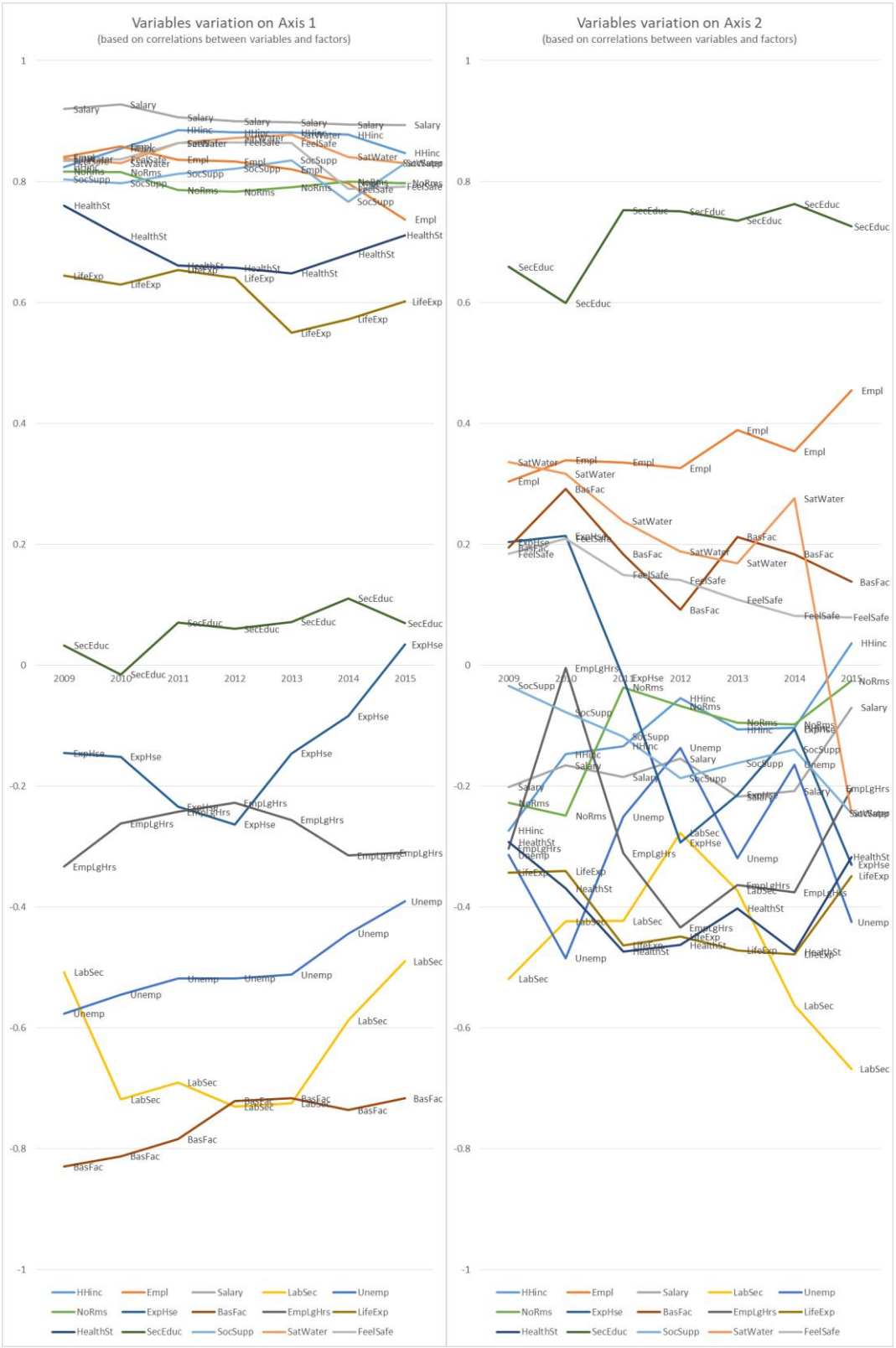
Main objectives and targets of OECD country budgetary stimulus packages excluding measures aimed at the financial system (2009)[2].

Luxem-bourg	Support of purchasing power through targeted measures; support of business activity through tax measures and financial support; of business activity through public investments; direct support of enterprises in difficulty; creation of an administrative environment conducive to economic activity; support tackling the effects of the crisis on employment; and measures to prepare growth after the crisis.
Mexico	Transport infrastructure programme; Temporary Employment Programme and the Programme to Preserve Employment; protection of family incomes (extending the social health care coverage, freeze on energy prices, and supporting households to change old home appliances to energy-saving equipment); supporting SMEs by reducing electricity prices, increasing credit availability and using government procurement targeted at SMEs.
Nether-lands	Measures focused on problems in the housing market; export credit insurance; help for medium-sized companies; and measures aimed at the health care sector. Additional package of measures aimed at sustainability, innovation, education, the labour market, infrastructure and construction.
Norway	Tax relief and measures for employment, welfare and the environment. Emphasis on municipalities (schools, nursing homes, churches); construction (in particular transport and buildings with energy efficiency in mind); employment, readjustment and skills; business R&D (direct grants and grants for PhD-students) and ICTs (infrastructure, digitising of government services, electronic signature, etc.). Also, focus on green measures.
Poland	Facilitating investment financed from EU funds; stimulating investment in telecommunication infrastructure; financing for enterprises, especially SMEs (including credit guarantees, micro-finance); support to R&D; and focus on renewable energy.
Portugal	Public investment in education (modernisation of schools); energy (especially transmission infrastructures and renewable energy) and new-generation technologies (broadband networks); promotion of economic activity and employment (creation of fund for industrial restructuring, financing facilities to SME and exporting enterprises; new corporate tax benefits; reductions of social contributions in special cases; education/training programmes); strengthening of social protection; investments in R&D; and support to the automotive sector.
Slovak Republic	Infrastructure (roads, high-speed broadband, new atomic reactors); transfer of financial sources from basic research to applied research and innovation; reallocation of funds to SMEs and venture capital; and increase energy efficiency.
Spain	Tax cuts; spending on public works and other stimulus measures to raise employment rates; liquidity to credit-strapped companies (especially SMEs) and households (families, in particular); special help to the automobile sector and modernising of basic industries such as transportation, energy, services and telecommunications; and modernisation of the public civil service.
Switzerland	Railway and road infrastructure; energy efficiency of buildings; tourism industry; and export promotion.
Turkey	Tax cuts (on income, businesses and consumption); other revenue and fiscal measures; credit facilities and guarantee schemes for SMEs; contributions for public pensions; measures to reduce unemployment; support to health care; and measures targeted at increasing economic competitiveness (details to be confirmed).
United Kingdom	Cut in value-added tax rate; acceleration of capital investment projects (likely to include some research infrastructure) and for accelerated roll-out of broadband; credit line and loan guarantees (in particular for SMEs); and measures to combat unemployment (*e.g.* paying companies to hire and train the unemployed).
United States	Direct relief to working and middle-class families (tax credit, expansion of unemployment insurance, state fiscal reliefs, etc.); large infrastructure investments (roads, public transit, high speed rail, smart electricity grid and broadband); protecting health care coverage of citizens and modernising the health sector (including its computerisation and digital health records); increased funding for key scientific and engineering agencies; modernisation of classrooms; laboratories and libraries; and fostering renewable energy production and investments.

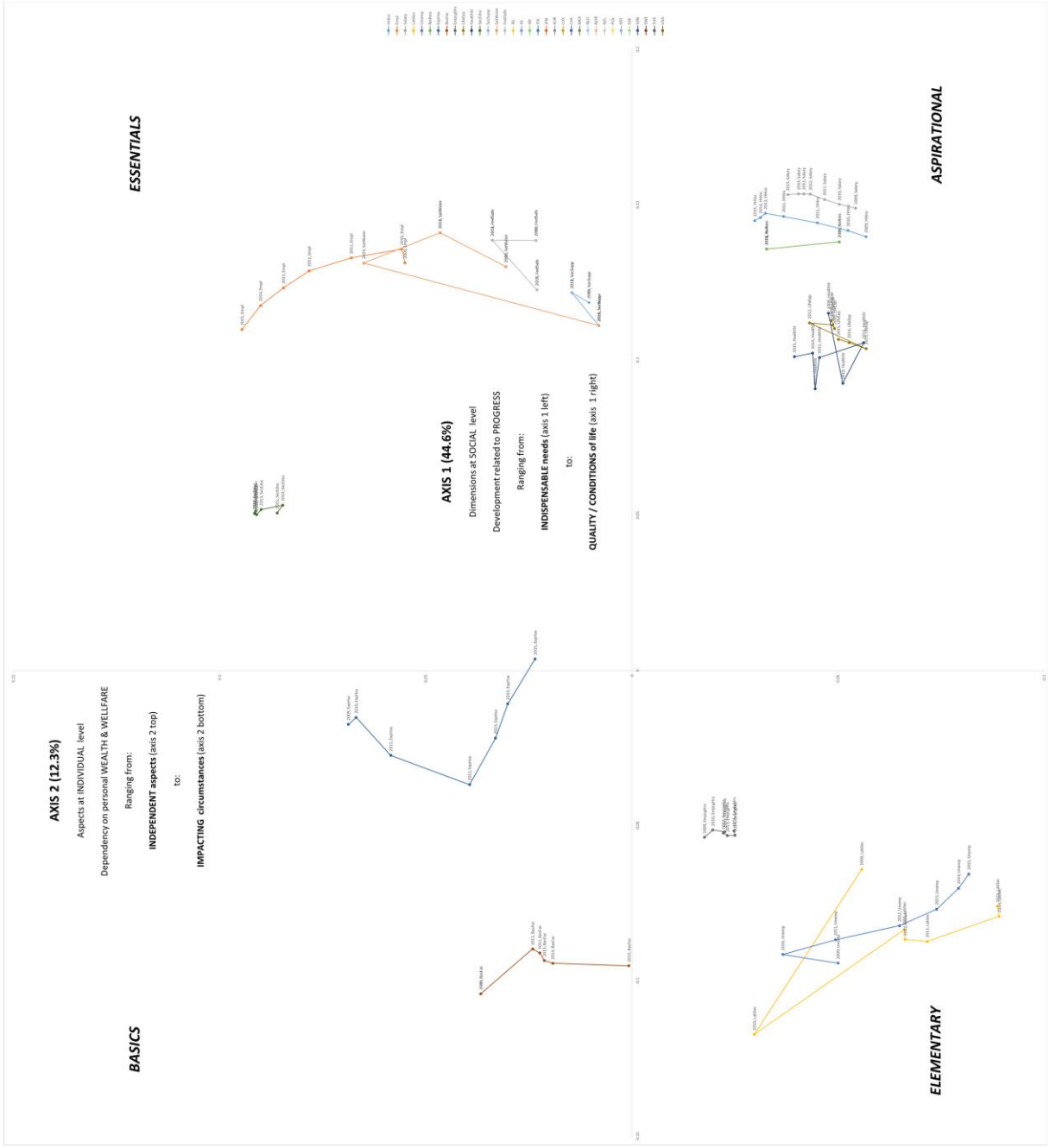
[2] OECD (2009). *Policy responses to the economic crisis: Investing in innovation for long-term growth*.

9. ANNEXES

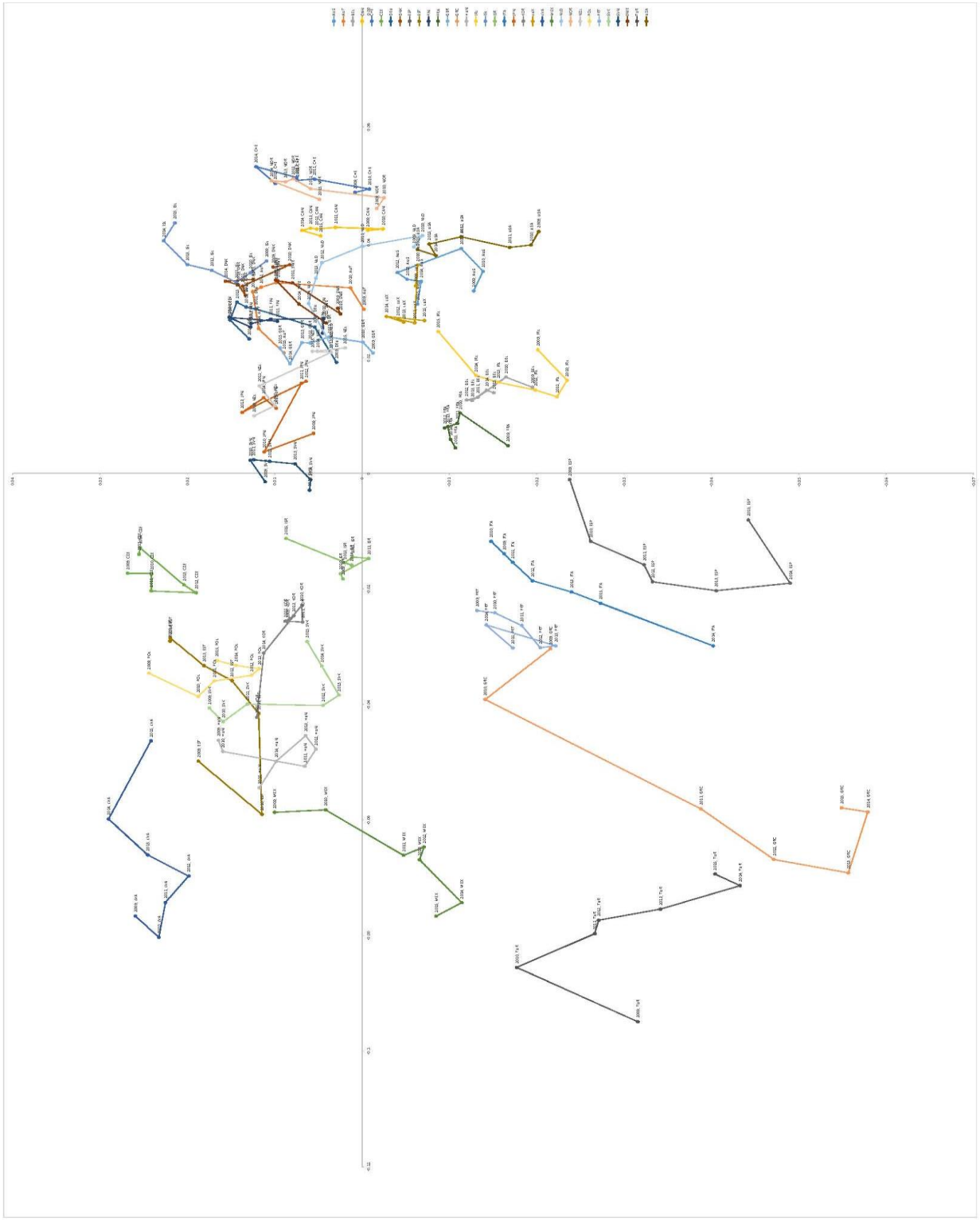
9.1. VARIABLES VARIATION ON FIRST TWO AXES



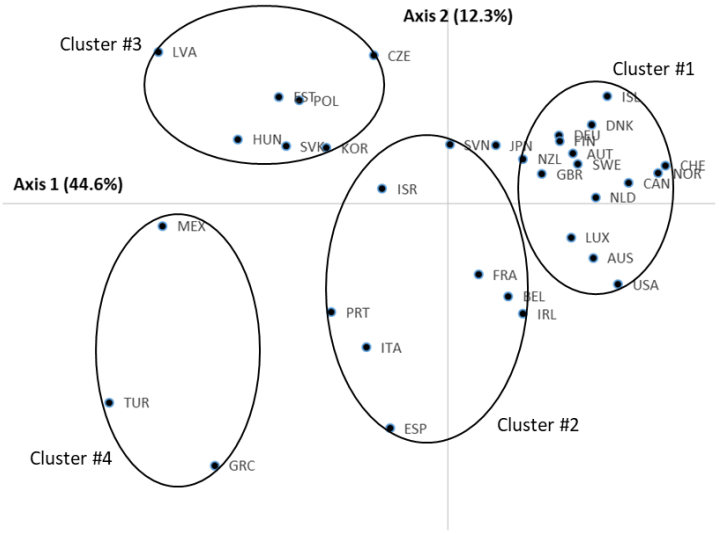
9.2. VARIABLES TRAJECTORIES



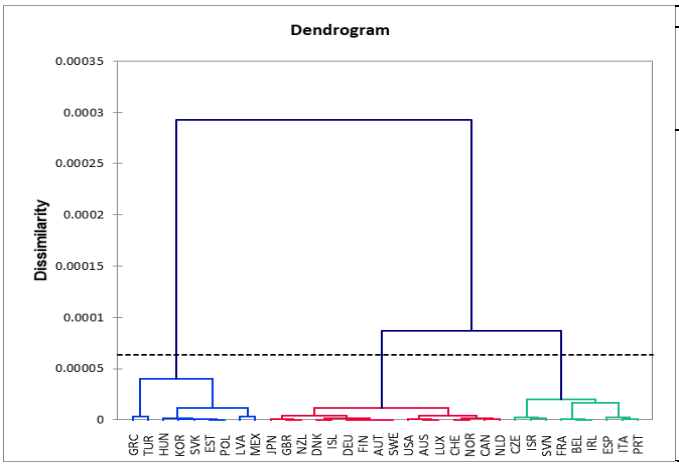
9.3. COUNTRIES TRAJECTORIES



9.4. COMPROMISE POSITIONS

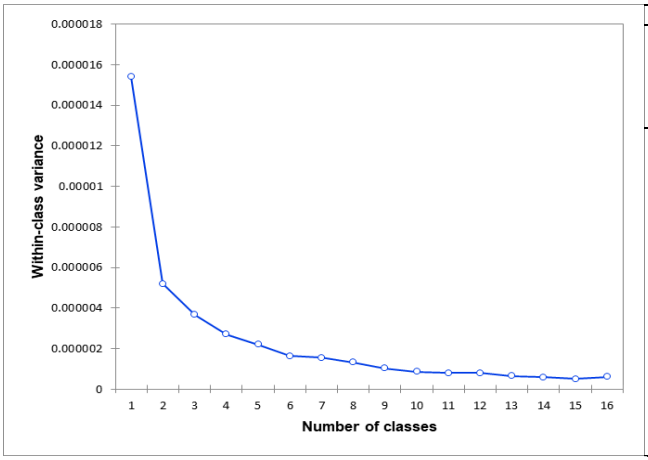


a) Agglomerative hierarchical clustering



Class	1	2	3
Objects	16.0	9.0	9.0
Within-class variance	0.0	0.0	0.0
Min distance centroid	0.0	0.0	0.0
Av distance centroid	0.0	0.0	0.0
Max distance centroid	0.0	0.0	0.0
	AUS	BEL	EST
	AUT	CZE	GRC
	CAN	ESP	HUN
	CHE	FRA	KOR
	DEU	IRL	LVA
	DNK	ISR	MEX
	FIN	ITA	POL
	GBR	PRT	SVK
	ISL	SVN	TUR
	JPN		
	LUX		
	NLD		
	NOR		
	NZL		
	SWE		
	USA		

b) K-means clustering (number of classes = 4)



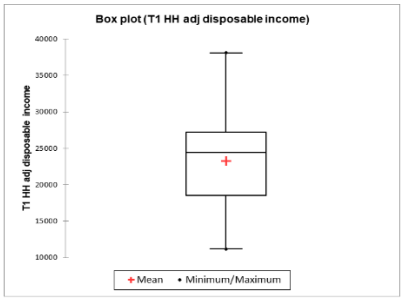
Class	1	2	3	4
Objects	16.0	8.0	7.0	3.0
Within-class variance	0.000002	0.000004	0.000003	0.000005
Min distance centroid	0.000228	0.001144	0.000134	0.001322
Av distance centroid	0.001111	0.001926	0.001228	0.001798
Max distance centroid	0.002056	0.002319	0.002849	0.002127
	AUS	BEL	CZE	GRC
	AUT	ESP	EST	MEX
	CAN	FRA	HUN	TUR
	CHE	IRL	KOR	
	DEU	ISR	LVA	
	DNK	ITA	POL	
	FIN	PRT	SVK	
	GBR	SVN		
	ISL			
	JPN			
	LUX			
	NLD			
	NOR			
	NZL			
	SWE			
	USA			

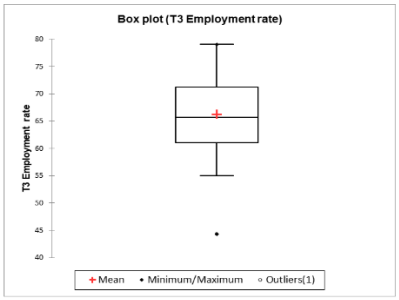
9.5. OECD "HOW'S LIFE" DATA & DESCRIPTIVE STATISTICS - 2009

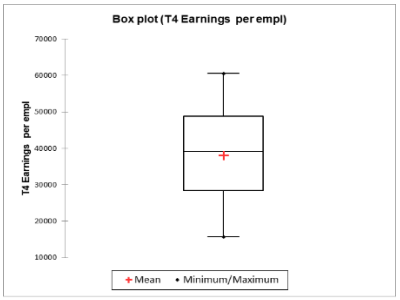
Y2009	T1 HH adj disposable income	T3 Employment rate	T4 Earnings per empl	T5 Labour insecurity	T7 Unemploym rate	T8 Rooms per person	T9 HH exp on housing	T10 Lack basic facilities	T11 Empl working long	T13 Life expect at birth	T14 Perc health status	T15 Adult upper sec educ	T18 Social support	T21 Satisf with water	T24 Feelings of safety
Australia	28525.4	72.1	49181.6	5.4	0.8	2.3	19.3	0.5	14.3	81.6	76.4	71.0	94.8	90.9	63.4
Austria	29872.4	70.3	48143.7	5.0	1.1	1.7	19.8	1.3	9.5	80.4	70.0	81.6	91.5	94.9	77.2
Belgium	27626.2	61.6	48974.0	7.0	3.5	2.2	19.3	0.8	4.2	80.1	73.5	70.6	92.3	85.0	65.5
Canada	26661.1	71.4	44677.3	5.5	0.7	2.6	22.3	0.5	3.9	80.8	88.5	87.5	94.2	88.7	77.1
Switzerland	32202.7	79.0	58219.1	3.2	1.2	1.8	21.8	0.1	5.0	82.3	80.9	86.9	93.2	96.1	76.5
Czech Republic	18181.6	65.4	21495.8	3.3	2.1	1.3	24.7	1.2	9.3	77.4	61.3	91.4	90.3	89.0	58.2
Germany	28907.6	70.4	42279.8	3.7	3.5	1.7	21.3	1.3	5.3	80.3	65.2	85.5	92.5	94.3	73.0
Denmark	24899.8	75.3	49456.7	6.3	0.6	1.9	23.0	0.0	1.9	79.0	72.3	74.8	95.2	96.6	81.0
Spain	22295.9	60.8	39248.4	13.5	4.2	1.9	19.9	0.2	6.9	81.9	70.6	51.6	93.3	78.8	65.3
Estonia	14558.3	63.7	20407.6	11.4	3.7	1.2	18.3	14.1	3.0	75.2	51.5	88.7	86.2	66.4	60.1
Finland	25918.5	68.4	41068.5	4.5	1.4	1.9	20.7	0.8	3.6	80.1	68.9	82.0	93.8	93.1	76.7
France	27833.1	64.1	40422.7	22.1	3.1	1.7	20.2	0.9	8.6	81.5	68.6	70.3	92.7	83.4	63.8
United Kingdom	26160.5	70.6	43560.7	12.4	1.9	1.8	23.3	0.7	12.0	80.4	78.2	73.7	95.5	93.3	66.8
Greece	23227.5	60.8	31874.5	34.4	3.9	1.2	20.6	2.6	5.6	80.4	75.3	61.5	82.6	66.8	55.7
Hungary	14311.3	55.0	21130.5	6.9	4.3	1.0	20.8	6.8	3.4	74.4	55.9	80.6	89.2	82.0	56.2
Ireland	24598.8	62.2	51749.3	4.0	3.6	2.0	18.1	0.4	3.4	80.3	83.1	71.2	97.1	87.0	66.3
Iceland	22792.1	78.9	43165.9	2.4	0.5	1.6	23.0	0.4	5.0	81.8	80.3	70.0	97.6	96.9	77.4
Israel	18520.5	64.3	31087.2	6.4	1.9	1.1	21.3	5.3	18.8	81.5	79.8	81.8	88.1	57.7	67.1
Italy	26408.8	57.4	35868.3	11.7	3.5	1.4	21.8	0.2	4.6	81.7	63.7	54.3	86.4	79.5	58.7
Japan	24246.2	70.0	38574.1	3.4	1.4	1.8	22.2	6.4	6.2	83.0	59.7	73.3	88.8	83.0	68.7
Korea	17507.6	62.9	30630.0	2.9	0.0	1.3	16.0	5.8	6.2	80.0	44.8	79.9	77.8	80.5	58.9
Luxembourg	27251.4	65.2	60540.4	2.4	1.2	1.8	20.5	0.6	3.5	80.7	73.9	77.3	94.3	90.6	75.6
Latvia	12694.0	60.3	18157.9	8.6	4.5	1.0	20.3	18.8	4.6	72.6	46.0	86.8	80.0	64.5	48.6
Mexico	11186.1	59.8	15745.3	6.5	0.1	1.0	23.3	5.5	29.1	74.0	59.7	31.3	86.8	68.4	48.6
Netherlands	27009.0	75.6	51772.0	3.1	0.9	2.0	18.3	0.0	0.6	80.8	77.6	73.4	94.3	93.6	73.0
Norway	29566.5	76.5	49409.4	1.4	0.2	2.0	17.9	0.2	3.0	81.0	76.5	80.7	93.1	95.3	81.4
New Zealand	21834.2	72.8	36881.1	7.6	0.4	2.3	25.0	5.3	13.4	80.7	59.7	73.3	95.6	87.3	59.6
Poland	15383.3	59.3	22864.2	9.3	2.1	1.0	22.6	5.9	7.6	75.8	56.1	88.0	91.6	77.0	61.2
Portugal	19917.5	66.1	26464.9	6.0	4.2	1.4	17.3	2.8	5.2	79.7	47.7	29.9	85.5	88.7	62.7
Slovak Republic	17080.3	60.2	21117.2	15.6	6.1	1.1	25.9	0.9	5.7	75.3	61.9	90.9	89.6	86.0	49.2
Slovenia	19295.3	67.5	33057.1	17.5	1.8	1.1	19.8	1.0	6.8	79.3	59.7	83.3	90.8	87.3	80.6
Sweden	26720.6	72.2	38947.9	10.1	1.1	1.8	20.9	0.0	1.2	81.5	79.7	85.7	92.0	96.1	70.9
Turkey	18520.5	44.3	27770.7	59.4	3.5	0.9	22.2	13.2	45.3	74.1	65.1	31.1	72.7	56.2	51.3
United States	38089.6	67.6	56610.3	17.5	1.5	2.3	19.0	0.1	10.8	78.5	87.9	88.6	92.6	88.4	76.6

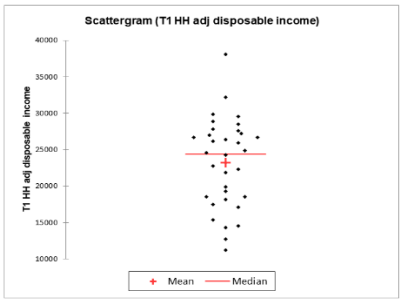
Statistic	T1 HH adj disposable income	T3 Employment rate	T4 Earnings per empl	T5 Labour insecurity	T7 Unemploym rate	T8 Rooms per person	T9 HH exp on housing	T10 Lack basic facilities	T11 Empl working long	T13 Life expect at birth	T14 Perc health status	T15 Adult upper sec educ	T18 Social support	T21 Satisf with water	T24 Feelings of safety
Minimum	11186.1	44.3	15745.3	1.4	0.0	0.9	16.0	0.0	0.6	72.6	44.8	29.9	72.7	56.2	48.6
Maximum	38089.6	79.0	60540.4	59.4	6.1	2.6	25.9	18.8	45.3	83.0	88.5	91.4	97.6	96.9	81.4
Range	26903.6	34.8	44795.1	58.0	6.1	1.7	9.9	18.8	44.7	10.4	43.7	61.5	24.9	40.7	32.8
1st Quartile	18520.5	61.0	28485.5	3.8	0.9	1.2	19.4	0.4	3.7	78.6	59.7	70.7	88.3	79.8	59.1
Median	24422.5	65.7	39098.2	6.5	1.8	1.7	20.8	0.9	5.4	80.4	69.5	78.6	92.2	87.3	65.9
3rd Quartile	27190.8	71.2	48766.4	11.6	3.5	1.9	22.3	5.3	9.1	81.4	77.3	85.7	94.1	93.2	76.3
Mean	23229.5	66.2	37957.5	10.0	2.2	1.6	20.9	3.1	8.2	79.4	68.2	73.8	90.3	84.2	66.3
Variance (n-1)	36807861.2	54.1	153556332.7	122.0	2.5	0.2	5.0	20.4	73.7	7.7	136.8	276.3	30.9	128.8	97.4
Standard deviation (n-1)	6066.9	7.4	12391.8	11.0	1.6	0.5	2.2	4.5	8.6	2.8	11.7	16.6	5.6	11.3	9.9
Skewness (Pearson)	0.0	-0.5	-0.1	3.0	0.5	0.1	0.1	2.0	2.9	-1.1	-0.3	-1.5	-1.4	-1.0	-0.2
Kurtosis (Pearson)	-0.3	0.7	-1.0	10.4	-0.7	-1.1	-0.3	3.6	9.3	-0.1	-0.7	1.6	1.8	0.1	-1.0
Standard error of the mean	1040.5	1.3	2125.2	1.9	0.3	0.1	0.4	0.8	1.5	0.5	2.0	2.9	1.0	1.9	1.7

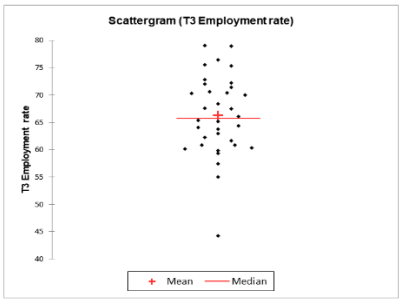
9.6. BOXPLOTS AND SCATTERGRAMS - 2009

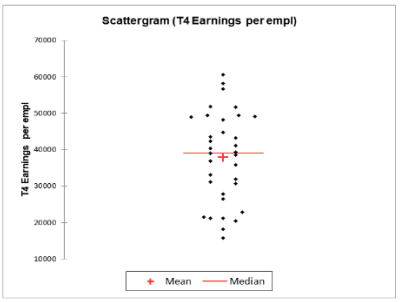


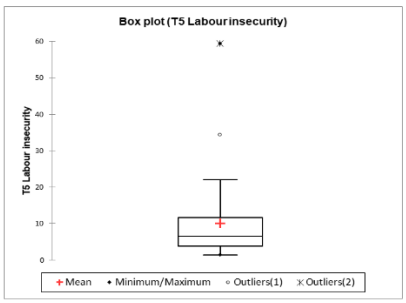


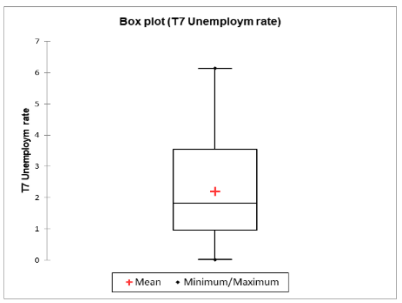


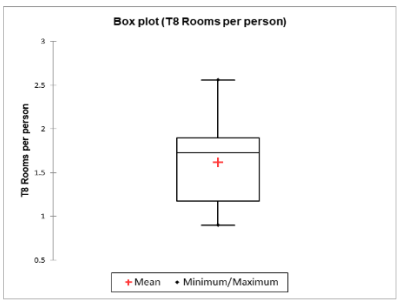


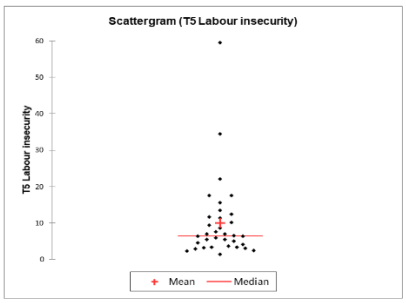


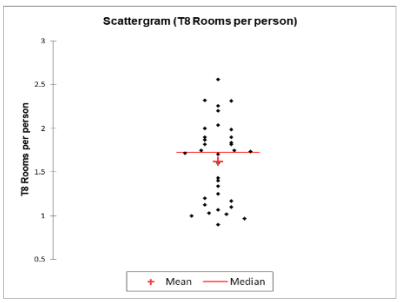


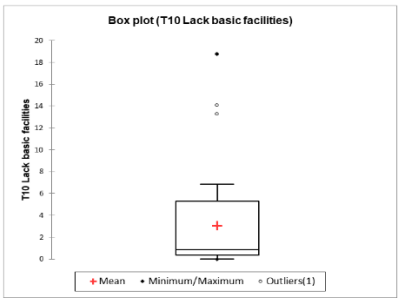


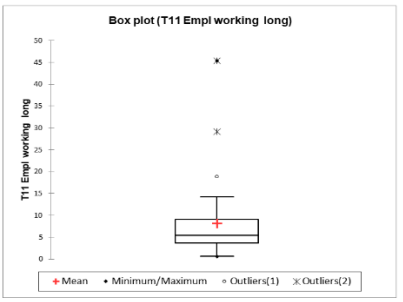




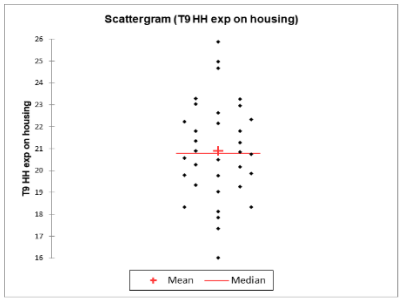


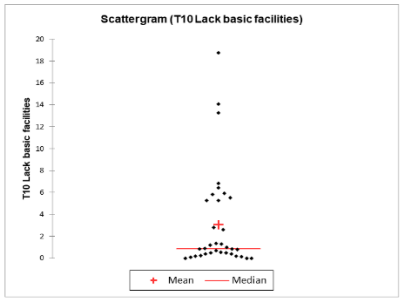


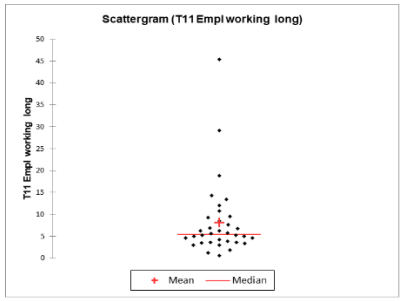


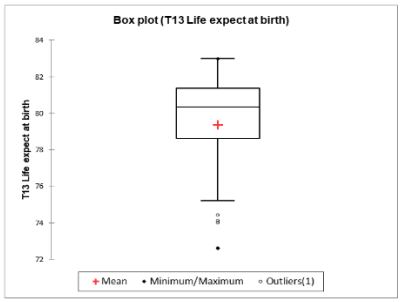


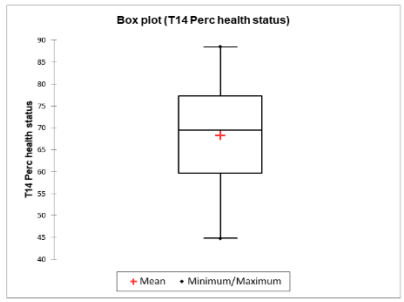
9.7. BOXPLOTS AND SCATTERGRAMS – 2009 (CONT.)

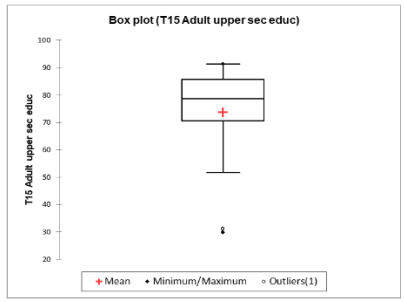


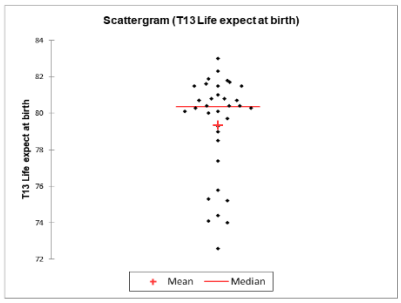


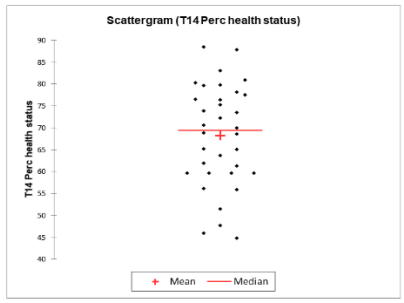


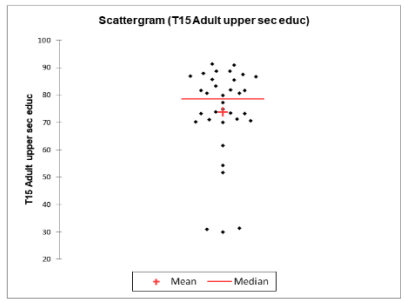


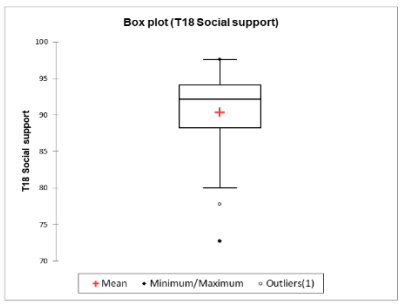


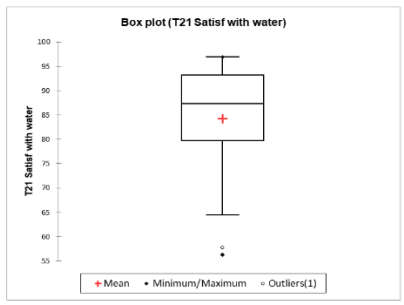


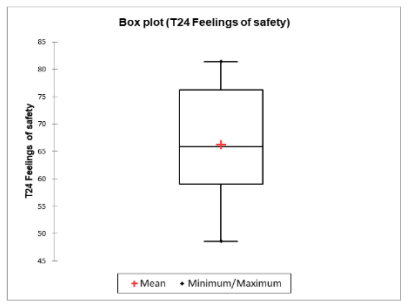


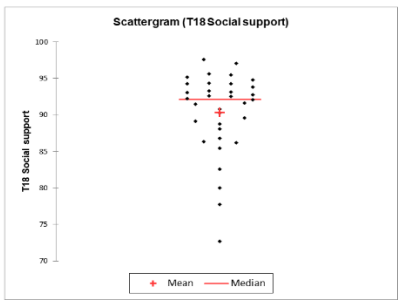


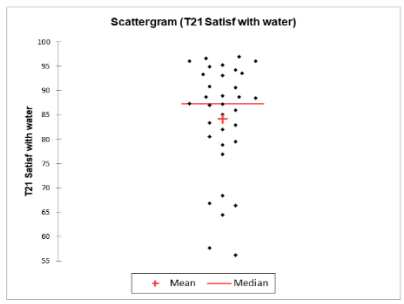


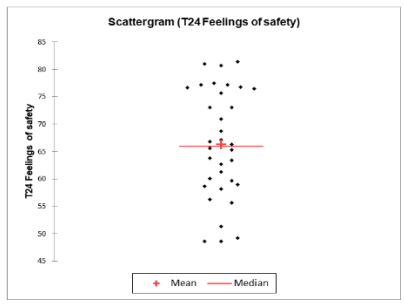




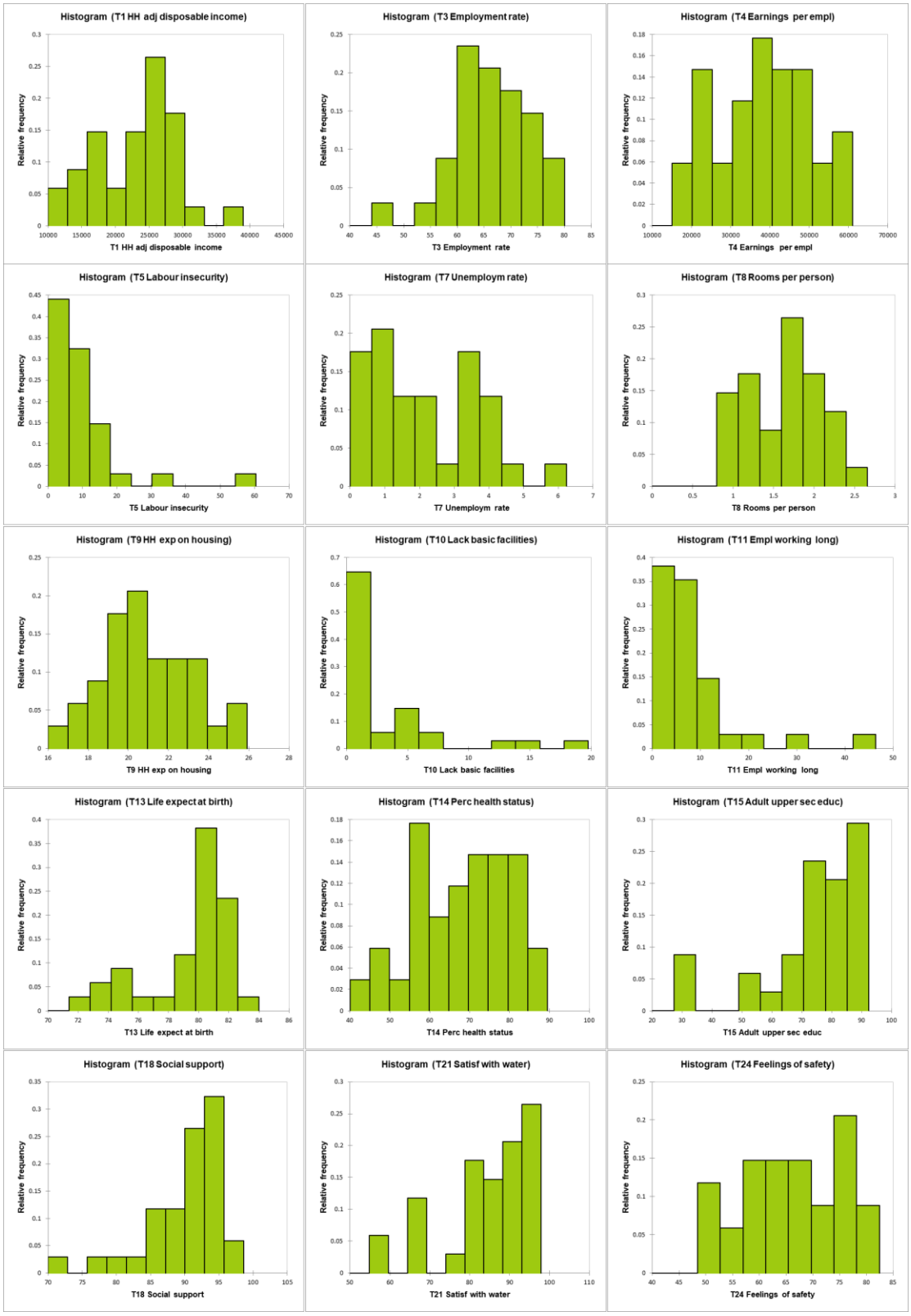






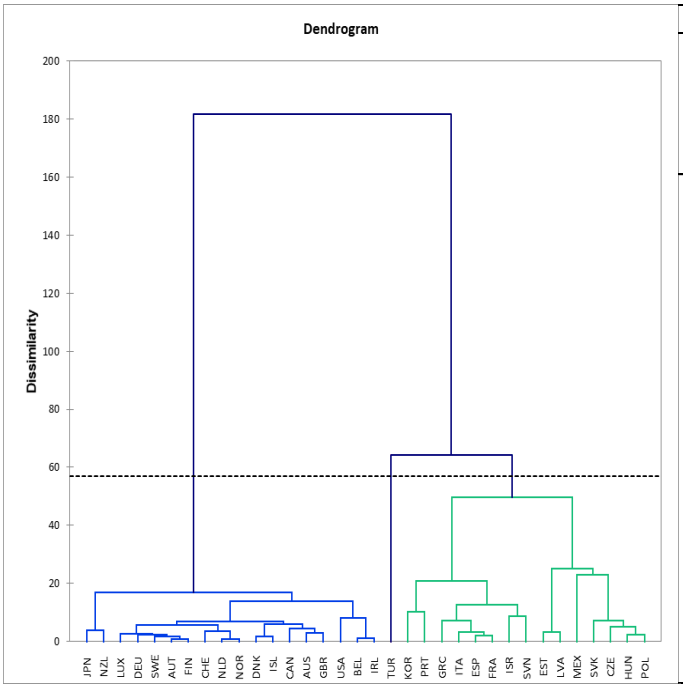


9.8. HISTOGRAMS – 2009



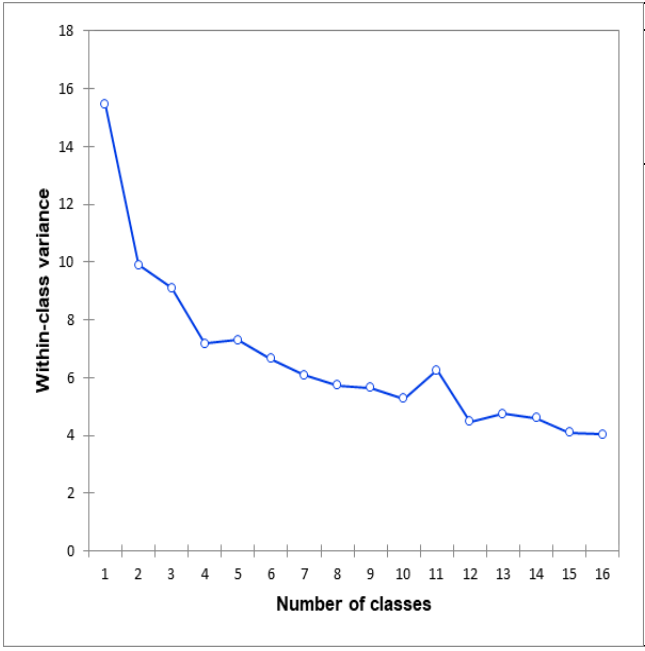
9.9. CLUSTERING ANALYSIS – 2009

a) Agglomerative hierarchical clustering



Class	1	2	3
Objects	18	15	1
Within-class variance	4.895	12.900	0.000
Min dist centroid	1.101	2.107	0.000
Aver dist centroid	2.067	3.387	0.000
Max dist centroid	3.434	4.887	0.000
	AUS	CZE	TUR
	AUT	ESP	
	BEL	EST	
	CAN	FRA	
	CHE	GRC	
	DEU	HUN	
	DNK	ISR	
	FIN	ITA	
	GBR	KOR	
	IRL	LVA	
	ISL	MEX	
	JPN	POL	
	LUX	PRT	
	NLD	SVK	
	NOR	SVN	
	NZL		
	SWE		
	USA		

b) K-means clustering (number of classes = 4)



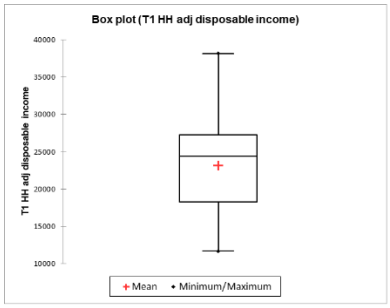
Class	1.0	2.0	3.0	4.0
Objects	18.0	6.0	8.0	2.0
Within-class varia	4.9	8.3	9.3	25.4
Min dist centroid	1.1	1.3	1.9	3.6
Aver dist centroid	2.1	2.5	2.8	3.6
Max dist centroid	3.4	3.5	3.9	3.6
	AUS	CZE	ESP	MEX
	AUT	EST	FRA	TUR
	BEL	HUN	GRC	
	CAN	LVA	ISR	
	CHE	POL	ITA	
	DEU	SVK	KOR	
	DNK		PRT	
	FIN		SVN	
	GBR			
	IRL			
	ISL			
	JPN			
	LUX			
	NLD			
	NOR			
	NZL			
	SWE			
	USA			

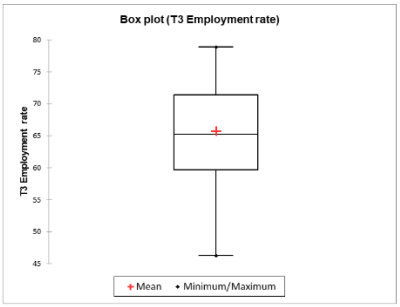
9.10. OECD "HOW'S LIFE" DATA & DESCRIPTIVE STATISTICS - 2010

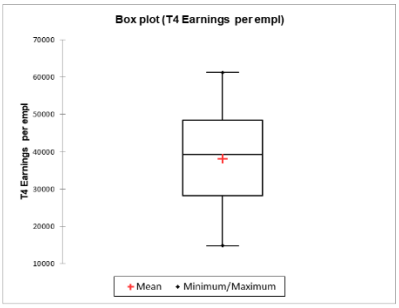
Y2010	T1 HH adj disposable income	T3 Employment rate	T4 Earnings per empl	T5 Labour insecurity	T7 Unemploym rate	T8 Rooms per person	T9 HH exp on housing	T10 Lack basic facilities	T11 Empl working long	T13 Life expect at birth	T14 Perc health status	T15 Adult upper sec educ	T18 Social support	T21 Satisf with water	T24 Feelings of safety
Australia	29390.1	72.4	50674.6	3.4	1.0	2.3	19.2	0.5	14.0	81.8	76.3	73.2	94.8	90.9	63.4
Austria	29518.9	70.8	48002.6	1.9	1.2	1.7	20.2	1.3	9.0	80.7	69.6	82.4	91.5	94.9	77.2
Belgium	27228.3	62.0	48698.8	4.6	4.0	2.2	20.0	0.8	4.5	80.3	73.0	70.5	92.3	85.0	65.5
Canada	27260.0	71.5	44801.9	4.2	1.0	2.6	22.1	0.5	3.9	81.0	88.1	88.3	94.2	88.7	77.1
Switzerland	32210.7	77.3	58257.5	2.8	1.7	1.8	22.2	0.1	5.1	82.6	81.5	85.0	93.2	96.1	76.5
Czech Republic	18157.7	65.0	21996.1	6.5	3.2	1.3	25.3	1.2	8.8	77.7	62.2	91.9	90.3	89.0	58.2
Germany	29170.3	71.2	42502.1	2.5	3.3	1.7	21.5	1.3	5.1	80.5	65.2	85.8	92.5	94.3	73.0
Denmark	25622.9	73.3	49980.0	3.7	1.5	1.9	23.5	0.0	2.0	79.3	71.0	75.6	95.2	96.6	81.0
Spain	21564.3	59.7	38530.5	18.4	7.3	1.9	21.0	0.2	6.6	82.4	71.8	52.9	93.3	78.8	65.3
Estonia	14121.9	61.2	20231.2	15.9	7.5	1.2	18.3	14.1	3.7	75.9	52.7	89.1	86.2	66.4	60.1
Finland	26406.3	68.3	41722.7	2.9	2.0	1.9	21.2	0.8	3.9	80.2	68.3	83.0	93.8	93.1	76.7
France	28095.2	64.0	41181.7	4.5	3.6	1.7	20.4	0.9	8.6	81.8	67.3	70.8	92.7	83.4	63.8
United Kingdom	26227.3	70.2	43446.6	5.0	2.5	1.8	23.4	0.7	11.8	80.6	79.4	75.1	95.5	93.3	66.8
Greece	20761.7	59.1	29828.7	18.1	5.7	1.2	22.3	2.6	5.1	80.7	75.5	62.7	82.6	66.8	55.7
Hungary	13971.4	55.0	21174.8	10.1	5.6	1.0	21.4	6.8	3.2	74.7	55.0	81.3	89.2	82.0	56.2
Ireland	24111.2	60.0	51286.8	6.4	6.8	2.0	18.0	0.4	3.7	80.8	82.8	72.8	97.1	87.0	66.3
Iceland	20357.8	78.9	45052.1	3.0	1.6	1.6	24.8	0.4	5.1	82.0	77.8	70.7	97.6	96.9	77.4
Israel	18326.2	65.2	30773.3	5.2	1.9	1.1	21.9	5.3	19.1	81.7	81.1	82.1	88.1	57.7	67.1
Italy	25926.5	56.8	36219.2	6.8	4.1	1.4	22.6	0.2	4.6	82.1	66.7	55.2	86.4	79.5	58.7
Japan	24753.4	70.1	39276.8	3.3	1.9	1.8	22.3	6.4	5.9	82.9	30.0	75.1	88.8	83.0	68.7
Korea	18052.9	63.3	31192.2	2.6	0.0	1.3	16.1	5.8	5.9	80.2	37.6	80.4	77.8	80.5	58.9
Luxembourg	27501.3	65.2	61246.7	1.2	1.3	1.8	20.8	0.6	3.7	80.7	75.3	77.7	94.3	90.6	75.6
Latvia	12120.6	58.5	17504.5	9.2	8.8	1.0	20.8	18.8	2.5	73.0	47.8	88.6	80.0	64.5	48.6
Mexico	11711.0	59.7	14829.8	5.7	0.1	1.0	22.4	5.5	29.4	74.1	59.4	32.1	86.8	68.4	48.6
Netherlands	26864.3	74.7	52020.9	1.5	1.2	2.0	18.5	0.0	0.7	81.0	78.0	73.0	94.3	93.6	73.0
Norway	29867.1	75.4	49967.7	1.5	0.3	2.0	18.7	0.2	2.7	81.2	76.7	80.6	93.1	95.3	81.4
New Zealand	22145.8	72.2	37198.3	5.4	0.6	2.3	24.9	5.3	13.8	80.8	59.4	75.1	95.6	87.3	59.6
Poland	15583.9	58.9	23501.5	15.2	2.5	1.0	22.7	5.9	7.4	76.5	57.8	88.5	91.6	77.0	61.2
Portugal	20048.9	65.3	26425.3	9.9	5.6	1.4	17.8	2.8	5.4	80.0	49.2	31.9	85.5	88.7	62.7
Slovak Republic	17153.9	58.8	22035.9	13.3	8.5	1.1	25.5	0.9	5.4	75.6	63.5	91.0	89.6	86.0	49.2
Slovenia	19155.1	66.2	34046.8	4.0	3.1	1.1	20.4	1.0	6.1	79.8	59.6	83.3	90.8	87.3	80.6
Sweden	26853.4	72.1	39231.0	7.3	1.5	1.8	21.3	0.0	1.3	81.6	80.0	86.3	92.0	96.1	70.9
Turkey	18326.2	46.3	27794.1	10.4	3.4	0.9	21.8	13.2	45.6	74.3	66.0	31.2	72.7	56.2	51.3
United States	38186.1	66.7	57012.7	8.1	2.8	2.3	18.8	0.1	11.0	78.6	87.6	89.0	92.6	88.4	76.6

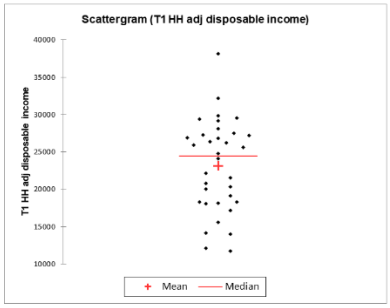
Statistic	T1 HH adj disposable income	T3 Employment rate	T4 Earnings per empl	T5 Labour insecurity	T7 Unemploym rate	T8 Rooms per person	T9 HH exp on housing	T10 Lack basic facilities	T11 Empl working long	T13 Life expect at birth	T14 Perc health status	T15 Adult upper sec educ	T18 Social support	T21 Satisf with water	T24 Feelings of safety
Minimum	11711.0	46.3	14829.8	1.2	0.0	0.9	16.1	0.0	0.7	73.0	30.0	31.2	72.7	56.2	48.6
Maximum	38186.1	78.9	61246.7	18.4	8.8	2.6	25.5	18.8	45.6	82.9	88.1	91.9	97.6	96.9	81.4
Range	26475.1	32.6	46416.9	17.1	8.8	1.7	9.4	18.8	44.9	9.9	58.1	60.7	24.9	40.7	32.8
1st Quartile	18326.2	59.7	28302.8	3.1	1.3	1.2	20.1	0.4	3.8	78.8	59.4	71.3	88.3	79.8	59.1
Median	24432.3	65.2	39253.9	5.1	2.5	1.7	21.3	0.9	5.3	80.7	69.0	79.1	92.2	87.3	65.9
3rd Quartile	27252.1	71.4	48524.8	8.9	4.1	1.9	22.4	5.3	8.8	81.5	77.5	85.6	94.1	93.2	76.3
Mean	23139.8	65.7	38166.1	6.6	3.1	1.6	21.2	3.1	8.1	79.6	67.4	74.5	90.3	84.2	66.3
Variance (n-1)	38252970.9	52.0	158167779.3	22.9	6.1	0.2	5.0	20.4	75.3	7.4	183.3	269.0	30.9	128.8	97.4
Standard deviation (n-1)	6184.9	7.2	12576.5	4.8	2.5	0.5	2.2	4.5	8.7	2.7	13.5	16.4	5.6	11.3	9.9
Skewness (Pearson)	0.0	-0.3	-0.1	1.1	0.9	0.1	-0.1	2.0	2.9	-1.1	-0.8	-1.5	-1.4	-1.0	-0.2
Kurtosis (Pearson)	-0.4	-0.1	-1.0	0.3	-0.3	-1.1	-0.3	3.6	9.3	0.0	0.4	1.7	1.8	0.1	-1.0
Standard error of the mean	1060.7	1.2	2156.8	0.8	0.4	0.1	0.4	0.8	1.5	0.5	2.3	2.8	1.0	1.9	1.7

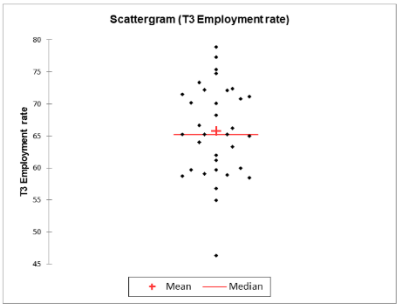
9.11. BOXPLOTS AND SCATTERGRAMS - 2010

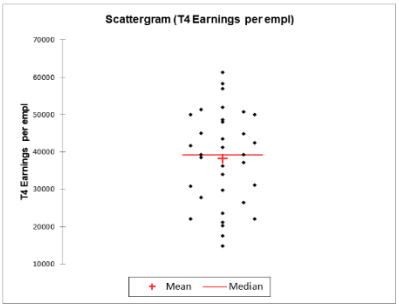


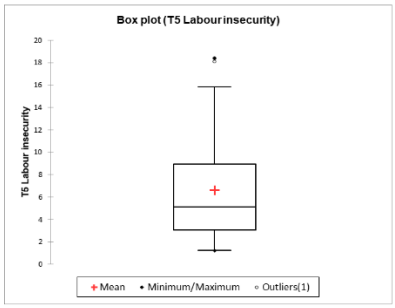


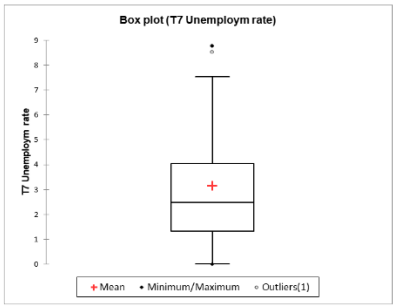


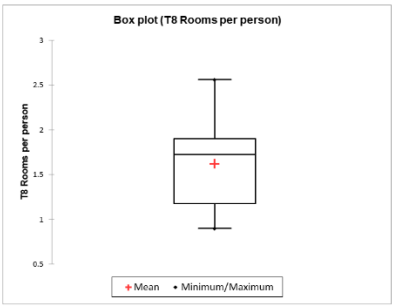


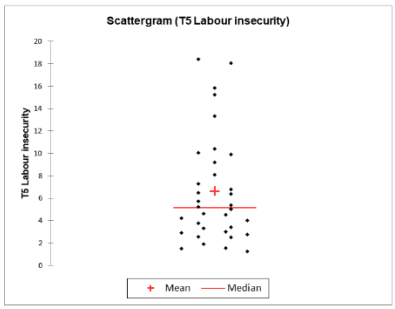


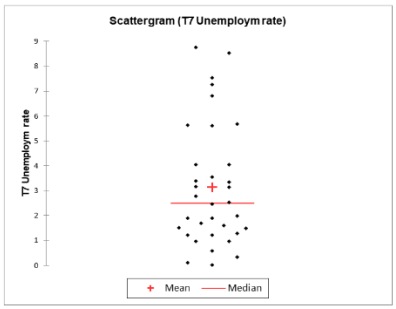


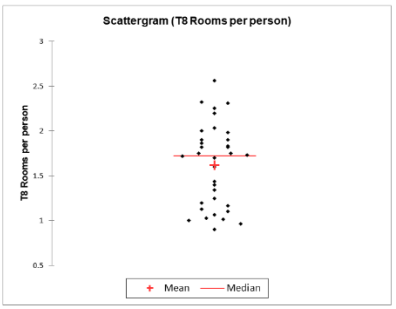


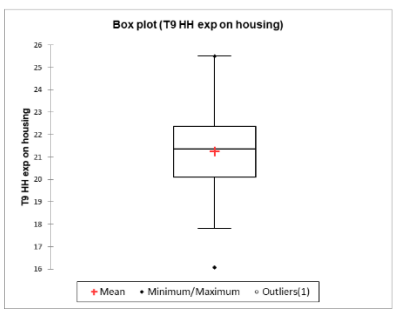


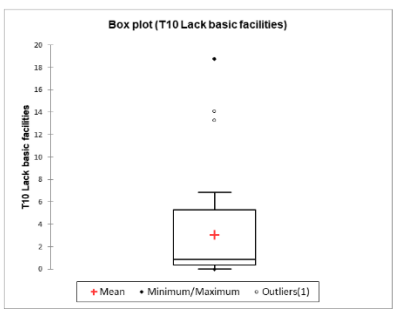


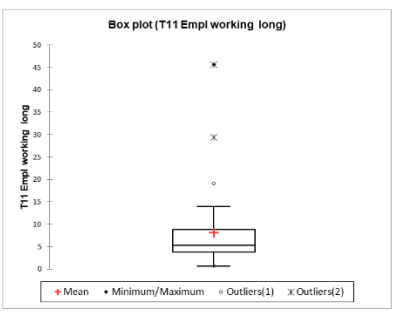




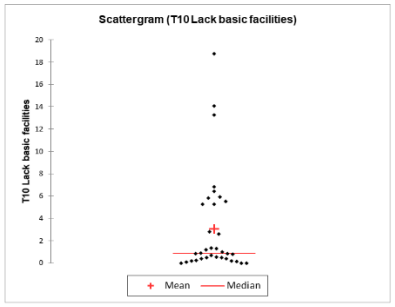


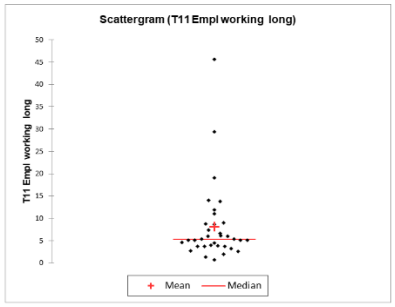


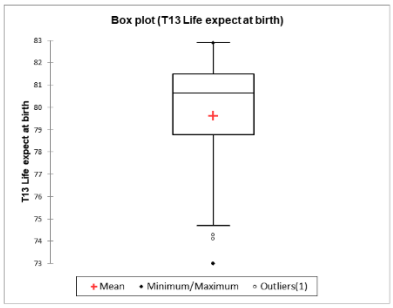


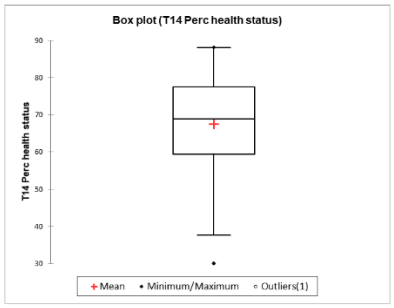


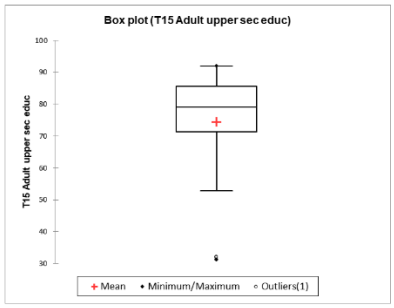
9.12. BOXPLOTS AND SCATTERGRAMS – 2010 (CONT.)

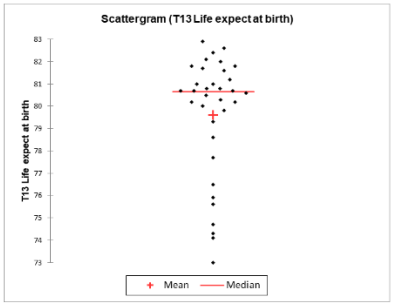


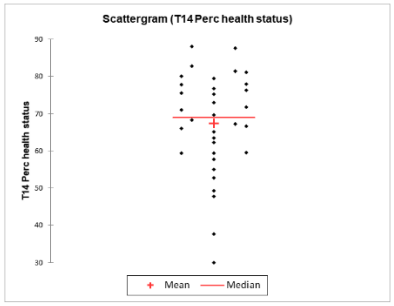


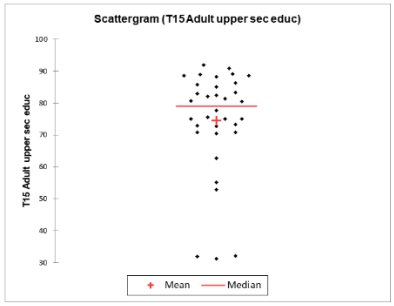


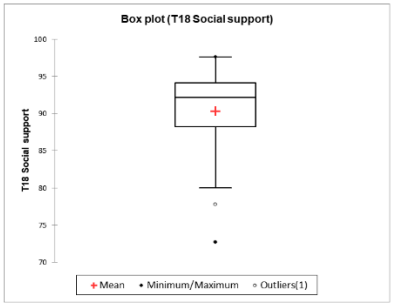


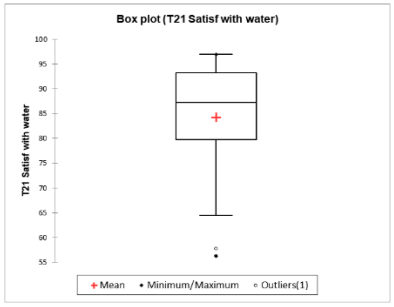


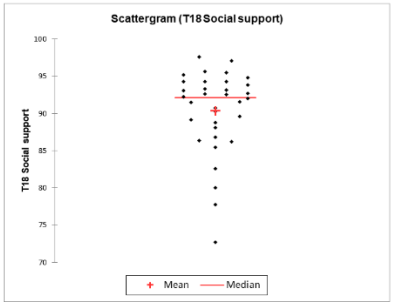


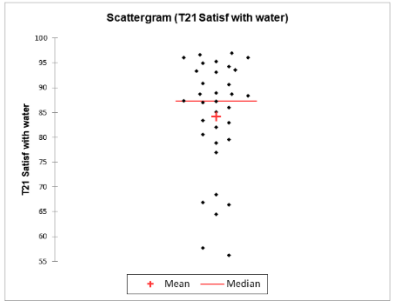


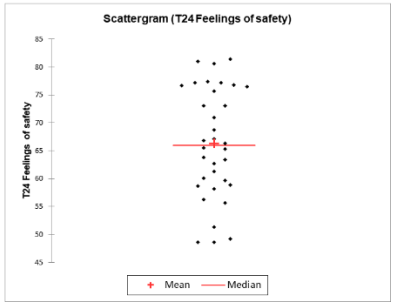




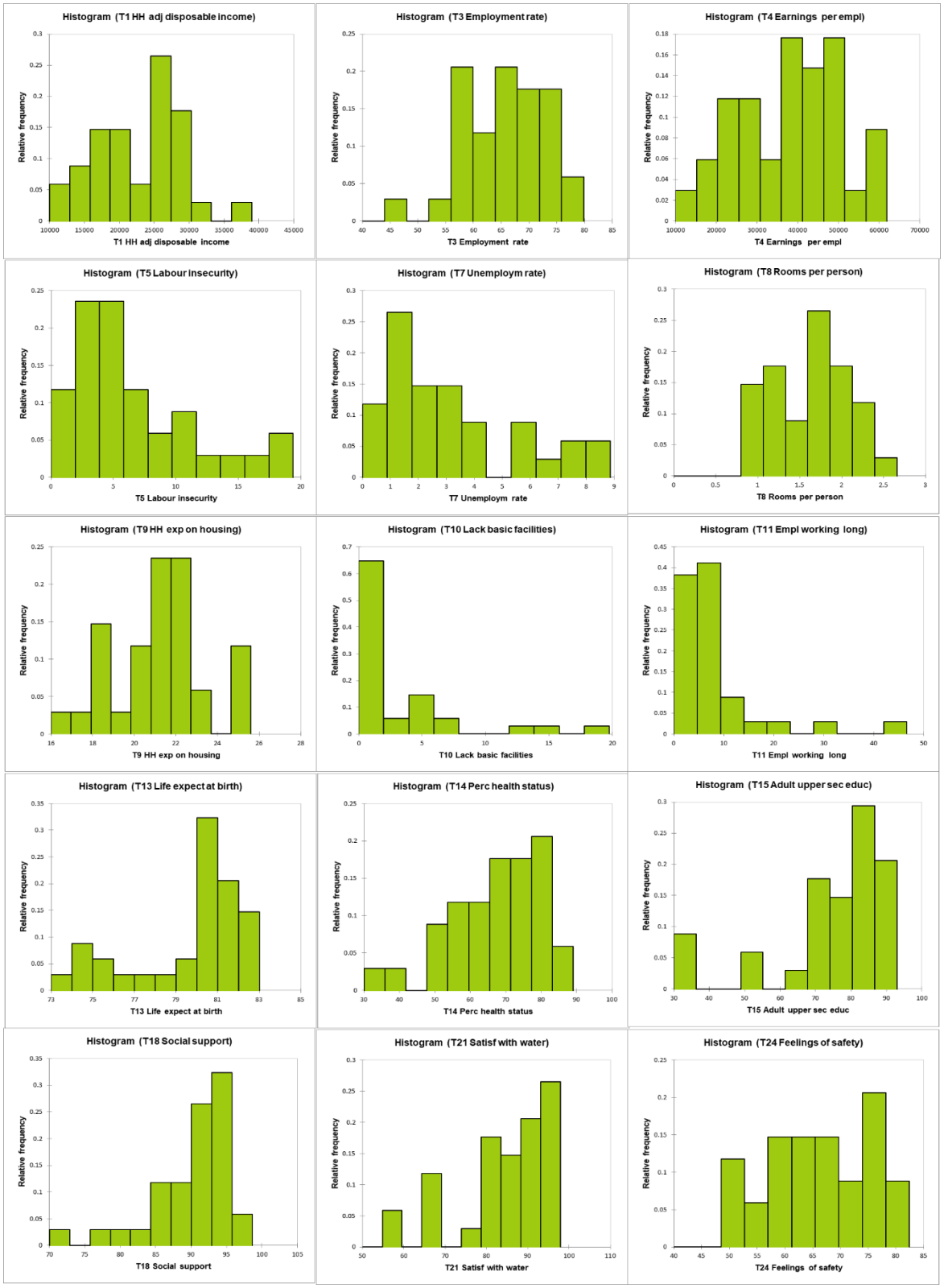






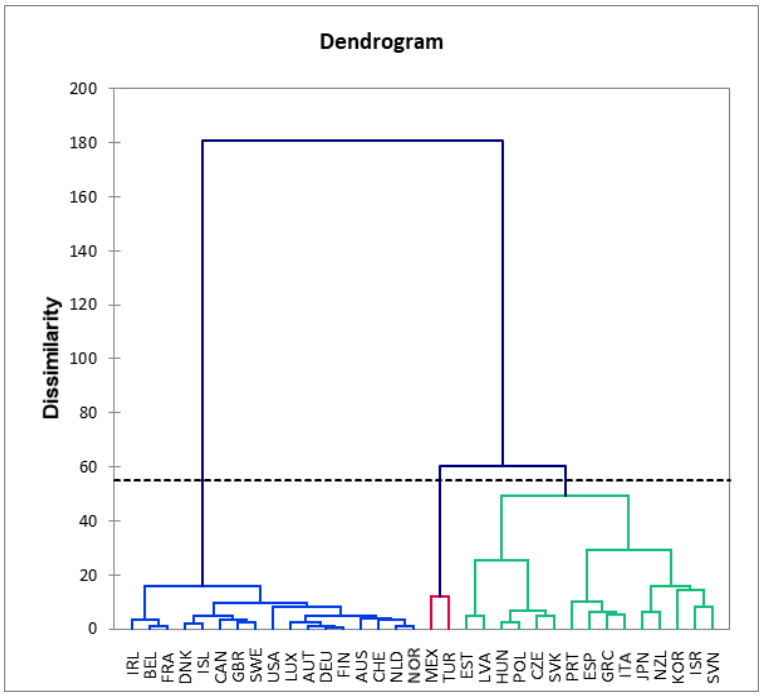


9.13. HISTOGRAMS – 2010



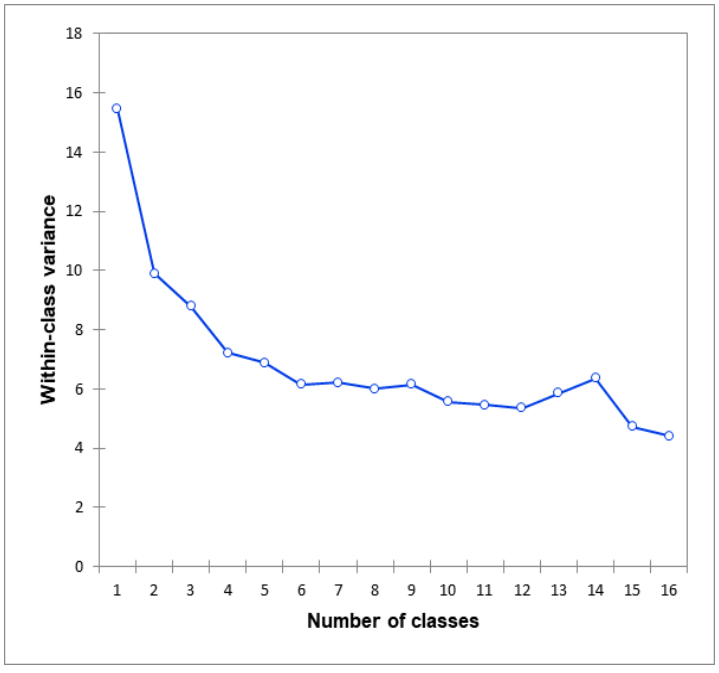
9.14. CLUSTERING ANALYSIS – 2010

a) Agglomerative hierarchical clustering



Class	1	2	3
Objects	17.0	15.0	2.0
Within-class variance	4.2	13.5	11.8
Min dist centroid	1.1	2.4	2.4
Aver dist centroid	1.9	3.5	2.4
Max dist centroid	3.1	5.2	2.4
	AUS	CZE	MEX
	AUT	ESP	TUR
	BEL	EST	
	CAN	GRC	
	CHE	HUN	
	DEU	ISR	
	DNK	ITA	
	FIN	JPN	
	FRA	KOR	
	GBR	LVA	
	IRL	NZL	
	ISL	POL	
	LUX	PRT	
	NLD	SVK	
	NOR	SVN	
	SWE		
	USA		

b) K-means clustering (number of classes = 4)



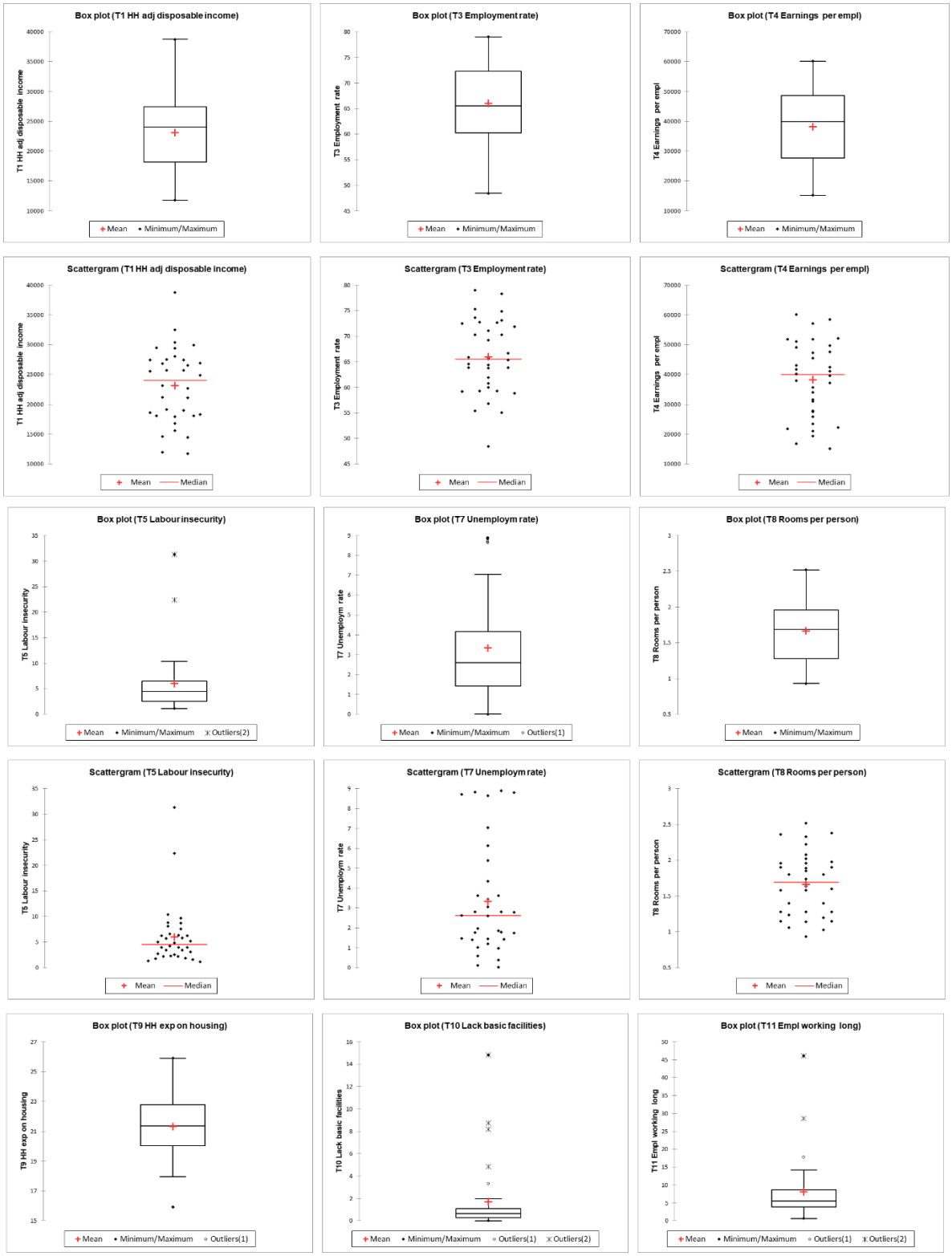
Class	1.0	2.0	3.0	4.0
Objects	18.0	6.0	8.0	2.0
Within-class varia	4.7	8.9	11.5	11.8
Min dist centroid	1.1	1.2	2.1	2.4
Aver dist centroid	2.0	2.6	3.1	2.4
Max dist centroid	3.3	3.7	3.9	2.4
	AUS	CZE	ESP	MEX
	AUT	EST	GRC	TUR
	BEL	HUN	ISR	
	CAN	LVA	ITA	
	CHE	POL	JPN	
	DEU	SVK	KOR	
	DNK		PRT	
	FIN		SVN	
	FRA			
	GBR			
	IRL			
	ISL			
	LUX			
	NLD			
	NOR			
	NZL			
	SWE			
	USA			

9.15. OECD "HOW'S LIFE" DATA & DESCRIPTIVE STATISTICS - 2011

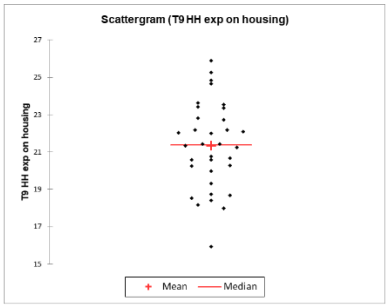
Y2011	T1 HH adj disposable income	T3 Employment rate	T4 Earnings per empl	T5 Labour insecurity	T7 Unemploym rate	T8 Rooms per person	T9 HH exp on housing	T10 Lack basic facilities	T11 Empl working long	T13 Life expect at birth	T14 Perc health status	T15 Adult upper sec educ	T18 Social support	T21 Satisf with water	T24 Feelings of safety
Australia	29937.9	72.7	52137.7	3.5	1.0	2.3	19.3	0.3	14.2	82.0	85.4	74.1	94.4	91.7	65.3
Austria	29417.8	71.1	47607.6	1.8	1.2	1.6	20.6	1.0	8.7	81.1	69.4	82.4	94.0	95.1	82.9
Belgium	26868.6	61.9	49104.4	3.1	3.4	2.2	20.3	2.0	4.4	80.7	73.5	71.3	92.2	82.0	64.1
Canada	27413.2	71.8	45483.4	3.9	1.0	2.5	22.1	0.3	4.1	81.3	88.2	88.6	93.4	89.4	79.8
Switzerland	32535.4	78.3	58547.8	1.3	1.8	1.9	22.0	0.1	5.2	82.8	81.2	84.8	94.4	94.5	77.6
Czech Republic	17961.1	65.7	22314.5	3.4	2.8	1.4	25.2	0.8	7.6	78.0	59.4	92.3	88.1	83.4	60.6
Germany	29474.9	72.7	43054.0	2.2	2.8	1.8	21.2	0.4	5.4	80.5	64.8	86.3	93.1	94.5	77.4
Denmark	25742.1	73.1	49766.2	2.7	1.8	1.9	23.6	0.5	2.0	79.9	70.8	76.9	95.4	95.0	79.3
Spain	21215.8	58.8	37979.7	22.4	8.9	1.3	21.4	0.1	6.3	82.6	75.3	54.0	93.1	78.7	73.6
Estonia	14598.7	65.3	19317.3	6.3	7.0	1.6	18.2	8.8	4.2	76.4	51.8	89.0	87.7	74.7	60.5
Finland	26548.1	69.2	41792.0	2.5	1.8	1.9	21.3	0.6	3.9	80.6	68.8	83.7	92.7	94.0	78.6
France	28069.7	63.9	41126.9	4.0	3.6	1.8	20.3	0.5	8.9	82.3	67.6	71.6	92.0	81.6	65.6
United Kingdom	25597.8	70.2	42468.6	5.2	2.6	2.0	23.6	0.3	12.2	81.0	77.5	76.8	93.8	93.8	73.1
Greece	18596.5	55.1	27854.0	31.3	8.8	1.2	23.4	0.6	5.2	80.8	76.4	64.6	78.0	65.3	50.8
Hungary	14500.6	55.4	21119.4	9.7	5.4	1.2	20.6	4.8	3.1	75.0	55.9	81.8	88.7	76.6	54.5
Ireland	23181.5	59.2	51155.8	6.2	8.6	2.1	18.7	1.8	3.9	80.8	83.2	73.6	96.3	85.4	71.8
Iceland	21118.3	79.0	47363.3	5.1	2.0	1.6	24.8	0.0	5.2	82.4	77.6	70.8	96.6	97.5	78.8
Israel	18101.0	65.8	30973.6	4.2	1.4	1.1	22.0	1.1	17.8	81.7	81.5	83.0	89.5	65.0	64.9
Italy	25680.7	56.8	35710.0	7.6	4.3	1.4	22.7	0.7	4.0	82.3	64.6	56.0	89.2	76.6	60.2
Japan	24898.7	70.3	40243.4	1.6	1.8	1.9	22.2	1.1	6.1	82.7	60.5	75.8	90.8	85.6	71.4
Korea	18349.9	63.9	31667.8	2.3	0.0	1.3	15.9	1.1	6.1	80.6	36.8	81.4	78.2	77.6	59.6
Luxembourg	27560.4	64.6	60195.8	2.2	1.4	2.0	20.8	0.2	2.6	81.1	72.5	77.3	90.7	86.5	69.7
Latvia	11755.7	60.8	16877.8	6.2	8.8	1.2	22.8	14.9	2.3	73.7	46.0	87.9	81.3	71.5	54.1
Mexico	11949.3	60.0	15164.6	5.8	0.1	1.0	22.2	1.1	28.7	74.2	60.5	33.1	76.3	71.6	50.2
Netherlands	26950.4	74.9	51815.3	1.8	1.5	2.0	18.4	0.0	0.7	81.3	76.3	72.3	93.0	92.2	78.9
Norway	30429.7	75.3	51798.6	1.2	0.4	2.0	18.0	0.1	2.8	81.4	73.2	81.9	92.8	95.8	86.8
New Zealand	22722.5	72.5	37218.9	4.8	0.6	2.4	24.7	1.1	13.3	81.0	60.5	75.8	94.5	88.4	65.6
Poland	15633.5	59.3	23515.3	8.7	3.0	1.1	23.4	3.3	7.3	76.8	57.6	88.9	89.4	76.8	65.2
Portugal	18959.8	63.8	25843.2	10.4	6.1	1.6	18.7	1.0	8.5	80.6	49.7	35.0	84.6	86.3	63.4
Slovak Republic	16825.7	59.3	21814.3	8.8	8.7	1.1	25.9	1.2	6.1	76.1	63.2	91.3	88.9	82.5	57.1
Slovenia	19156.9	64.4	34001.6	3.9	3.6	1.3	20.0	0.5	5.6	80.1	60.4	84.5	92.2	87.8	83.5
Sweden	27474.2	73.6	39626.2	5.7	1.4	1.7	20.7	0.0	1.2	81.9	79.9	87.0	91.1	95.9	78.7
Turkey	18101.0	48.4	27564.2	8.1	2.6	0.9	21.4	8.2	46.1	74.6	67.2	32.1	73.4	61.8	56.3
United States	38768.5	66.6	57176.3	6.6	2.8	2.4	18.5	0.1	11.3	78.7	87.3	89.3	91.5	85.9	74.5

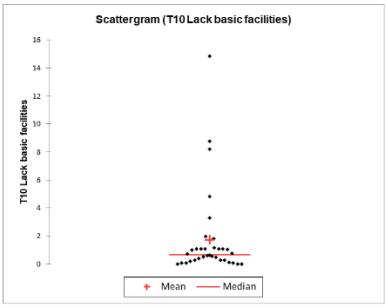
Statistic	T1 HH adj disposable income	T3 Employment rate	T4 Earnings per empl	T5 Labour insecurity	T7 Unemploym rate	T8 Rooms per person	T9 HH exp on housing	T10 Lack basic facilities	T11 Empl working long	T13 Life expect at birth	T14 Perc health status	T15 Adult upper sec educ	T18 Social support	T21 Satisf with water	T24 Feelings of safety
Minimum	11755.7	48.4	15164.6	1.2	0.0	0.9	15.9	0.0	0.7	73.7	36.8	32.1	73.4	61.8	50.2
Maximum	38768.5	79.0	60195.8	31.3	8.9	2.5	25.9	14.9	46.1	82.8	88.2	92.3	96.6	97.5	86.8
Range	27012.8	30.6	45031.2	30.2	8.9	1.6	10.0	14.9	45.5	9.1	51.4	60.2	23.2	35.7	36.5
1st Quartile	18163.2	60.2	27636.6	2.6	1.4	1.3	20.0	0.3	4.0	79.0	60.5	71.8	88.8	77.0	60.5
Median	24040.1	65.5	39934.8	4.5	2.6	1.7	21.4	0.7	5.5	80.8	69.1	79.3	91.7	85.8	67.7
3rd Quartile	27458.9	72.4	48730.2	6.5	4.2	2.0	22.8	1.1	8.7	81.6	77.2	85.9	93.4	93.4	78.4
Mean	23120.5	66.0	38217.6	6.0	3.3	1.7	21.3	1.7	8.1	79.9	68.4	75.2	89.7	84.1	68.7
Variance (n-1)	39873568.0	52.9	163655515.1	35.5	7.8	0.2	5.3	9.6	74.7	7.1	149.4	256.3	34.5	96.3	103.1
Standard deviation (n-1)	6314.6	7.3	12792.8	6.0	2.8	0.4	2.3	3.1	8.6	2.7	12.2	16.0	5.9	9.8	10.2
Skewness (Pearson)	0.1	-0.2	-0.1	2.9	1.0	0.1	-0.1	2.9	3.0	-1.1	-0.5	-1.6	-1.4	-0.6	-0.1
Kurtosis (Pearson)	-0.5	-0.5	-1.1	9.0	-0.3	-1.0	-0.4	8.5	9.9	0.0	-0.2	1.7	1.1	-0.5	-1.1
Standard error of mean	1082.9	1.2	2193.9	1.0	0.5	0.1	0.4	0.5	1.5	0.5	2.1	2.7	1.0	1.7	1.7

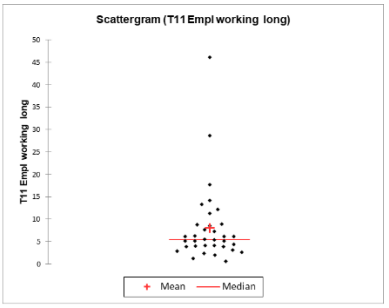
9.16. BOXPLOTS AND SCATTERGRAMS - 2011

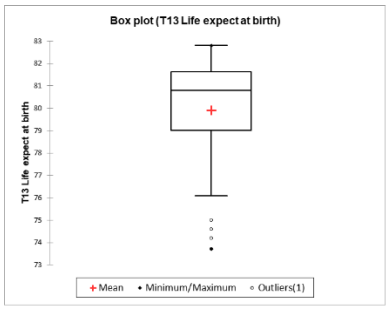


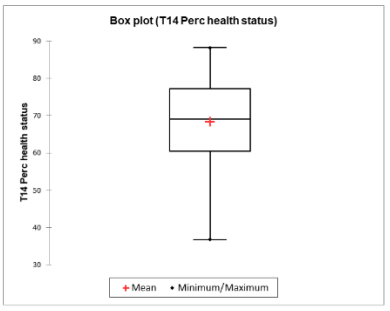
9.17. BOXPLOTS AND SCATTERGRAMS – 2011 (CONT.)

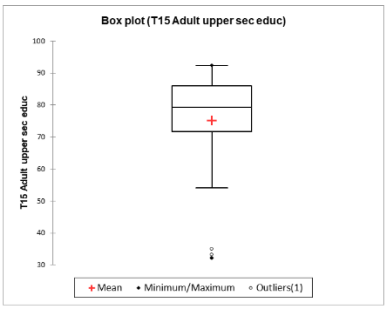


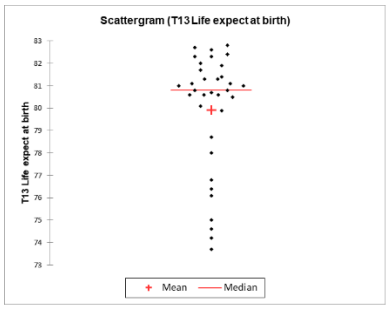


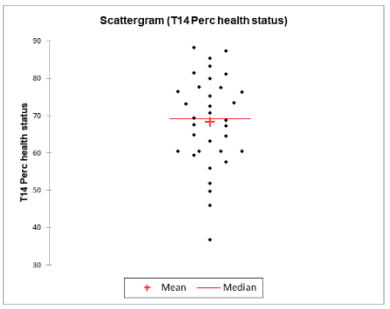


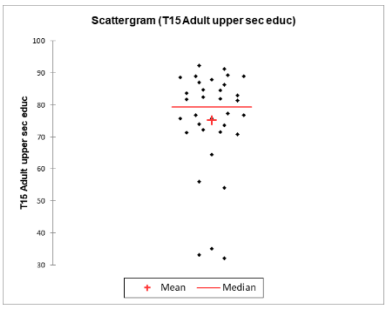


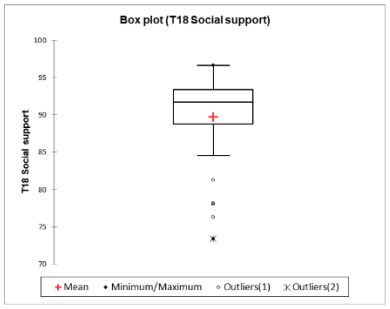


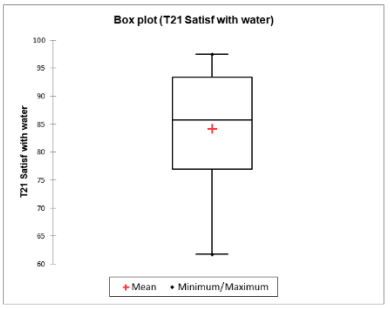


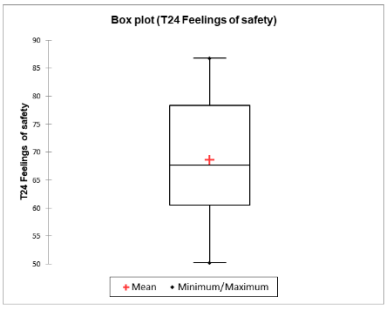


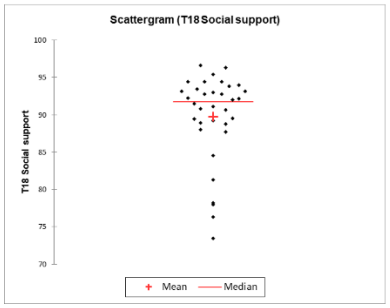


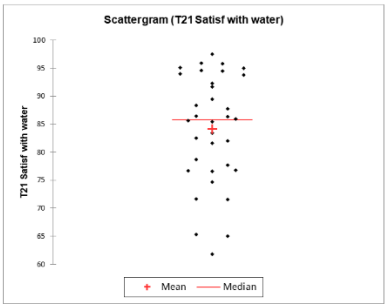


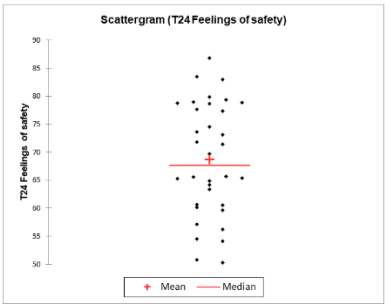








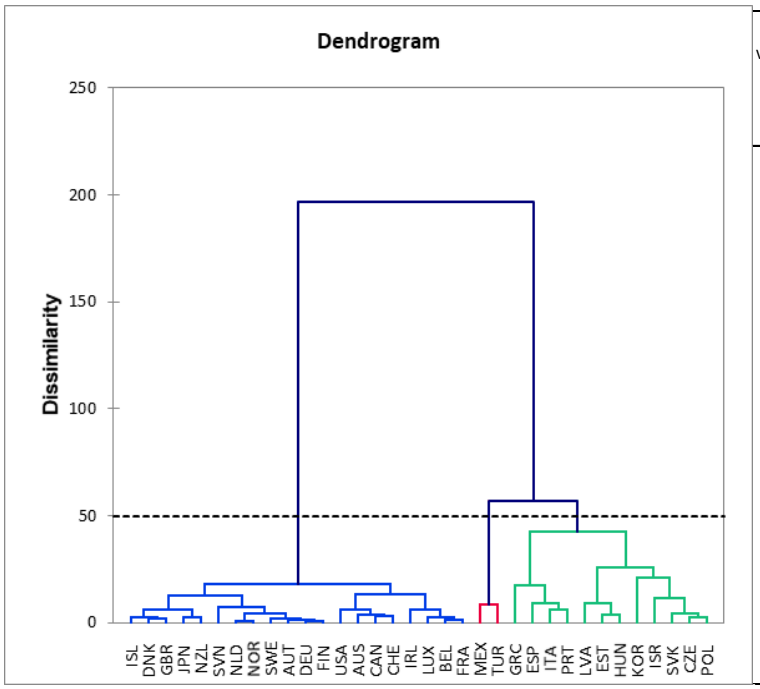




9.18. HISTOGRAMS – 2011

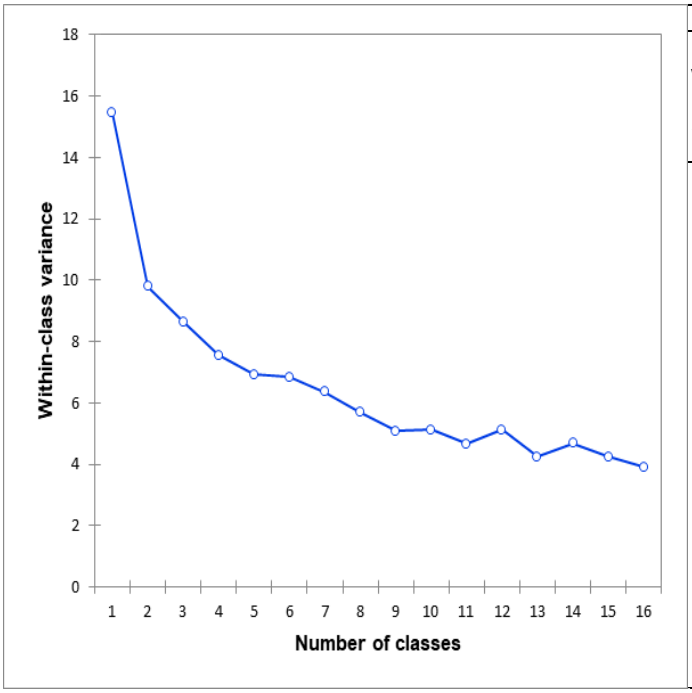
9.19. CLUSTERING ANALYSIS – 2011

a) Agglomerative hierarchical clustering



Class	1	2	3
Objects	20.0	12.0	2.0
Within-class variance	5.0	13.9	8.6
Min dist centroid	1.0	1.9	2.1
Aver dist centroid	2.1	3.4	2.1
Max dist centroid	3.4	5.0	2.1
	AUS	CZE	MEX
	AUT	ESP	TUR
	BEL	EST	
	CAN	GRC	
	CHE	HUN	
	DEU	ISR	
	DNK	ITA	
	FIN	KOR	
	FRA	LVA	
	GBR	POL	
	IRL	PRT	
	ISL	SVK	
	JPN		
	LUX		
	NLD		
	NOR		
	NZL		
	SVN		
	SWE		
	USA		

b) K-means clustering (number of classes = 4)



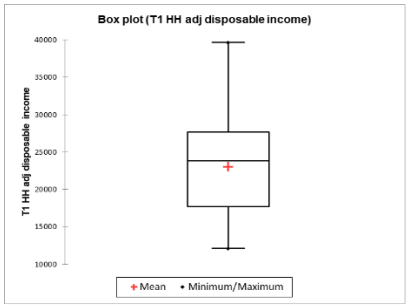
Class	1.0	2.0	3.0	4.0
Objects	20.0	6.0	5.0	3.0
Within-class varia	5.0	7.9	14.6	17.1
Min dist centroid	1.0	1.6	2.2	2.4
Aver dist centroid	2.1	2.5	3.3	3.3
Max dist centroid	3.4	3.7	4.5	4.1
	AUS	CZE	ESP	ISR
	AUT	EST	GRC	MEX
	BEL	HUN	ITA	TUR
	CAN	LVA	KOR	
	CHE	POL	PRT	
	DEU	SVK		
	DNK			
	FIN			
	FRA			
	GBR			
	IRL			
	ISL			
	JPN			
	LUX			
	NLD			
	NOR			
	NZL			
	SVN			
	SWE			
	USA			

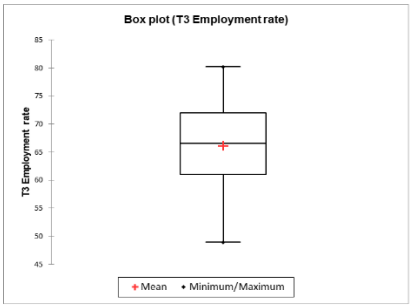
9.20. OECD "HOW'S LIFE" DATA & DESCRIPTIVE STATISTICS - 2012

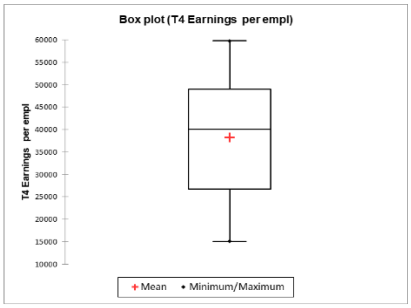
Y2012	T1 HH adj disposable income	T3 Employment rate	T4 Earnings per empl	T5 Labour insecurity	T7 Unemploym rate	T8 Rooms per person	T9 HH exp on housing	T10 Lack basic facilities	T11 Empl working long	T13 Life expect at birth	T14 Perc health status	T15 Adult upper sec educ	T18 Social support	T21 Satisf with water	T24 Feelings of safety
Australia	29603.8	72.3	52698.2	3.7	1.0	2.3	19.8	0.5	14.3	82.1	75.9	76.4	94.4	91.7	65.3
Austria	29645.6	71.4	47755.4	2.4	1.2	1.6	20.6	1.0	8.5	81.0	70.0	82.9	94.0	95.1	82.9
Belgium	26727.9	61.8	49395.1	4.5	3.4	2.2	20.6	2.0	4.4	80.5	74.5	71.6	92.2	82.0	64.1
Canada	27686.0	72.1	46560.6	4.0	0.9	2.5	22.0	0.5	4.0	81.5	88.8	89.0	93.4	89.4	79.8
Switzerland	33449.5	78.5	59806.3	1.8	1.6	1.9	21.7	0.1	5.2	82.8	81.9	85.7	94.4	94.5	77.6
Czech Republic	17734.1	66.5	22266.3	6.4	3.0	1.4	25.1	0.8	7.2	78.2	60.4	92.5	88.1	83.4	60.6
Germany	29687.4	73.0	43700.8	2.3	2.4	1.8	21.3	0.4	5.6	80.6	65.4	86.3	93.1	94.5	77.4
Denmark	25626.4	72.6	49648.6	2.6	2.1	1.9	23.8	0.5	2.1	80.1	70.7	77.9	95.4	95.0	79.3
Spain	20041.2	56.5	36916.9	28.9	11.0	1.3	22.3	0.1	5.9	82.5	74.3	54.7	93.1	78.7	73.6
Estonia	15002.9	67.2	19822.1	5.4	5.4	1.6	18.5	8.8	3.7	76.5	52.4	89.9	87.7	74.7	60.5
Finland	26415.0	69.5	41950.4	2.3	1.6	1.9	21.6	0.6	3.7	80.7	67.1	84.8	92.7	94.0	78.6
France	27841.6	64.0	41363.2	6.1	3.8	1.8	20.8	0.5	8.7	82.1	68.1	72.5	92.0	81.6	65.6
United Kingdom	25969.7	70.7	42330.3	4.6	2.7	2.0	23.6	0.5	12.4	81.0	74.7	78.1	93.8	93.8	73.1
Greece	16873.0	50.8	26538.9	44.4	14.4	1.2	25.0	0.6	5.6	80.7	74.9	65.8	78.0	65.3	50.8
Hungary	14128.3	56.7	20423.4	11.4	5.1	1.2	20.7	4.8	2.9	75.2	57.6	82.1	88.7	76.6	54.5
Ireland	23318.6	58.8	50528.5	5.8	9.2	2.1	18.8	1.8	4.2	80.9	82.7	74.6	96.3	85.4	71.8
Iceland	21412.9	80.2	47252.3	0.3	1.7	1.6	24.5	0.0	5.2	83.0	76.8	70.8	96.6	97.5	78.8
Israel	17656.4	66.5	31468.9	4.2	0.9	1.1	22.2	1.5	19.0	81.8	83.5	84.5	89.5	65.0	64.9
Italy	24306.1	56.6	34538.5	12.4	5.7	1.4	23.6	1.7	3.7	82.3	68.4	57.2	89.2	76.6	60.2
Japan	25250.5	70.6	39527.9	1.9	1.7	1.9	22.3	1.5	6.5	83.2	63.0	76.8	90.8	85.6	71.4
Korea	18604.7	64.2	31282.8	2.2	0.0	1.3	16.1	1.5	6.5	80.9	33.3	82.4	78.2	77.6	59.6
Luxembourg	27582.4	65.8	59829.4	2.3	1.6	2.0	20.8	0.2	3.2	81.5	73.8	78.3	90.7	86.5	69.7
Latvia	12174.7	63.0	17595.7	7.9	7.8	1.2	23.6	14.9	2.6	73.9	46.7	89.1	81.3	71.5	54.1
Mexico	12116.1	60.9	15079.6	5.4	0.1	1.0	22.3	1.5	29.0	74.4	63.0	34.0	76.3	71.6	50.2
Netherlands	26642.3	75.1	51719.2	2.2	1.8	2.0	18.8	1.0	0.6	81.2	75.6	73.4	93.0	92.2	78.9
Norway	31153.3	75.8	53153.2	1.3	0.3	2.0	17.7	0.1	3.1	81.5	78.7	82.1	92.8	95.8	86.8
New Zealand	22841.5	72.0	37998.5	5.7	0.9	2.4	25.2	1.5	13.3	81.2	89.3	76.8	94.5	88.4	65.6
Poland	15779.7	59.7	23254.9	10.5	3.5	1.1	22.6	3.3	7.6	76.9	57.7	89.6	89.4	76.8	65.2
Portugal	18122.9	61.4	24672.8	16.0	7.6	1.6	19.8	1.0	9.3	80.5	48.0	37.6	84.6	86.3	63.4
Slovak Republic	16730.9	59.7	21566.0	18.1	8.9	1.1	25.9	1.2	6.5	76.2	65.7	91.7	88.9	82.5	57.1
Slovenia	18367.5	64.1	33040.2	5.0	4.2	1.3	19.7	0.5	5.7	80.2	63.1	85.0	92.2	87.8	83.5
Sweden	28030.0	73.8	40526.2	6.7	1.4	1.7	20.0	0.0	1.1	81.8	80.9	87.5	91.1	95.9	78.7
Turkey	17656.4	48.9	27177.8	8.3	2.3	0.9	21.2	8.2	43.3	74.6	68.6	33.9	73.4	61.8	56.3
United States	39660.6	67.1	57653.1	6.0	2.4	2.4	18.1	0.1	11.6	78.8	87.5	89.3	91.5	85.9	74.5

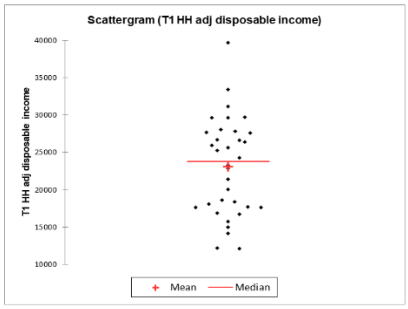
Statistic	T1 HH adj disposable income	T3 Employment rate	T4 Earnings per empl	T5 Labour insecurity	T7 Unemploym rate	T8 Rooms per person	T9 HH exp on housing	T10 Lack basic facilities	T11 Empl working long	T13 Life expect at birth	T14 Perc health status	T15 Adult upper sec educ	T18 Social support	T21 Satisf with water	T24 Feelings of safety
Minimum	12116.1	48.9	15079.6	0.3	0.0	0.9	16.1	0.0	0.6	73.9	33.3	33.9	73.4	61.8	50.2
Maximum	39660.6	80.2	59829.4	44.4	14.4	2.5	25.9	14.9	43.3	83.2	89.3	92.5	96.6	97.5	86.8
Range	27544.6	31.3	44749.8	44.0	14.4	1.6	9.9	14.9	42.7	9.3	56.0	58.6	23.2	35.7	36.5
1st Quartile	17675.8	61.0	26698.6	2.3	1.4	1.3	19.9	0.5	3.7	79.1	63.1	72.8	88.8	77.0	60.5
Median	23812.4	66.5	40027.1	5.2	2.3	1.7	21.5	0.9	5.7	80.9	70.4	80.2	91.7	85.8	67.7
3rd Quartile	27660.1	72.0	48985.2	7.6	4.9	2.0	23.3	1.5	8.7	81.7	76.6	86.1	93.4	93.4	78.4
Mean	23054.1	66.1	38207.1	7.4	3.6	1.7	21.5	1.9	8.1	80.0	69.5	76.0	89.7	84.1	68.7
Variance (n-1)	42628429.9	57.4	169753082.9	75.0	11.6	0.2	5.6	9.4	69.4	7.0	157.5	246.8	34.5	96.3	103.1
Standard deviation (n-1)	6529.0	7.6	13028.9	8.7	3.4	0.4	2.4	3.1	8.3	2.6	12.6	15.7	5.9	9.8	10.2
Skewness (Pearson)	0.2	-0.3	-0.1	2.9	1.5	0.1	-0.1	2.9	2.8	-1.1	-0.7	-1.6	-1.4	-0.6	-0.1
Kurtosis (Pearson)	-0.4	-0.5	-1.1	8.7	1.7	-1.0	-0.5	8.5	8.3	0.0	0.6	1.7	1.1	-0.5	-1.1
Standard error of mean	1119.7	1.3	2234.4	1.5	0.6	0.1	0.4	0.5	1.4	0.5	2.2	2.7	1.0	1.7	1.7

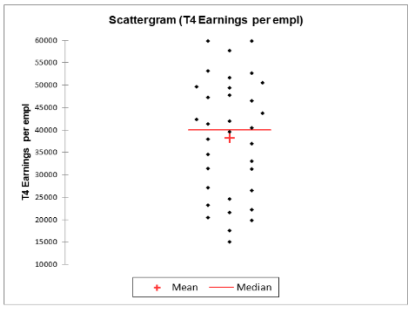
9.21. BOXPLOTS AND SCATTERGRAMS - 2012

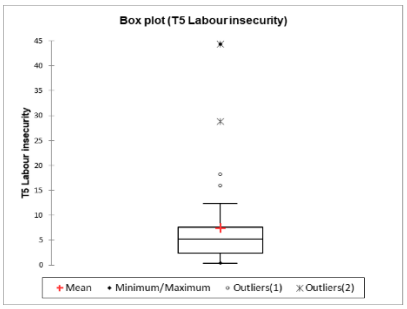


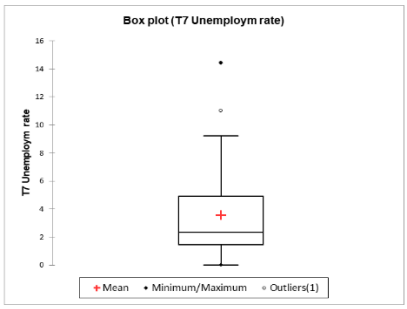


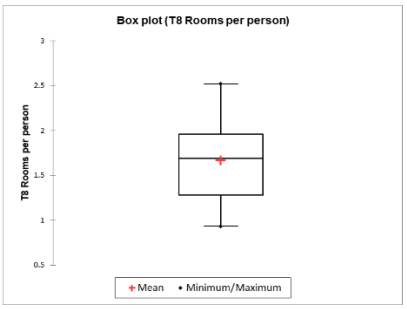


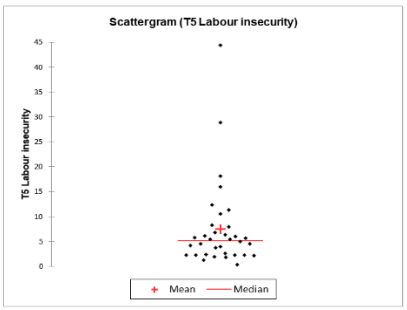


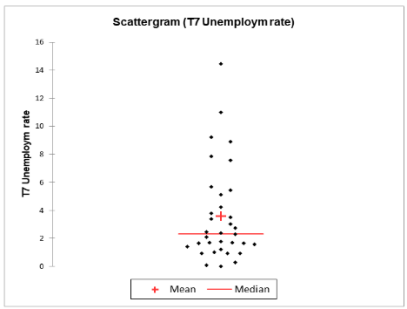


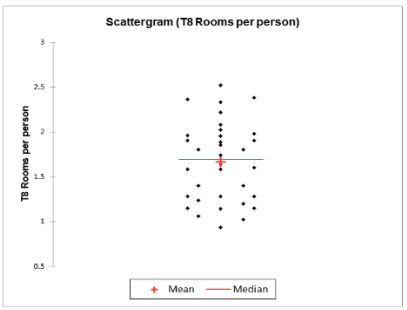


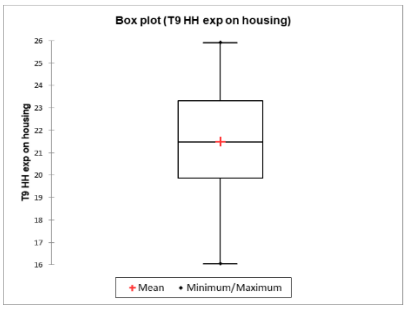


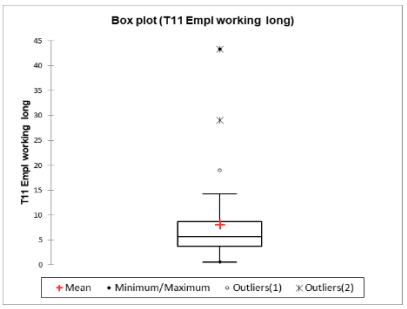




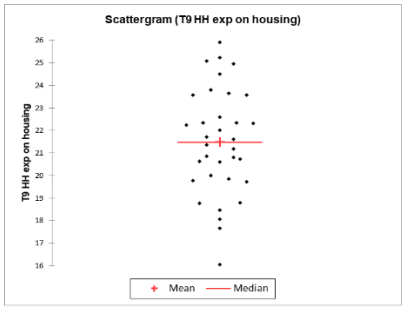


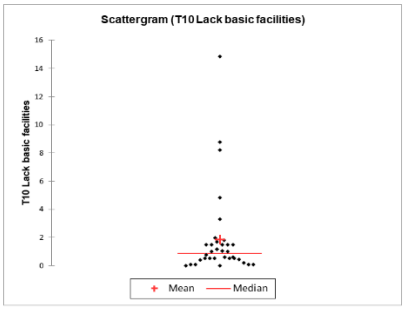


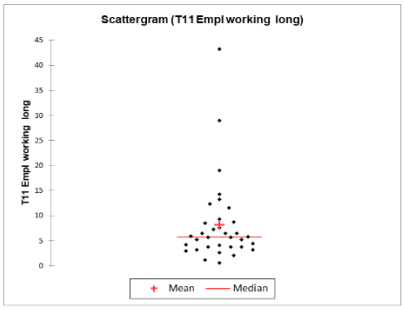


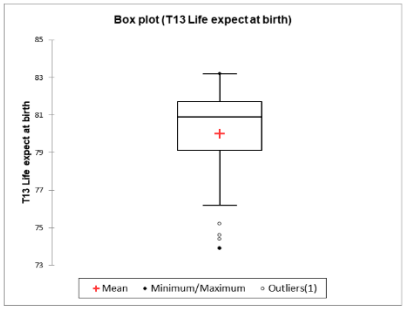


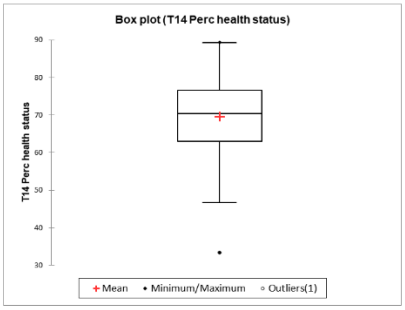
9.22. BOXPLOTS AND SCATTERGRAMS – 2012 (CONT.)

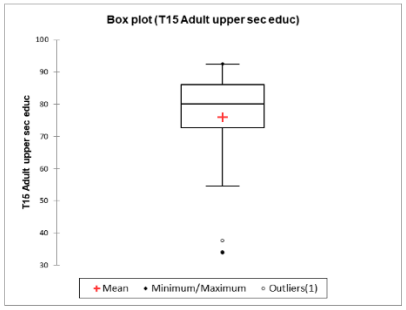


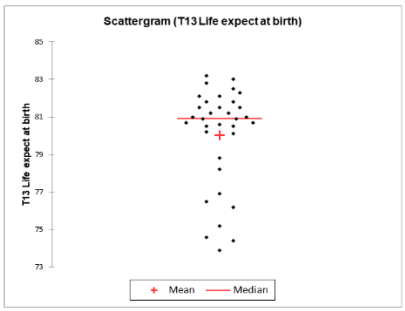


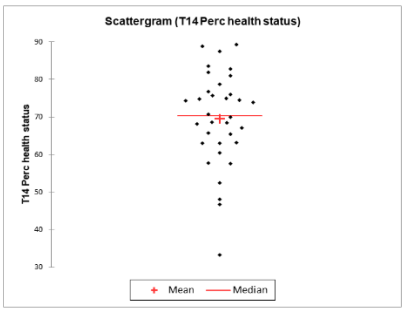


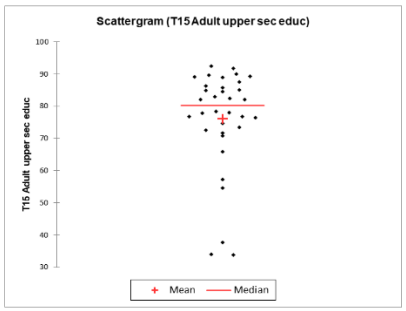


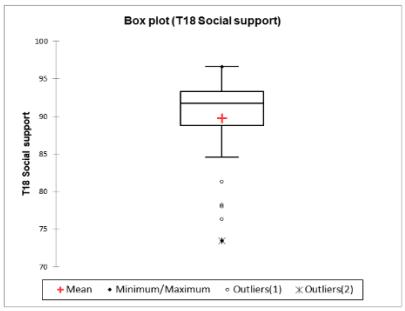


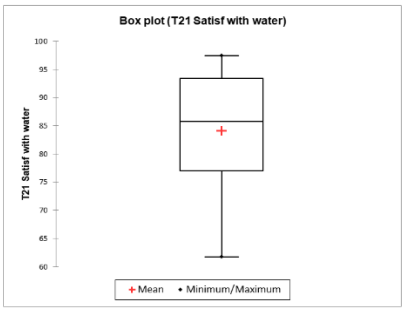


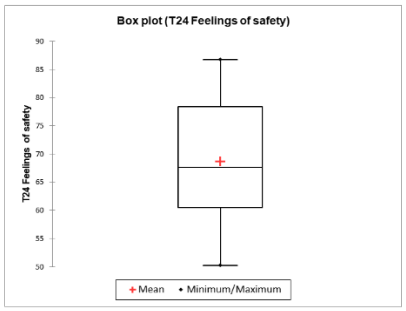


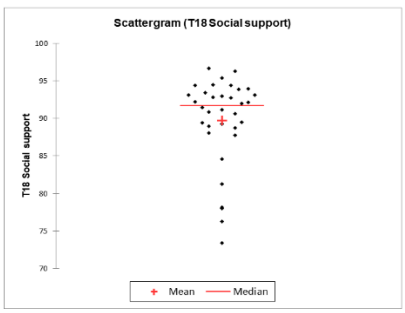


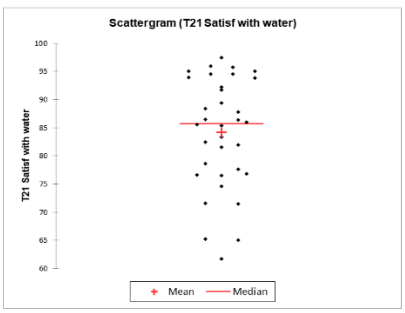


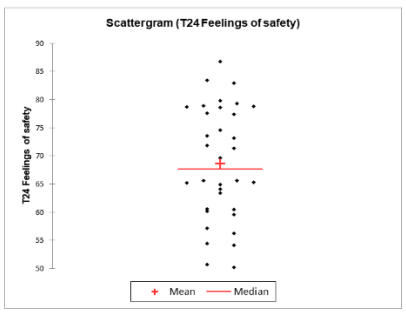




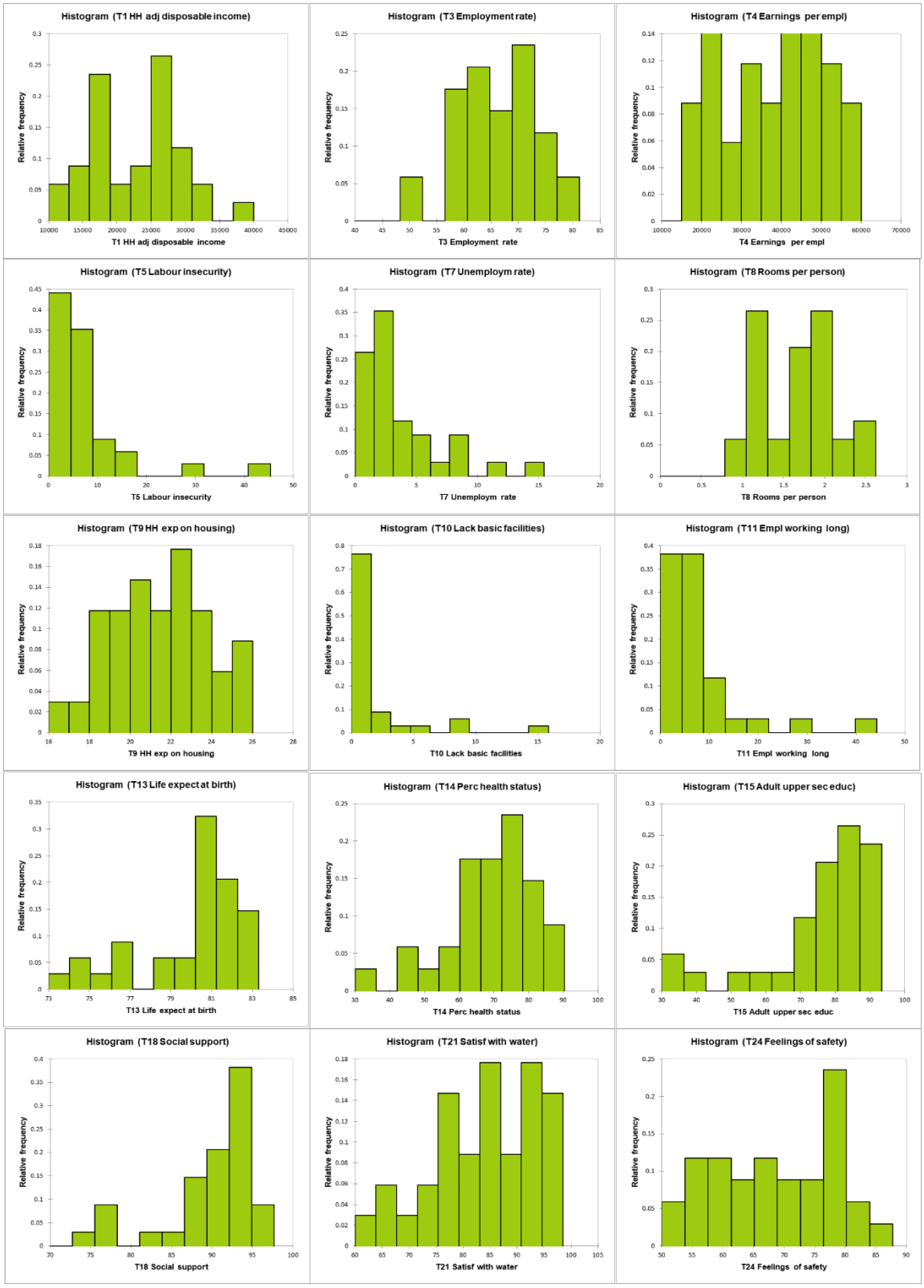






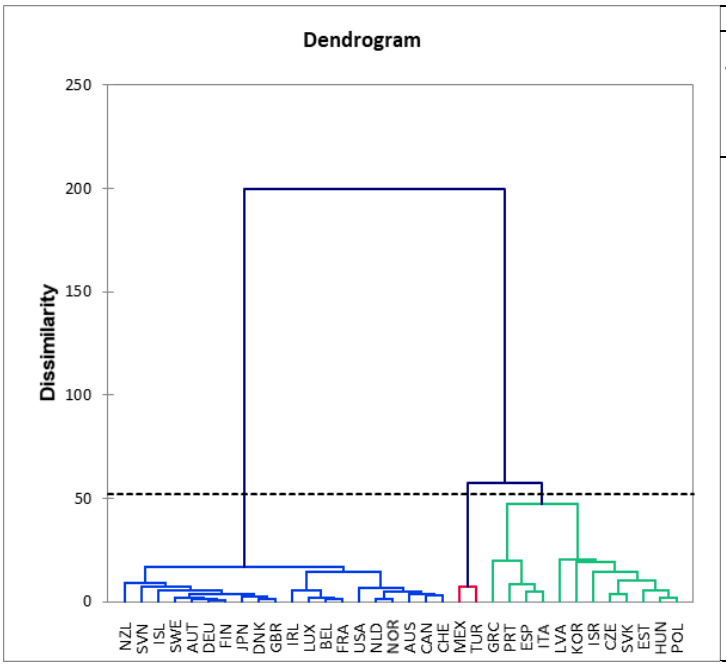


9.23. HISTOGRAMS – 2012



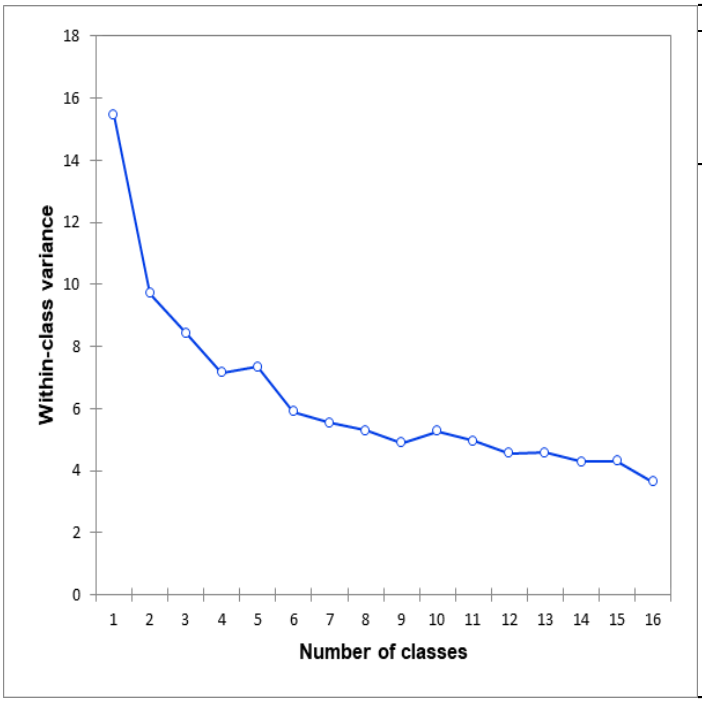
9.24. CLUSTERING ANALYSIS – 2012

a) Agglomerative hierarchical clustering



Class	1	2	3
Objects	20.0	12.0	2.0
Within-class variance	4.8	14.0	7.4
Min dist centroid	1.1	1.7	1.9
Aver dist centroid	2.0	3.4	1.9
Max dist centroid	3.2	5.5	1.9
	AUS	CZE	MEX
	AUT	ESP	TUR
	BEL	EST	
	CAN	GRC	
	CHE	HUN	
	DEU	ISR	
	DNK	ITA	
	FIN	KOR	
	FRA	LVA	
	GBR	POL	
	IRL	PRT	
	ISL	SVK	
	JPN		
	LUX		
	NLD		
	NOR		
	NZL		
	SVN		
	SWE		
	USA		

b) K-means clustering (number of classes = 4)



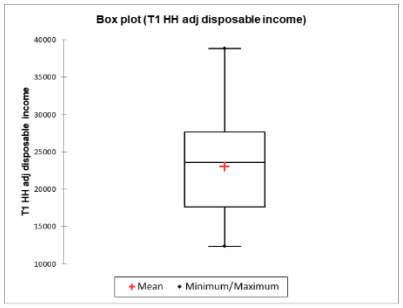
Class	1.0	2.0	3.0	4.0
Objects	20.0	7.0	4.0	3.0
Within-class varia	4.8	9.7	11.0	16.2
Min dist centroid	1.1	1.4	2.0	2.3
Aver dist centroid	2.0	2.7	2.8	3.2
Max dist centroid	3.2	4.2	3.9	4.1
	AUS	CZE	ESP	ISR
	AUT	EST	GRC	MEX
	BEL	HUN	ITA	TUR
	CAN	KOR	PRT	
	CHE	LVA		
	DEU	POL		
	DNK	SVK		
	FIN			
	FRA			
	GBR			
	IRL			
	ISL			
	JPN			
	LUX			
	NLD			
	NOR			
	NZL			
	SVN			
	SWE			
	USA			

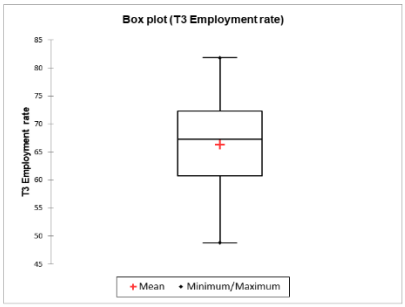
9.25. OECD "HOW'S LIFE" DATA & DESCRIPTIVE STATISTICS - 2013

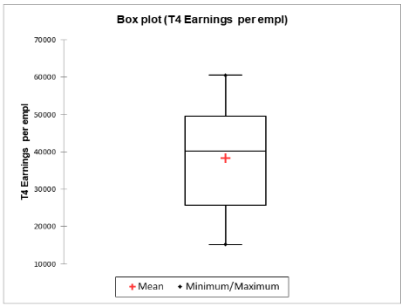
Y2013	T1 HH adj disposable income	T3 Employment rate	T4 Earnings per empl	T5 Labour insecurity	T7 Unemploym rate	T8 Rooms per person	T9 HH exp on housing	T10 Lack basic facilities	T11 Empl working long	T13 Life expect at birth	T14 Perc health status	T15 Adult upper sec educ	T18 Social support	T21 Satisf with water	T24 Feelings of safety
Australia	30008.3	72.0	52460.3	4.3	1.1	2.3	19.9	0.5	14.1	82.2	75.2	75.7	94.4	91.7	65.3
Austria	29070.2	71.4	47871.7	2.9	1.3	1.6	21.1	1.0	7.6	81.2	68.6	83.0	94.0	95.1	82.9
Belgium	26576.8	61.8	50014.3	4.5	3.9	2.2	20.7	2.0	4.6	80.7	74.3	72.8	92.2	82.0	64.1
Canada	28033.9	72.4	47384.6	3.9	0.9	2.5	22.0	0.5	4.0	81.4	88.7	89.5	93.4	89.4	79.8
Switzerland	34097.9	78.4	60591.8	2.1	1.6	1.9	21.5	0.1	5.1	82.9	80.7	86.4	94.4	94.5	77.6
Czech Republic	17676.0	67.7	22027.6	5.3	3.1	1.4	25.2	0.8	7.0	78.3	59.6	92.8	88.1	83.4	60.6
Germany	29774.3	73.5	44161.4	2.6	2.3	1.8	21.3	0.4	5.3	80.6	64.9	86.3	93.1	94.5	77.4
Denmark	25813.4	72.5	50009.1	2.2	1.8	1.9	24.1	0.5	2.0	80.4	71.7	78.3	95.4	95.0	79.3
Spain	19764.1	55.6	36951.6	27.0	13.0	1.3	22.5	0.1	5.9	83.2	71.6	55.5	93.1	78.7	73.6
Estonia	15134.3	68.5	19951.4	5.5	3.8	1.6	19.0	8.8	3.4	77.3	53.4	90.5	87.7	74.7	60.5
Finland	26376.7	68.5	41376.1	2.7	1.7	1.9	21.9	0.6	3.6	81.1	64.6	85.9	92.7	94.0	78.6
France	27713.0	64.0	41703.4	6.2	4.0	1.8	21.1	0.5	8.1	82.3	67.2	74.8	92.0	81.6	65.6
United Kingdom	25791.8	71.1	42058.2	4.1	2.8	2.0	23.9	0.5	12.8	81.1	73.7	79.2	93.8	93.8	73.1
Greece	15698.5	48.8	24853.8	36.0	18.4	1.2	24.8	0.6	6.1	81.4	73.9	67.2	78.0	65.3	50.8
Hungary	14451.7	58.1	20453.6	8.9	5.1	1.2	19.7	4.8	3.2	75.7	56.9	82.5	88.7	76.6	54.5
Ireland	22755.3	60.2	50185.2	4.6	8.4	2.1	19.7	1.8	4.2	81.1	82.0	76.7	96.3	85.4	71.8
Iceland	21739.9	81.8	48516.6	0.4	1.2	1.6	24.4	0.0	5.1	82.1	76.6	72.2	96.6	97.5	78.8
Israel	17581.6	67.1	31816.3	3.4	0.8	1.1	22.0	2.2	16.1	82.1	80.0	85.0	89.5	65.0	64.9
Italy	24019.0	55.5	34616.1	11.8	6.9	1.4	23.6	2.7	3.6	82.8	66.1	58.2	89.2	76.6	60.2
Japan	25338.0	71.7	39409.0	1.6	1.7	1.9	22.8	2.2	6.8	83.4	35.4	80.3	90.8	85.6	71.4
Korea	19256.9	64.4	31745.0	2.1	0.0	1.3	15.9	2.2	6.8	81.4	35.1	83.7	78.2	77.6	59.6
Luxembourg	27672.7	65.7	60193.2	3.9	1.8	2.0	21.0	0.2	3.5	81.9	71.9	80.5	90.7	86.5	69.7
Latvia	12837.3	65.0	18438.8	7.7	5.8	1.2	23.7	14.9	2.3	74.1	45.2	89.4	81.3	71.5	54.1
Mexico	12386.9	60.8	15171.7	5.3	0.1	1.0	21.7	2.2	29.0	74.6	60.8	34.8	76.3	71.6	50.2
Netherlands	26240.4	74.3	51896.3	3.0	2.4	2.0	19.2	2.0	0.4	81.4	75.6	75.8	93.0	92.2	78.9
Norway	31718.9	75.5	54149.8	1.6	0.3	2.0	17.7	0.1	2.8	81.8	76.0	82.4	92.8	95.8	86.8
New Zealand	23118.8	72.8	37582.2	4.4	0.8	2.4	25.6	2.2	14.1	81.4	89.5	80.3	94.5	88.4	65.6
Poland	16038.9	60.0	23550.0	9.6	3.8	1.1	22.0	3.3	7.4	77.1	58.3	90.1	89.4	76.8	65.2
Portugal	18093.2	60.6	25169.2	11.7	9.1	1.6	20.0	1.0	9.6	80.8	46.1	40.0	84.6	86.3	63.4
Slovak Republic	16790.6	59.9	21758.9	15.9	9.5	1.1	25.2	1.2	7.0	76.5	65.9	91.8	88.9	82.5	57.1
Slovenia	18042.7	63.3	32888.0	5.2	5.1	1.3	19.0	0.5	5.6	80.4	64.8	85.5	92.2	87.8	83.5
Sweden	28185.6	74.4	40931.0	6.7	1.4	1.7	19.9	0.0	1.1	82.0	81.1	88.2	91.1	95.9	78.7
Turkey	17581.6	49.5	27228.6	12.0	2.4	0.9	20.6	8.2	40.9	78.0	67.8	34.8	73.4	61.8	56.3
United States	38858.3	67.4	57369.3	5.4	1.9	2.4	18.6	0.1	11.4	78.8	87.5	89.6	91.5	85.9	74.5

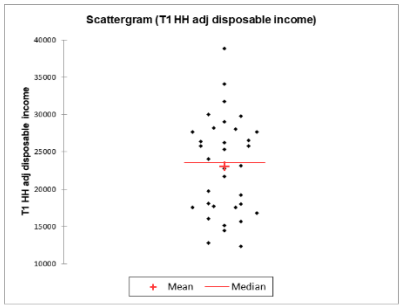
Statistic	T1 HH adj disposable income	T3 Employment rate	T4 Earnings per empl	T5 Labour insecurity	T7 Unemploym rate	T8 Rooms per person	T9 HH exp on housing	T10 Lack basic facilities	T11 Empl working long	T13 Life expect at birth	T14 Perc health status	T15 Adult upper sec educ	T18 Social support	T21 Satisf with water	T24 Feelings of safety
Minimum	12386.9	48.8	15171.7	0.4	0.0	0.9	15.9	0.0	0.4	74.1	35.1	34.8	73.4	61.8	50.2
Maximum	38858.3	81.8	60591.8	36.0	18.4	2.5	25.6	14.9	40.9	83.4	89.5	92.8	96.6	97.5	86.8
Range	26471.5	33.0	45420.1	35.6	18.4	1.6	9.7	14.9	40.4	9.3	54.4	58.0	23.2	35.7	36.5
1st Quartile	17605.2	60.7	25684.1	2.9	1.3	1.3	19.9	0.5	3.6	79.2	61.7	75.1	88.8	77.0	60.5
Median	23568.9	67.2	40170.0	4.5	2.4	1.7	21.4	0.9	5.8	81.2	70.1	81.4	91.7	85.8	67.7
3rd Quartile	27702.9	72.3	49636.0	7.5	4.8	2.0	23.4	2.2	8.0	82.0	75.9	86.4	93.4	93.4	78.4
Mean	23065.8	66.3	38367.2	6.9	3.8	1.7	21.5	2.0	8.0	80.3	68.0	77.0	89.7	84.1	68.7
Variance (n-1)	42078997.4	60.7	172563926.9	52.3	15.8	0.2	5.4	9.4	63.2	6.0	184.2	238.7	34.5	96.3	103.1
Standard deviation (n-1)	6486.8	7.8	13136.4	7.2	4.0	0.4	2.3	3.1	7.9	2.5	13.6	15.5	5.9	9.8	10.2
Skewness (Pearson)	0.2	-0.3	-0.1	2.6	2.0	0.1	-0.1	2.8	2.7	-1.1	-0.7	-1.6	-1.4	-0.6	-0.1
Kurtosis (Pearson)	-0.6	-0.3	-1.2	7.2	4.1	-1.0	-0.4	8.0	7.8	0.3	0.3	1.9	1.1	-0.5	-1.1
Standard error of mean	1112.5	1.3	2252.9	1.2	0.7	0.1	0.4	0.5	1.4	0.4	2.3	2.6	1.0	1.7	1.7

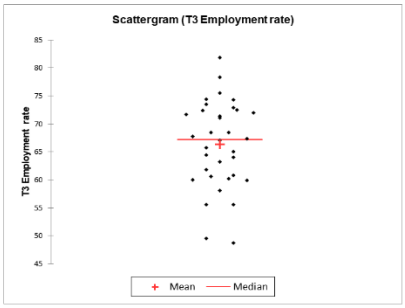
9.26. BOXPLOTS AND SCATTERGRAMS - 2013

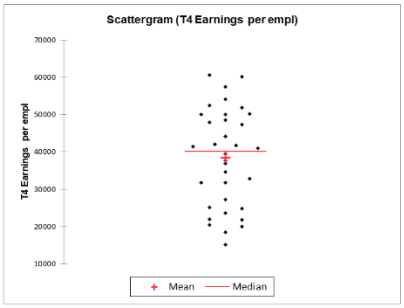


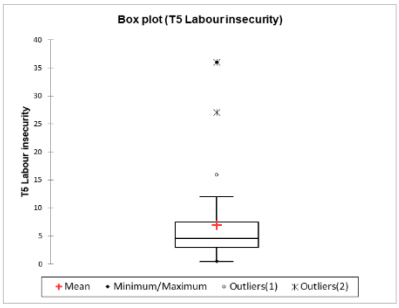


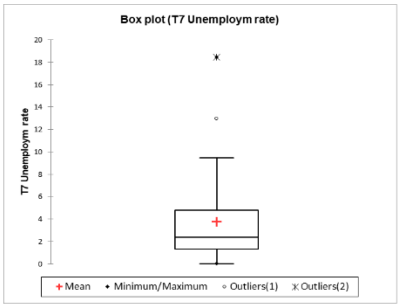


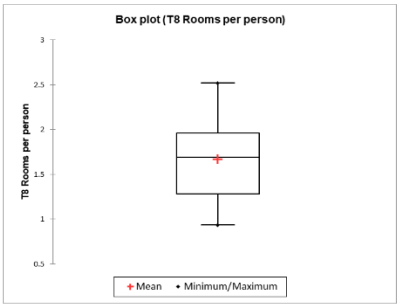


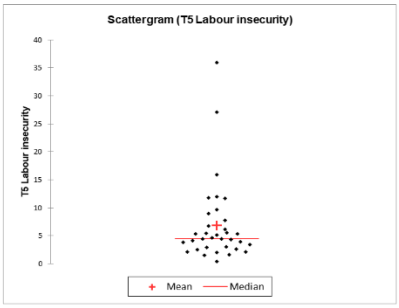


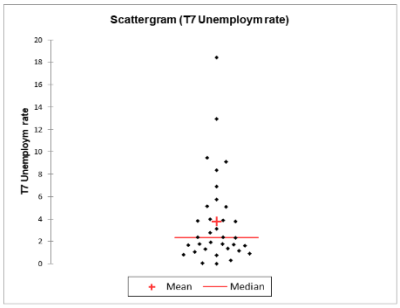


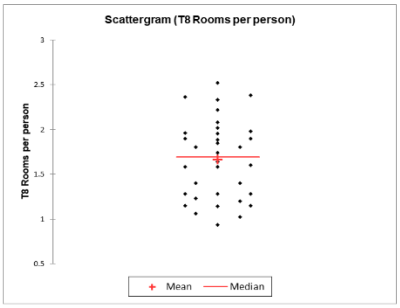


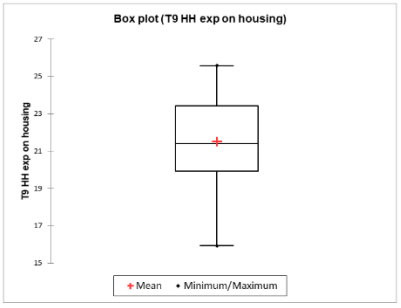


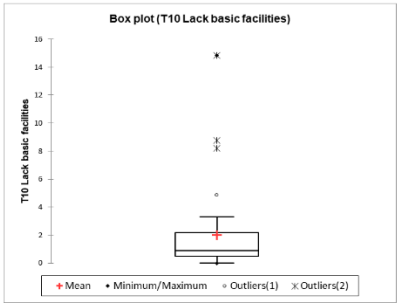




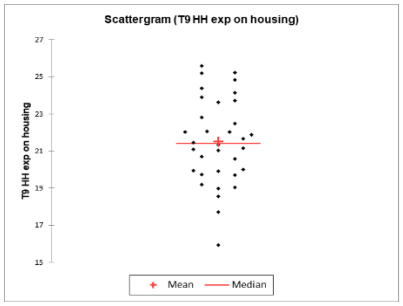


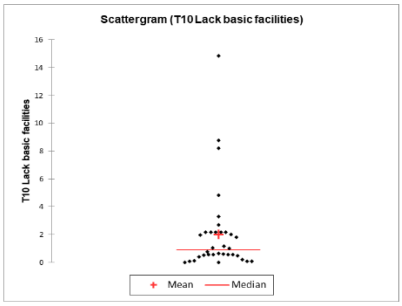


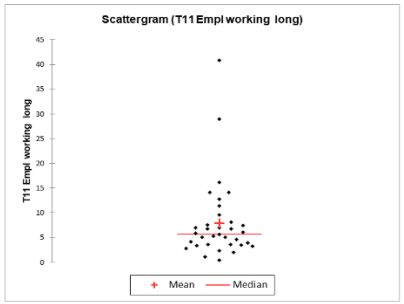


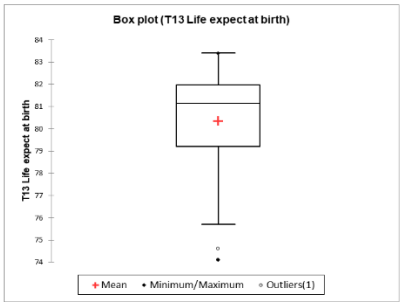


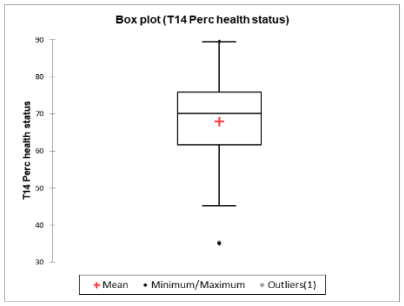
9.27. BOXPLOTS AND SCATTERGRAMS – 2013 (CONT.)

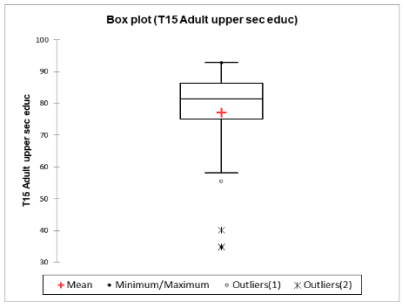


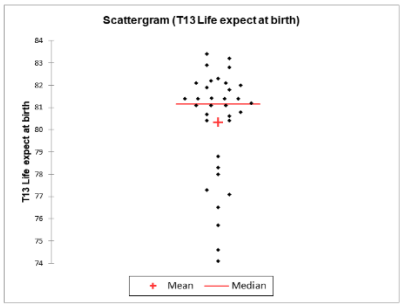


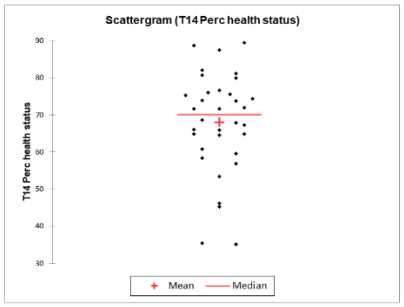


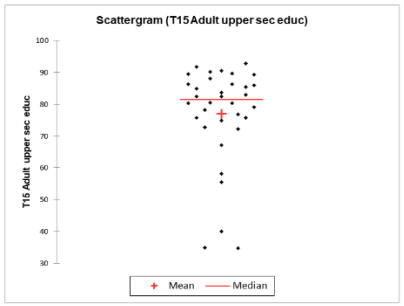


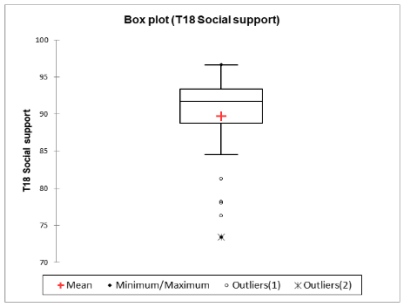


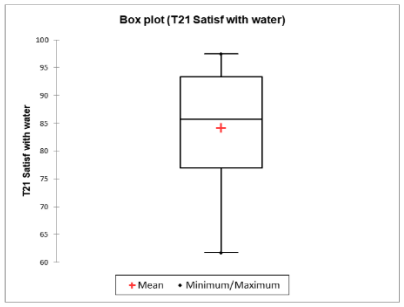


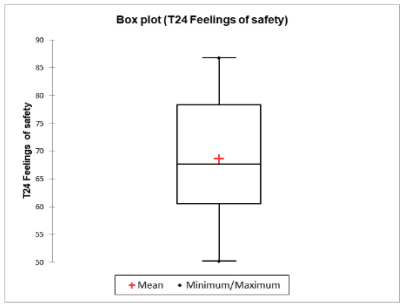


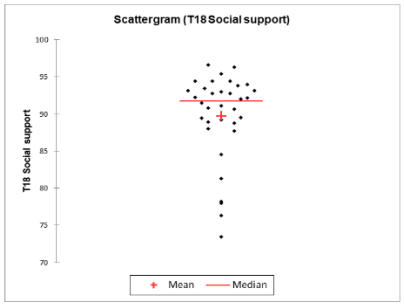


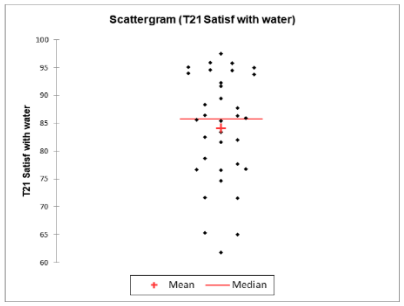


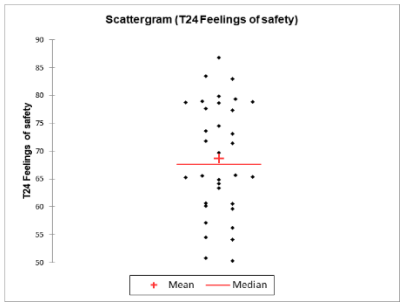




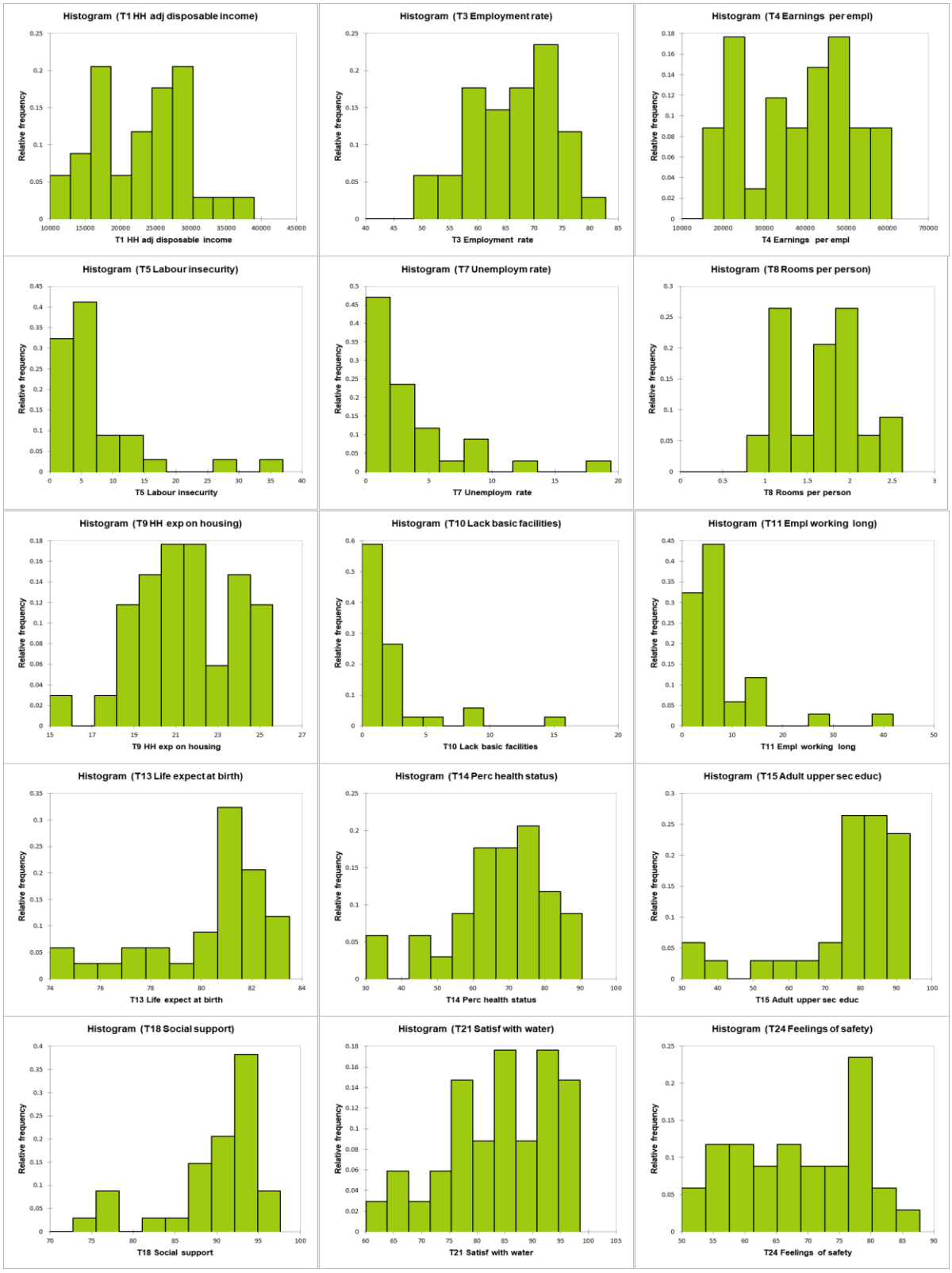






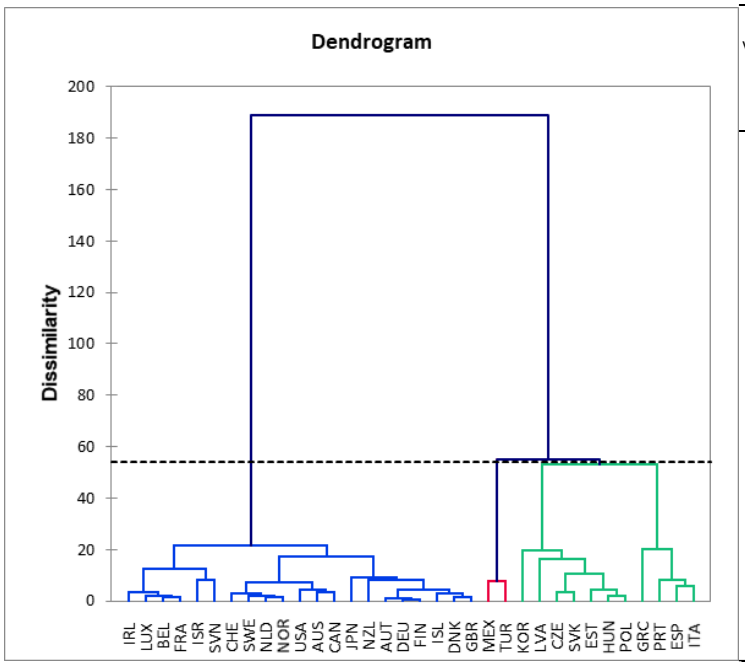


9.28. HISTOGRAMS – 2013



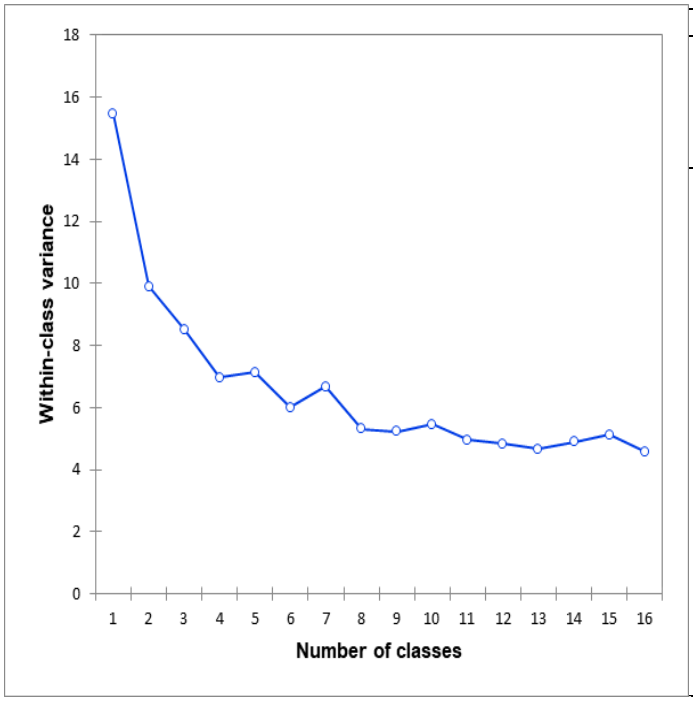
9.29. CLUSTERING ANALYSIS – 2013

a) Agglomerative hierarchical clustering



Class	1	2	3
Objects	21.0	11.0	2.0
Within-class variance	5.8	14.3	7.7
Min dist centroid	1.2	1.8	2.0
Aver dist centroid	2.2	3.4	2.0
Max dist centroid	4.1	5.6	2.0
	AUS	CZE	MEX
	AUT	ESP	TUR
	BEL	EST	
	CAN	GRC	
	CHE	HUN	
	DEU	ITA	
	DNK	KOR	
	FIN	LVA	
	FRA	POL	
	GBR	PRT	
	IRL	SVK	
	ISL		
	ISR		
	JPN		
	LUX		
	NLD		
	NOR		
	NZL		
	SVN		
	SWE		
	USA		

b) K-means clustering (number of classes = 4)



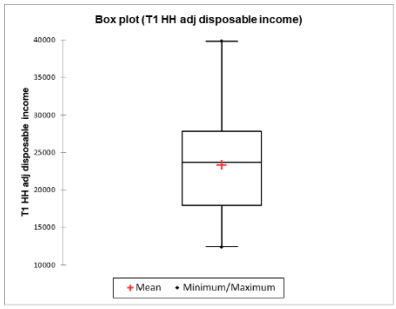
Class	1.0	2.0	3.0	4.0
Objects	20.0	8.0	4.0	2.0
Within-class varia	5.1	9.9	11.3	7.7
Min dist centroid	1.2	1.2	2.1	2.0
Aver dist centroid	2.1	2.8	2.8	2.0
Max dist centroid	3.3	4.2	3.9	2.0
	AUS	CZE	ESP	MEX
	AUT	EST	GRC	TUR
	BEL	HUN	ITA	
	CAN	ISR	PRT	
	CHE	KOR		
	DEU	LVA		
	DNK	POL		
	FIN	SVK		
	FRA			
	GBR			
	IRL			
	ISL			
	JPN			
	LUX			
	NLD			
	NOR			
	NZL			
	SVN			
	SWE			
	USA			

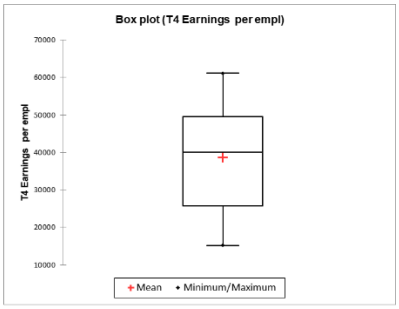
9.30. OECD "HOW'S LIFE" DATA & DESCRIPTIVE STATISTICS - 2014

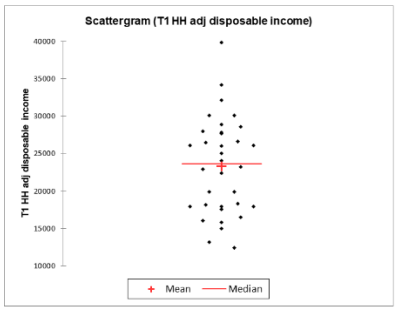
Y2014	T1 HH adj disposable income	T3 Employment rate	T4 Earnings per empl	T5 Labour insecurity	T7 Unemploym rate	T8 Rooms per person	T9 HH exp on housing	T10 Lack basic facilities	T11 Empl working long	T13 Life expect at birth	T14 Perc health status	T15 Adult upper sec educ	T18 Social support	T21 Satisf with water	T24 Feelings of safety
Australia	30110.4	71.6	52648.6	4.7	1.3	2.3	20.1	0.5	13.4	82.4	85.2	77.1	93.6	92.2	63.6
Austria	28895.4	71.1	48009.3	2.8	1.5	1.6	21.0	1.0	7.3	81.6	69.5	83.9	91.5	93.0	80.7
Belgium	26636.3	61.9	50020.4	5.2	4.3	2.2	20.4	2.0	4.7	81.4	75.0	73.6	91.7	84.4	70.7
Canada	27985.4	72.3	47930.5	3.8	0.9	2.5	22.5	0.5	3.8	81.9	88.1	90.0	92.6	91.0	80.9
Switzerland	34139.8	78.8	60520.0	2.0	1.9	1.9	21.5	0.1	4.8	83.3	79.3	87.2	94.0	95.9	84.0
Czech Republic	18142.3	69.0	22494.8	2.6	2.7	1.4	24.0	0.8	6.0	78.9	60.7	93.2	89.0	86.9	68.3
Germany	30065.5	73.8	44743.1	2.2	2.2	1.8	20.7	0.4	5.0	81.2	65.2	86.9	92.0	93.4	75.9
Denmark	26074.5	72.8	50950.6	2.4	1.7	1.9	23.8	0.5	2.2	80.8	72.4	79.6	95.3	94.3	83.0
Spain	19928.0	56.8	36889.6	20.5	12.9	1.3	22.1	0.1	5.6	83.3	72.6	56.6	94.8	72.7	83.1
Estonia	16085.4	69.6	20789.0	4.6	3.3	1.6	18.1	8.8	3.4	77.2	51.8	88.1	90.5	81.8	67.2
Finland	26068.0	68.9	41375.9	2.3	2.0	1.9	22.4	0.6	3.6	81.3	69.2	86.5	94.6	94.0	82.9
France	27839.1	64.2	41847.7	4.8	4.2	1.8	20.9	0.5	7.6	82.8	68.1	77.3	88.4	81.7	69.6
United Kingdom	25985.7	72.6	41878.2	2.6	2.2	2.0	23.8	0.5	13.0	81.4	70.0	79.2	93.2	85.3	77.4
Greece	15816.5	49.4	25085.4	21.1	19.5	1.2	23.6	0.6	6.4	81.5	73.5	68.3	82.3	69.3	61.8
Hungary	14962.7	61.8	20387.9	4.2	3.8	1.2	18.4	4.8	3.8	75.9	57.5	83.1	84.2	76.2	50.7
Ireland	23245.0	61.3	49970.6	2.7	7.0	2.1	20.2	1.8	4.1	81.4	82.5	78.8	95.7	82.2	75.5
Iceland	22394.6	82.2	48415.4	3.6	0.7	1.6	24.4	0.0	4.8	82.9	76.1	73.3	98.3	98.6	87.0
Israel	17939.2	67.9	31713.3	3.2	0.6	1.1	21.9	2.6	14.8	82.2	84.3	85.4	86.6	66.5	70.2
Italy	24051.9	55.7	34781.0	16.9	7.8	1.4	23.5	3.7	3.8	83.2	67.9	59.3	90.8	70.9	58.3
Japan	25070.1	72.7	38762.7	1.2	1.4	1.9	23.0	2.6	6.4	83.7	62.7	79.1	89.7	86.1	70.6
Korea	19878.1	65.3	31687.5	2.4	0.0	1.3	15.7	2.6	6.4	81.8	32.5	85.0	75.9	77.8	63.9
Luxembourg	27684.0	66.6	61175.3	2.7	1.6	2.0	21.0	0.2	3.3	82.3	72.8	82.0	91.6	84.7	72.0
Latvia	13185.6	66.3	19629.2	4.9	4.7	1.2	24.2	14.9	2.5	74.3	45.8	86.7	85.8	76.6	60.7
Mexico	12394.7	60.4	15230.1	5.1	0.1	1.0	21.8	2.6	28.8	74.8	62.7	35.1	80.1	67.0	45.9
Netherlands	26446.7	73.9	51576.2	2.9	2.7	2.0	19.1	3.0	0.5	81.8	77.3	75.9	90.1	93.0	81.2
Norway	32114.2	75.3	54476.2	1.5	0.4	2.0	17.3	0.1	3.1	82.2	78.5	81.9	94.1	96.4	87.7
New Zealand	22919.0	74.2	37856.0	4.7	0.8	2.4	26.2	2.6	14.0	81.5	91.4	74.1	95.4	89.8	64.8
Poland	16500.2	61.7	24032.5	6.1	3.3	1.1	22.8	3.3	7.3	77.7	58.1	90.5	88.7	80.0	66.3
Portugal	17964.5	62.6	24716.7	6.2	8.3	1.6	20.9	1.0	9.8	81.2	45.9	43.3	86.5	86.9	72.1
Slovak Republic	17583.5	61.0	22153.3	8.3	8.8	1.1	24.3	1.2	6.2	76.9	64.7	90.8	91.5	82.5	60.1
Slovenia	18281.1	63.9	33439.3	5.0	5.3	1.3	18.6	0.5	5.5	81.2	64.8	85.7	90.5	89.4	84.7
Sweden	28566.1	74.9	41461.1	6.6	1.3	1.7	19.8	0.0	1.1	82.3	80.1	81.6	91.8	95.0	75.9
Turkey	17939.2	49.5	27446.5	14.5	2.0	0.9	19.8	8.2	39.2	78.0	68.1	35.6	85.6	63.0	60.6
United States	39837.9	68.1	58219.4	4.3	1.4	2.4	18.4	0.1	11.8	78.9	88.1	89.6	89.9	84.1	74.1

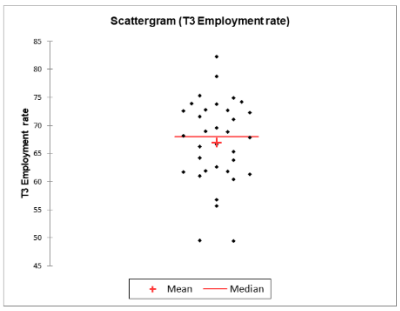
Statistic	T1 HH adj disposable income	T3 Employment rate	T4 Earnings per empl	T5 Labour insecurity	T7 Unemploym rate	T8 Rooms per person	T9 HH exp on housing	T10 Lack basic facilities	T11 Empl working long	T13 Life expect at birth	T14 Perc health status	T15 Adult upper sec educ	T18 Social support	T21 Satisf with water	T24 Feelings of safety
Minimum	12394.7	49.4	15230.1	1.2	0.0	0.9	15.7	0.0	0.5	74.3	32.5	35.1	75.9	63.0	45.9
Maximum	39837.9	82.2	61175.3	21.1	19.5	2.5	26.2	14.9	39.2	83.7	91.4	93.2	98.3	98.6	87.7
Range	27443.3	32.8	45945.2	19.8	19.5	1.6	10.6	14.9	38.8	9.4	58.9	58.1	22.3	35.6	41.8
1st Quartile	17945.5	61.8	25675.7	2.6	1.3	1.3	19.9	0.5	3.8	79.4	63.2	74.5	88.5	78.4	64.2
Median	23648.5	68.0	40069.3	4.3	2.1	1.7	21.3	0.9	5.6	81.5	69.8	81.8	91.1	85.0	71.4
3rd Quartile	27800.3	72.7	49581.8	5.2	4.3	2.0	23.4	2.6	7.6	82.3	78.2	86.6	93.5	92.8	80.9
Mean	23315.6	67.0	38597.5	5.5	3.6	1.7	21.4	2.1	7.8	80.7	69.5	77.2	90.2	84.2	71.5
Variance (n-1)	41468098.7	57.8	172385680.8	25.4	16.2	0.2	5.7	9.5	59.2	6.3	169.4	221.2	22.4	91.6	107.4
Standard deviation (n-1)	6439.6	7.6	13129.6	5.0	4.0	0.4	2.4	3.1	7.7	2.5	13.0	14.9	4.7	9.6	10.4
Skewness (Pearson)	0.3	-0.4	-0.1	2.1	2.3	0.1	-0.3	2.6	2.7	-1.2	-0.7	-1.7	-1.0	-0.5	-0.4
Kurtosis (Pearson)	-0.4	0.0	-1.1	3.4	5.7	-1.0	-0.4	7.2	7.6	0.3	0.6	2.1	1.1	-0.6	-0.4
Standard error of mean	1104.4	1.3	2251.7	0.9	0.7	0.1	0.4	0.5	1.3	0.4	2.2	2.6	0.8	1.6	1.8

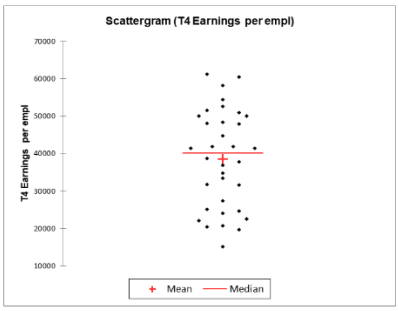
9.31. BOXPLOTS AND SCATTERGRAMS - 2014

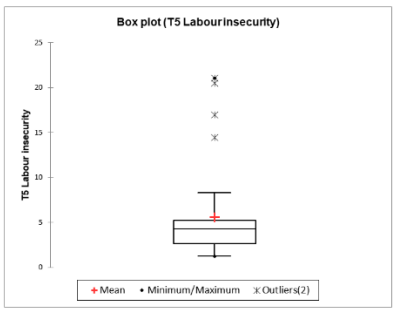


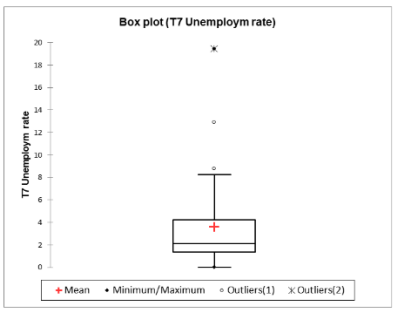


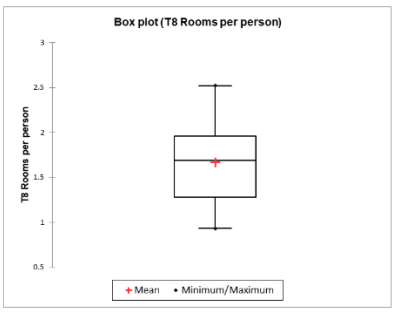


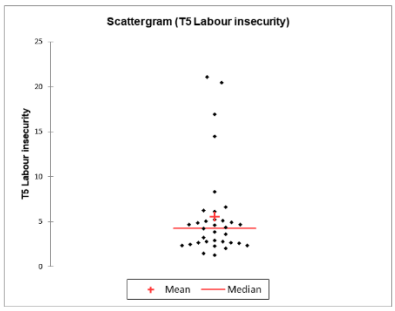


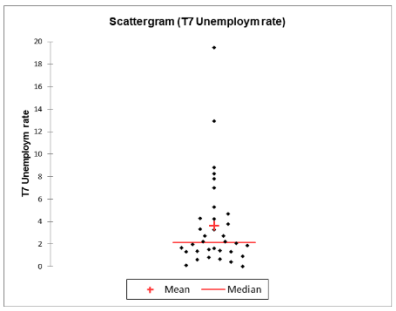


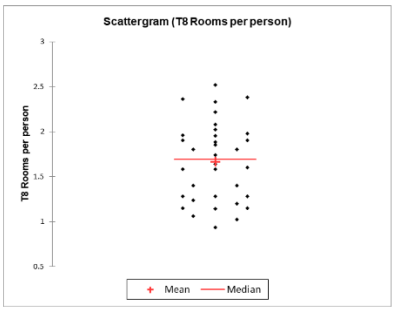


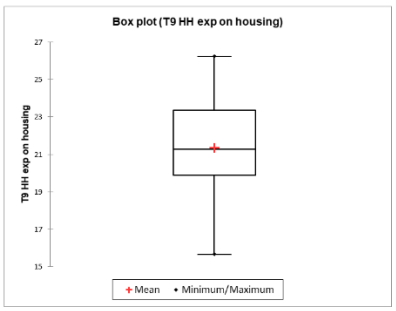


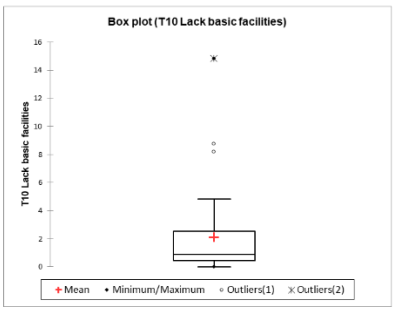


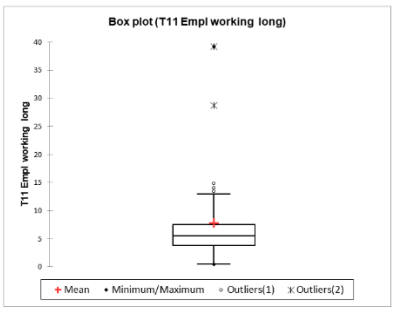




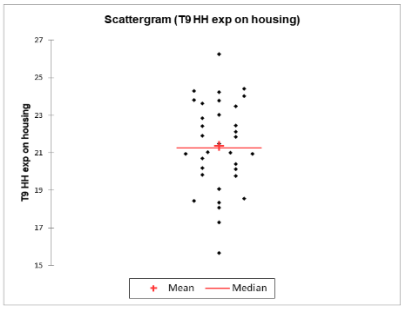


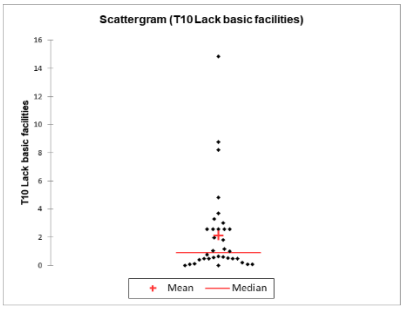


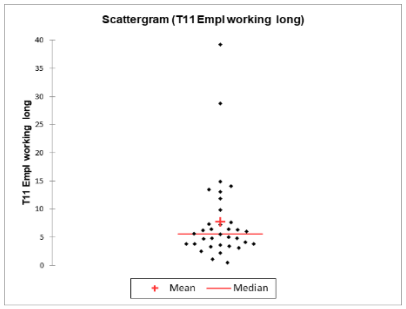


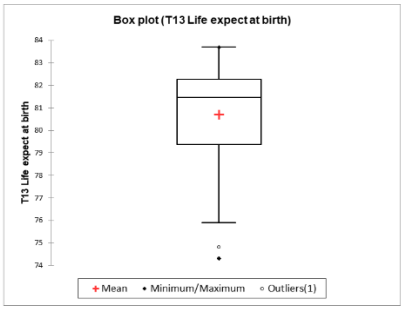


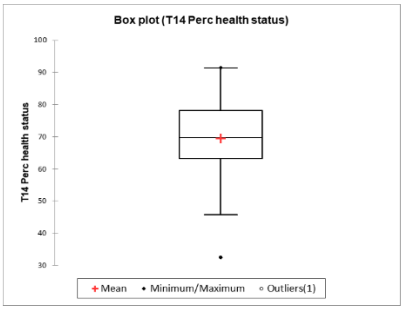
9.32. BOXPLOTS AND SCATTERGRAMS – 2014 (CONT.)

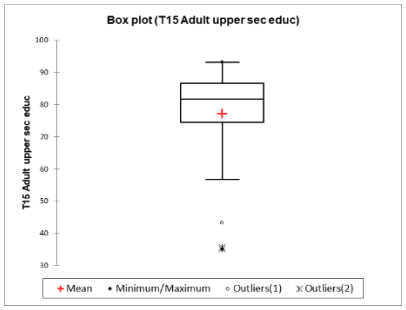


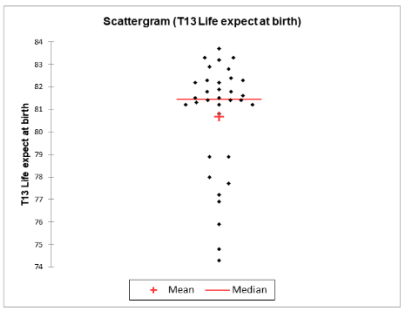


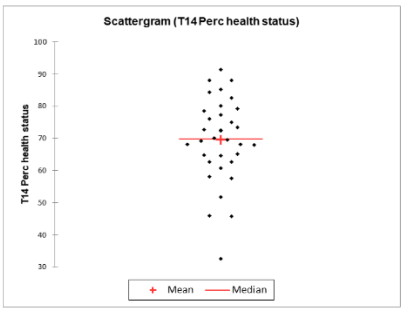


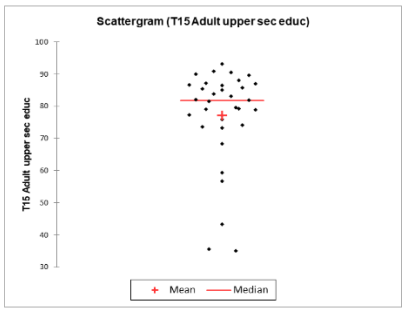


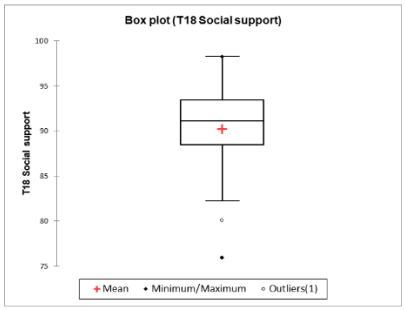


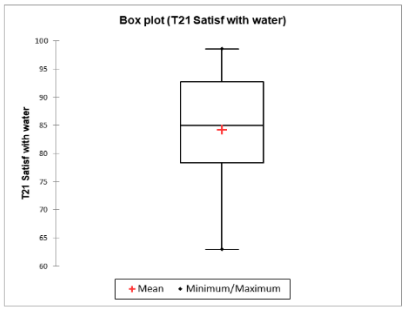


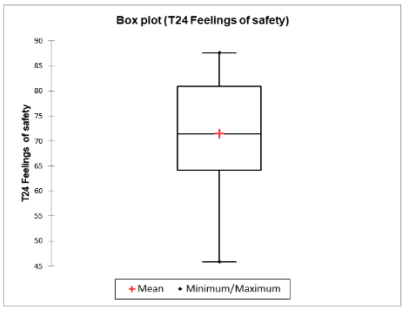


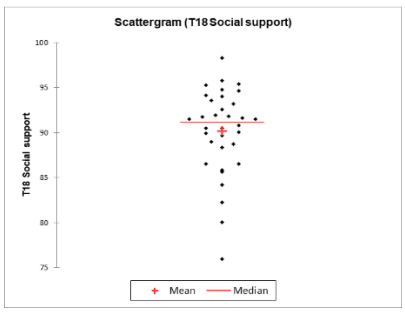


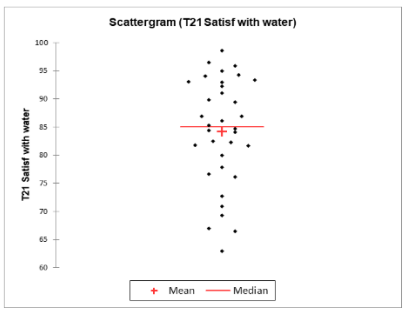


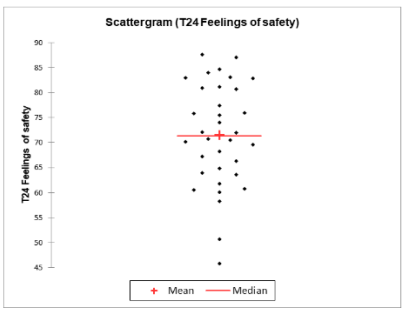




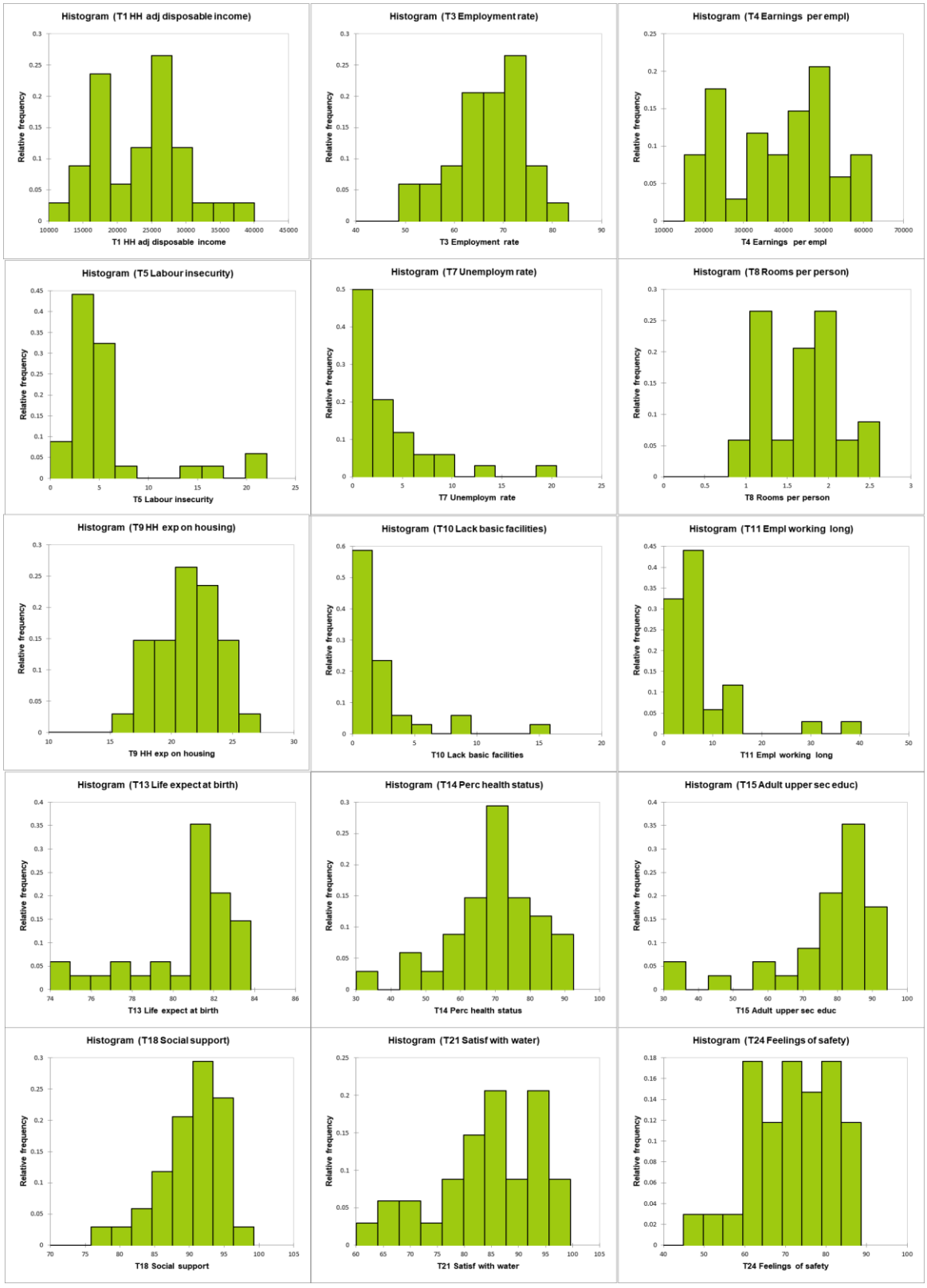






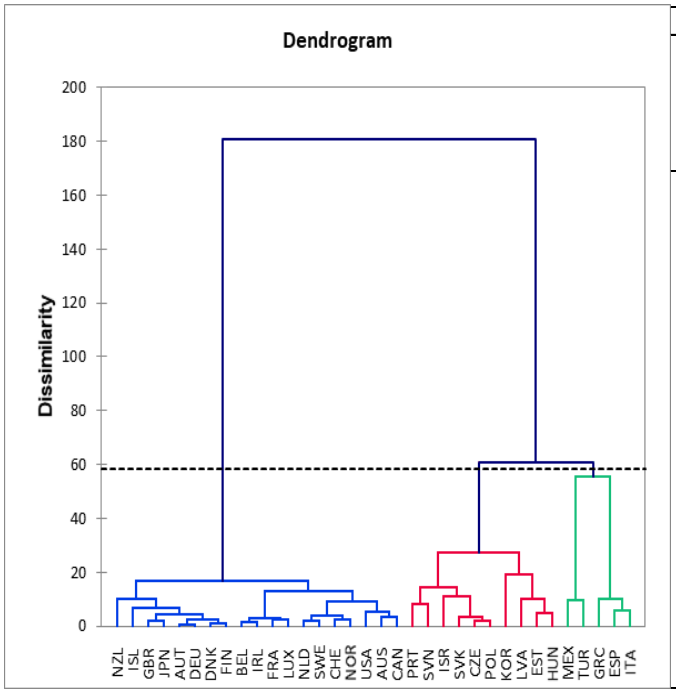


9.33. HISTOGRAMS – 2014



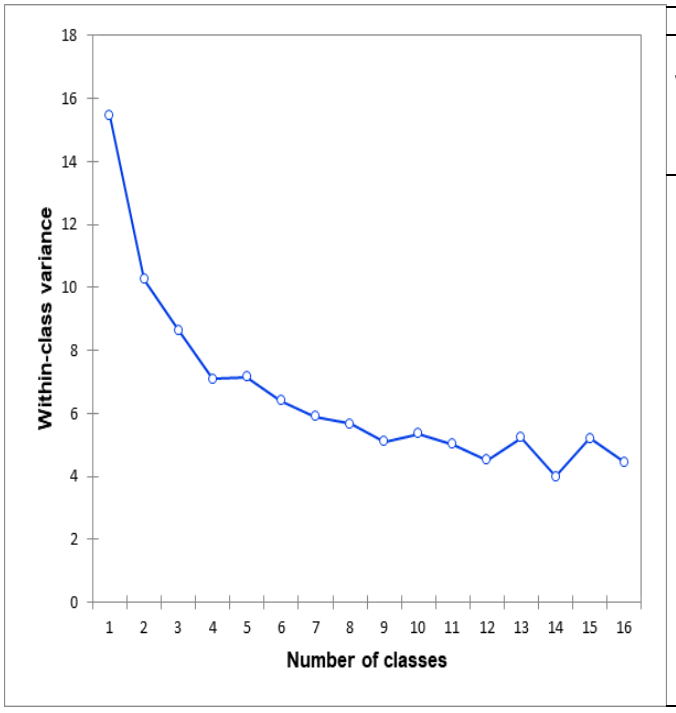
9.34. CLUSTERING ANALYSIS – 2014

a) Agglomerative hierarchical clustering



Class	1	2	3
Objects	19.0	10.0	5.0
Within-class variance	4.9	11.0	20.3
Min dist centroid	1.3	1.4	2.8
Aver dist centroid	2.1	3.0	4.0
Max dist centroid	3.4	4.5	5.0
	AUS	CZE	ESP
	AUT	EST	GRC
	BEL	HUN	ITA
	CAN	ISR	MEX
	CHE	KOR	TUR
	DEU	LVA	
	DNK	POL	
	FIN	PRT	
	FRA	SVK	
	GBR	SVN	
	IRL		
	ISL		
	JPN		
	LUX		
	NLD		
	NOR		
	NZL		
	SWE		
	USA		

b) K-means clustering (number of classes = 4)



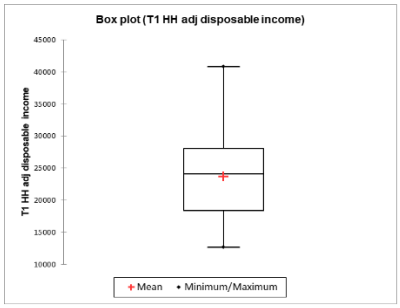
Class	1.0	2.0	3.0	4.0
Objects	19.0	10.0	3.0	2.0
Within-class varia	4.9	11.0	8.0	9.6
Min dist centroid	1.3	1.4	2.1	2.2
Aver dist centroid	2.1	3.0	2.3	2.2
Max dist centroid	3.4	4.5	2.6	2.2
	AUS	CZE	ESP	MEX
	AUT	EST	GRC	TUR
	BEL	HUN	ITA	
	CAN	ISR		
	CHE	KOR		
	DEU	LVA		
	DNK	POL		
	FIN	PRT		
	FRA	SVK		
	GBR	SVN		
	IRL			
	ISL			
	JPN			
	LUX			
	NLD			
	NOR			
	NZL			
	SWE			
	USA			

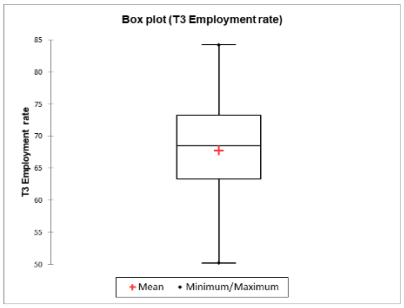
9.35. OECD "HOW'S LIFE" DATA & DESCRIPTIVE STATISTICS - 2015

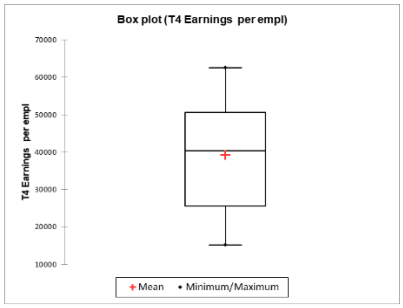
Y2015	T1 HH adj disposable income	T3 Employment rate	T4 Earnings per empl	T5 Labour insecurity	T7 Unemploym rate	T8 Rooms per person	T9 HH exp on housing	T10 Lack basic facilities	T11 Empl working long	T13 Life expect at birth	T14 Perc health status	T15 Adult upper sec educ	T18 Social support	T21 Satisf with water	T24 Feelings of safety
Australia	30229.1	72.2	51985.6	4.3	1.4	2.3	20.3	0.5	13.5	82.5	75.2	79.0	93.6	93.6	63.6
Austria	28761.8	71.1	48251.9	2.7	1.7	1.6	21.3	1.0	7.2	81.3	69.8	84.6	91.5	91.5	80.7
Belgium	26695.5	61.8	50097.8	4.8	4.4	2.2	20.5	2.0	4.3	81.1	74.6	74.7	91.7	91.7	70.7
Canada	28362.1	72.5	48213.0	3.9	0.8	2.5	22.5	0.5	3.8	81.7	88.4	90.4	92.6	92.6	80.9
Switzerland	33630.8	79.2	60241.5	1.8	1.9	1.9	21.4	0.1	4.8	83.0	79.6	87.3	94.0	94.0	84.0
Czech Republic	18600.2	70.2	23003.2	1.8	2.4	1.4	24.0	0.8	6.1	78.7	61.2	93.2	89.0	89.0	68.3
Germany	30564.1	74.0	45809.8	2.0	2.0	1.8	20.4	0.4	4.8	80.7	64.5	86.8	92.0	92.0	75.9
Denmark	26539.6	73.5	51462.9	2.3	1.7	1.9	23.6	0.5	2.5	80.8	71.6	80.4	95.3	95.3	83.0
Spain	20367.2	58.7	37259.1	17.3	11.4	1.3	21.8	0.1	5.2	83.0	72.4	57.4	94.8	94.8	83.1
Estonia	16795.4	71.8	22438.0	4.0	2.4	1.6	17.7	8.8	3.4	77.7	51.4	88.6	90.5	90.5	67.2
Finland	26236.6	68.7	41952.5	2.7	2.3	1.9	22.7	0.6	3.7	81.6	69.8	87.2	94.6	94.6	82.9
France	28072.2	64.3	42454.7	5.0	4.3	1.8	20.9	0.5	7.6	82.4	67.8	77.5	88.4	88.4	69.6
United Kingdom	26668.0	73.2	42304.4	2.6	1.7	2.0	23.6	0.5	13.0	81.0	69.8	79.6	93.2	93.2	77.4
Greece	15445.1	50.8	24718.8	17.4	18.2	1.2	23.7	0.6	6.5	81.1	74.4	70.2	82.3	82.3	61.8
Hungary	15282.1	63.9	20666.9	4.8	3.2	1.2	18.4	4.8	3.8	75.7	56.3	83.2	84.2	84.2	50.7
Ireland	23966.6	63.1	50866.0	2.1	5.6	2.1	20.8	1.8	4.6	81.5	82.3	79.8	95.7	95.7	75.5
Iceland	22813.1	84.2	51404.6	2.6	0.6	1.6	24.9	0.0	4.8	82.5	76.3	74.7	98.3	98.3	87.0
Israel	18341.6	68.3	32729.4	2.6	0.6	1.1	21.5	2.8	15.1	82.1	83.9	85.5	86.6	86.6	70.2
Italy	24244.8	56.3	35116.7	8.1	7.0	1.4	23.3	4.7	3.9	82.6	65.6	59.9	90.8	90.8	58.3
Japan	25368.3	73.3	38660.2	1.5	1.2	1.9	22.3	2.8	6.1	83.9	62.4	79.9	89.7	89.7	70.6
Korea	20179.9	65.7	32061.9	2.4	0.0	1.3	15.2	2.8	6.1	82.1	32.5	85.8	75.9	75.9	63.9
Luxembourg	27992.3	66.1	62579.6	3.2	1.9	2.0	21.1	0.2	3.7	82.4	70.4	74.6	91.6	91.6	72.0
Latvia	14002.8	68.1	21112.7	4.6	4.5	1.2	23.2	2.8	2.4	74.6	46.2	87.8	85.8	85.8	60.7
Mexico	12694.3	60.7	15230.0	4.6	0.1	1.0	20.7	2.8	29.6	75.0	62.4	35.7	80.1	80.1	45.9
Netherlands	26606.3	74.1	52719.5	2.1	3.0	2.0	19.5	4.0	0.5	81.6	76.2	76.4	90.1	90.1	81.2
Norway	33131.9	74.9	54628.7	2.7	0.5	2.0	17.2	0.1	3.2	82.4	78.3	82.4	94.1	94.1	87.7
New Zealand	22817.4	74.3	38519.2	4.9	0.8	2.4	27.1	2.8	13.6	81.7	88.9	74.7	95.4	95.4	64.8
Poland	17048.5	62.9	24597.2	4.3	2.9	1.1	22.6	3.3	6.9	77.6	57.8	90.8	88.7	88.7	66.3
Portugal	18390.5	63.9	24595.3	6.5	7.1	1.6	21.1	1.0	8.8	81.2	46.4	45.1	86.5	86.5	72.1
Slovak Republic	18293.6	62.7	22923.8	6.7	7.1	1.1	23.6	1.2	5.6	76.7	65.9	91.3	91.5	91.5	60.1
Slovenia	18598.3	65.2	34153.0	4.0	4.7	1.3	18.3	0.5	5.4	80.9	64.8	86.8	90.5	90.5	84.7
Sweden	28962.2	75.5	42190.2	5.7	1.3	1.7	19.6	0.0	1.1	82.3	79.7	82.0	91.8	91.8	75.9
Turkey	18341.6	50.2	28017.1	13.0	2.2	0.9	19.6	8.2	36.7	78.0	66.4	37.0	85.6	85.6	60.6
United States	40870.1	68.7	59690.9	3.8	1.0	2.4	18.4	0.1	11.6	78.8	88.1	89.5	89.9	89.9	74.1

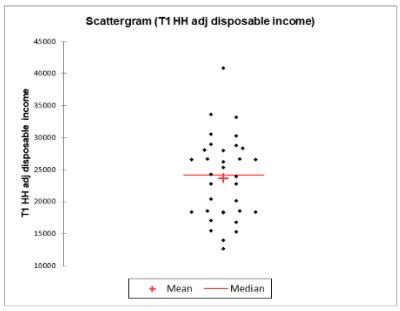
Statistic	T1 HH adj disposable income	T3 Employment rate	T4 Earnings per empl	T5 Labour insecurity	T7 Unemploym rate	T8 Rooms per person	T9 HH exp on housing	T10 Lack basic facilities	T11 Empl working long	T13 Life expect at birth	T14 Perc health status	T15 Adult upper sec educ	T18 Social support	T21 Satisf with water	T24 Feelings of safety
Minimum	12694.3	50.2	15230.0	1.5	0.0	0.9	15.2	0.0	0.5	74.6	32.5	35.7	75.9	75.9	45.9
Maximum	40870.1	84.2	62579.6	17.4	18.2	2.5	27.1	8.8	36.7	83.9	88.9	93.2	98.3	98.3	87.7
Range	28175.8	34.0	47349.7	15.9	18.2	1.6	11.9	8.8	36.2	9.3	56.4	57.5	22.3	22.3	41.8
1st Quartile	18353.8	63.3	25543.4	2.6	1.2	1.3	19.8	0.5	3.8	79.3	62.9	74.7	88.5	88.5	64.2
Median	24105.7	68.5	40306.4	3.9	2.1	1.7	21.2	0.9	5.3	81.4	69.8	81.2	91.1	91.1	71.4
3rd Quartile	28052.2	73.3	50673.9	4.9	4.4	2.0	23.1	2.8	7.5	82.4	76.3	87.1	93.5	93.5	80.9
Mean	23673.9	67.8	39195.8	4.8	3.3	1.7	21.3	1.9	7.6	80.6	68.9	77.6	90.2	90.2	71.5
Variance (n-1)	41412296.2	55.3	174106500.4	15.1	13.1	0.2	5.9	4.8	55.4	5.9	159.1	213.3	22.4	22.4	107.4
Standard deviation (n-1)	6435.2	7.4	13194.9	3.9	3.6	0.4	2.4	2.2	7.4	2.4	12.6	14.6	4.7	4.7	10.4
Skewness (Pearson)	0.4	-0.4	0.0	2.3	2.5	0.1	-0.2	1.7	2.6	-1.1	-0.7	-1.7	-1.0	-1.0	-0.4
Kurtosis (Pearson)	-0.2	0.2	-1.1	4.6	7.0	-1.0	0.2	2.6	6.8	0.2	0.7	2.1	1.1	1.1	-0.4
Standard error of mean	1103.6	1.3	2262.9	0.7	0.6	0.1	0.4	0.4	1.3	0.4	2.2	2.5	0.8	0.8	1.8

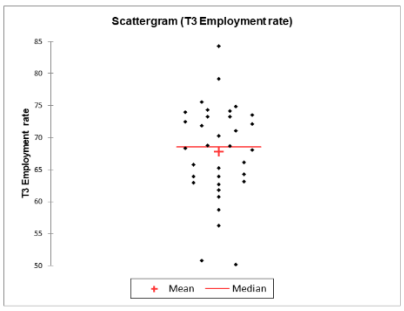
9.36. BOXPLOTS AND SCATTERGRAMS - 2015

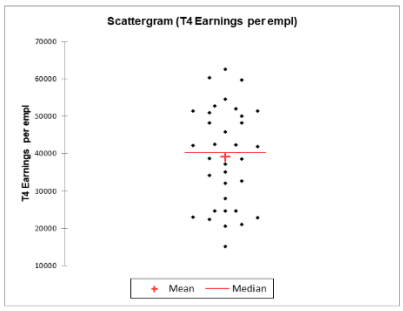


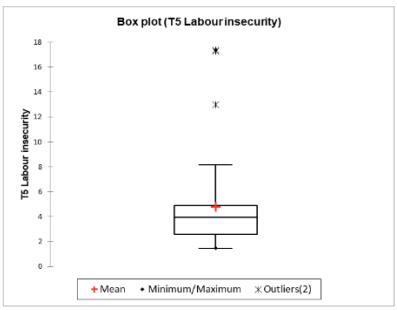


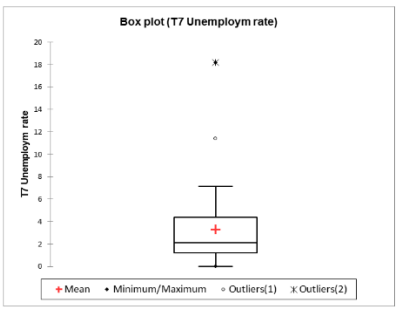


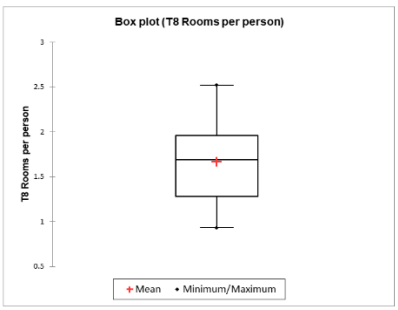


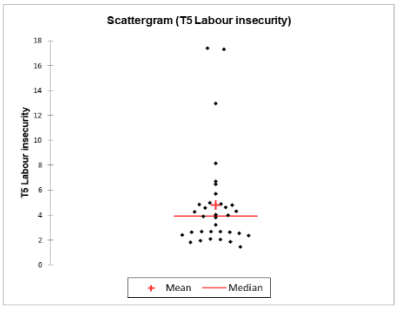


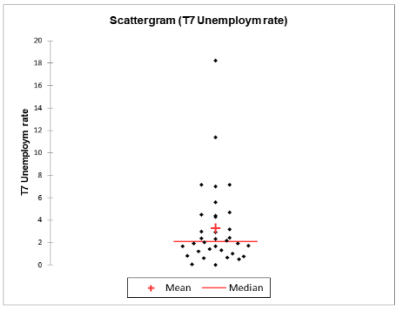


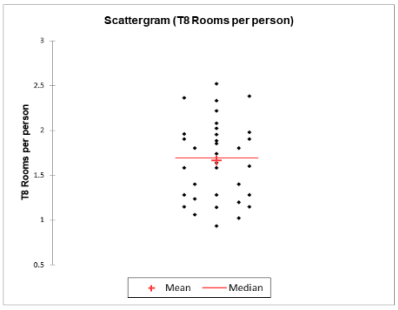


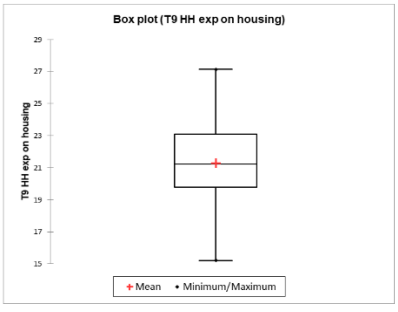


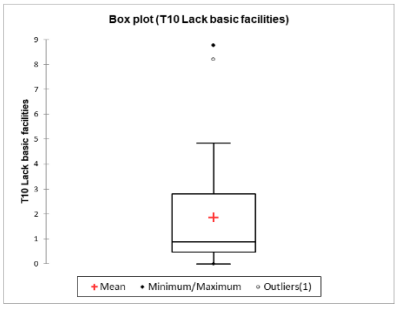


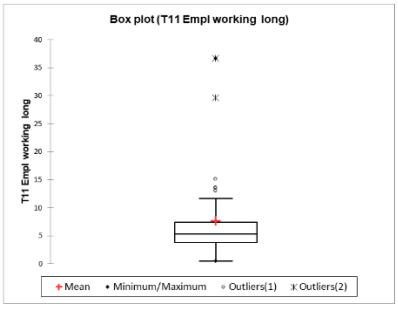




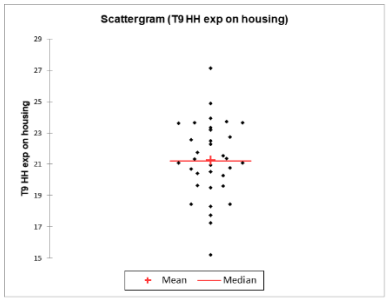


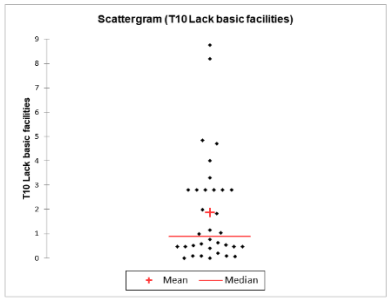


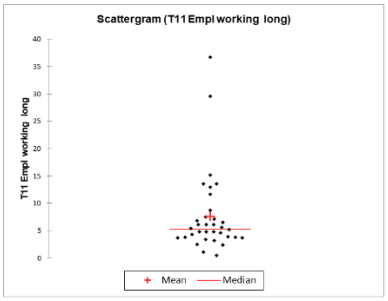


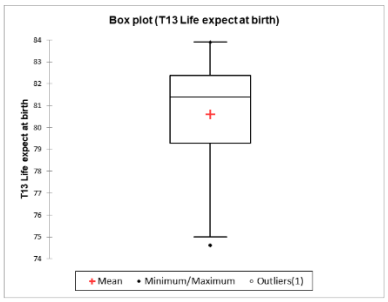


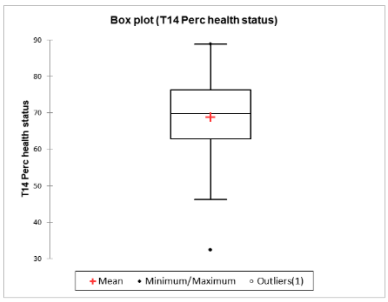
9.37. BOXPLOTS AND SCATTERGRAMS – 2015 (CONT.)

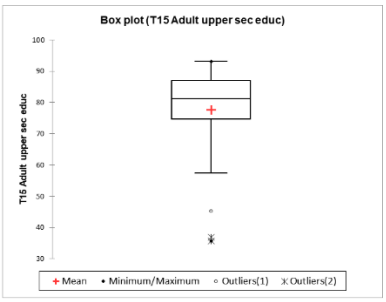


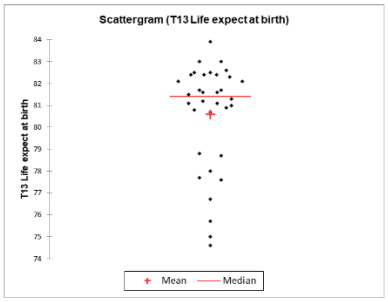


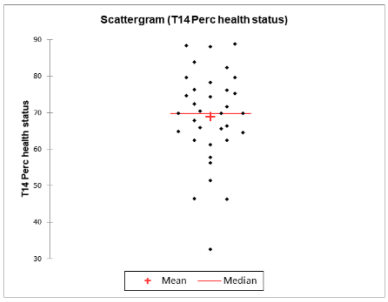


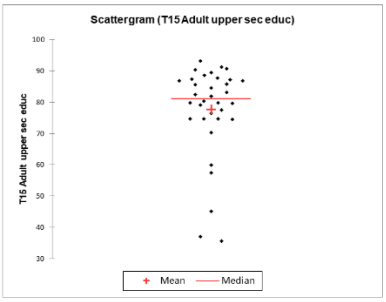


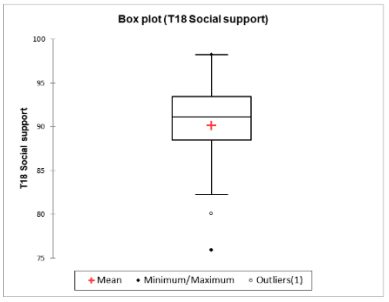


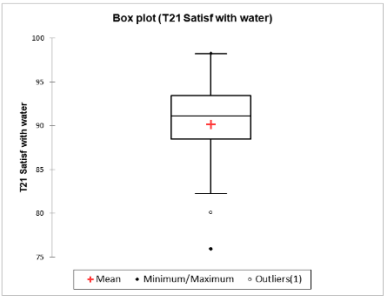


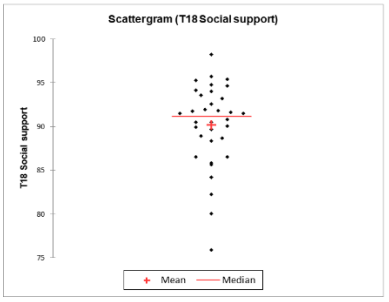


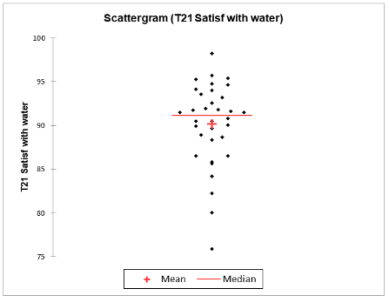


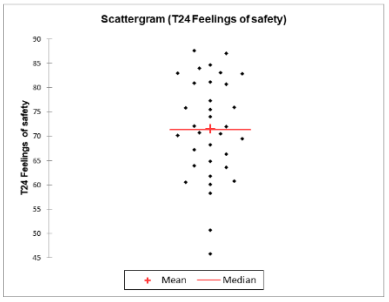




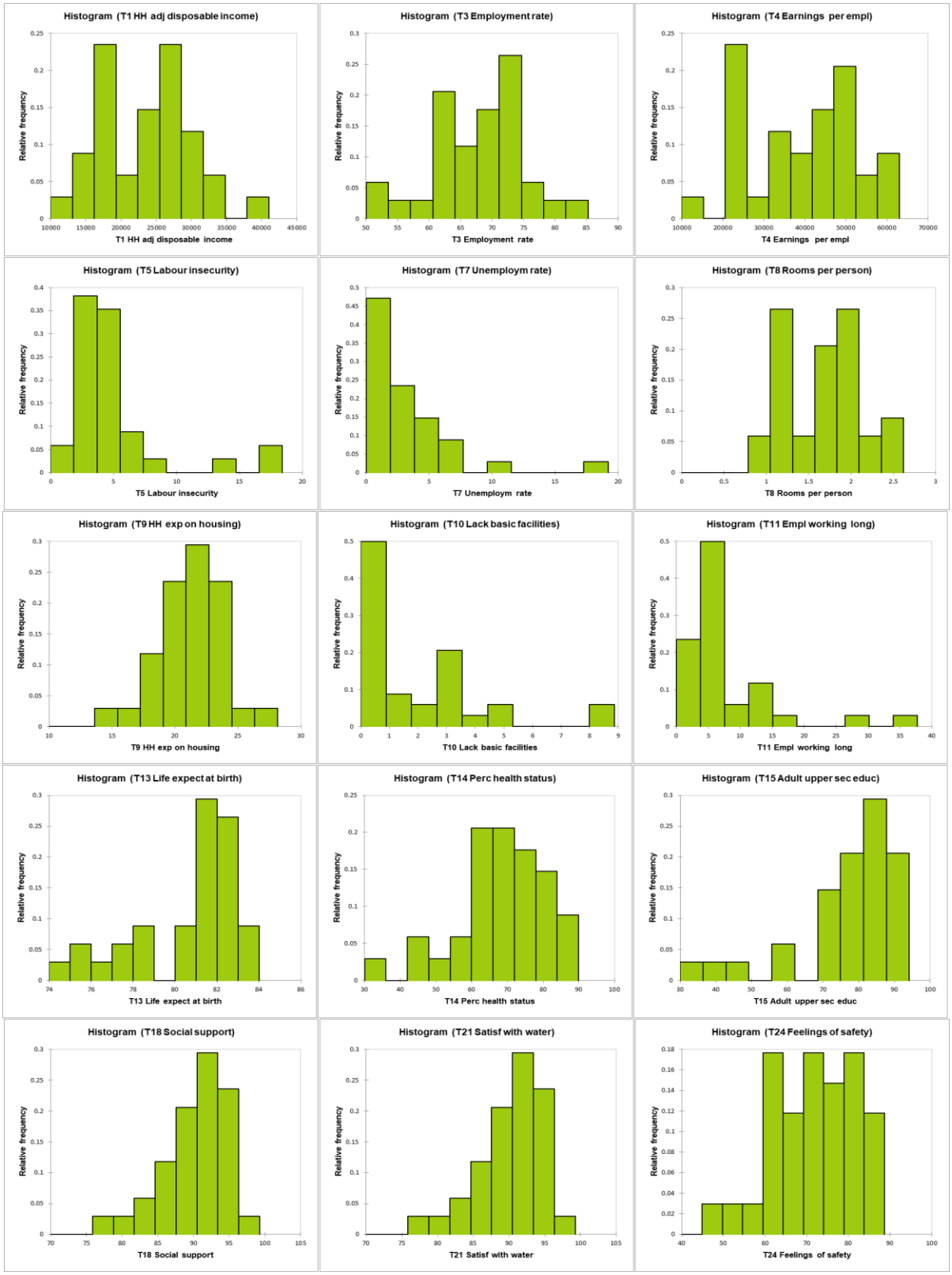






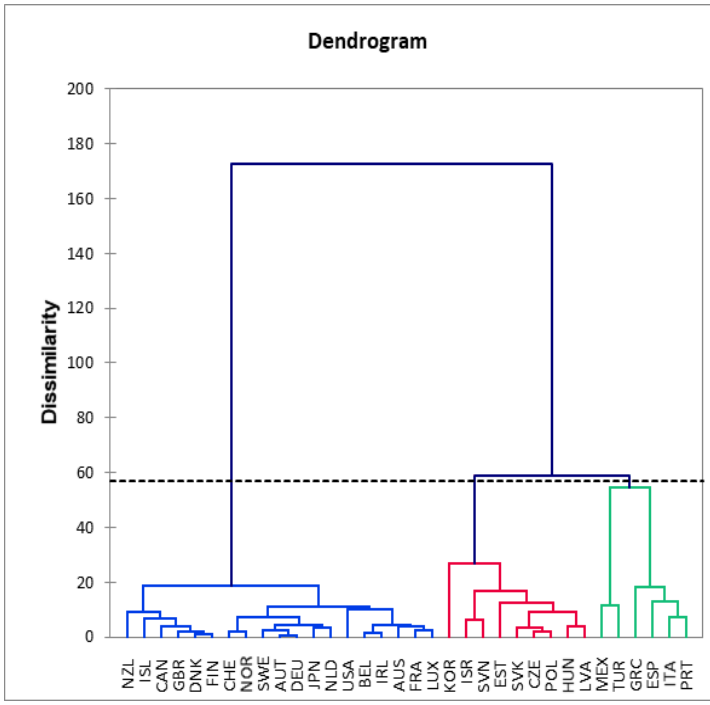


9.38. HISTOGRAMS – 2015



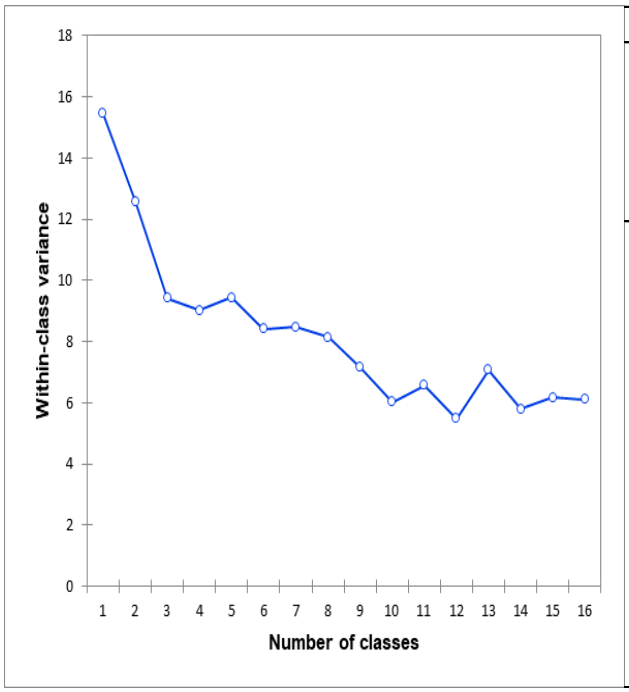
9.39. CLUSTERING ANALYSIS – 2015

a) Agglomerative hierarchical clustering



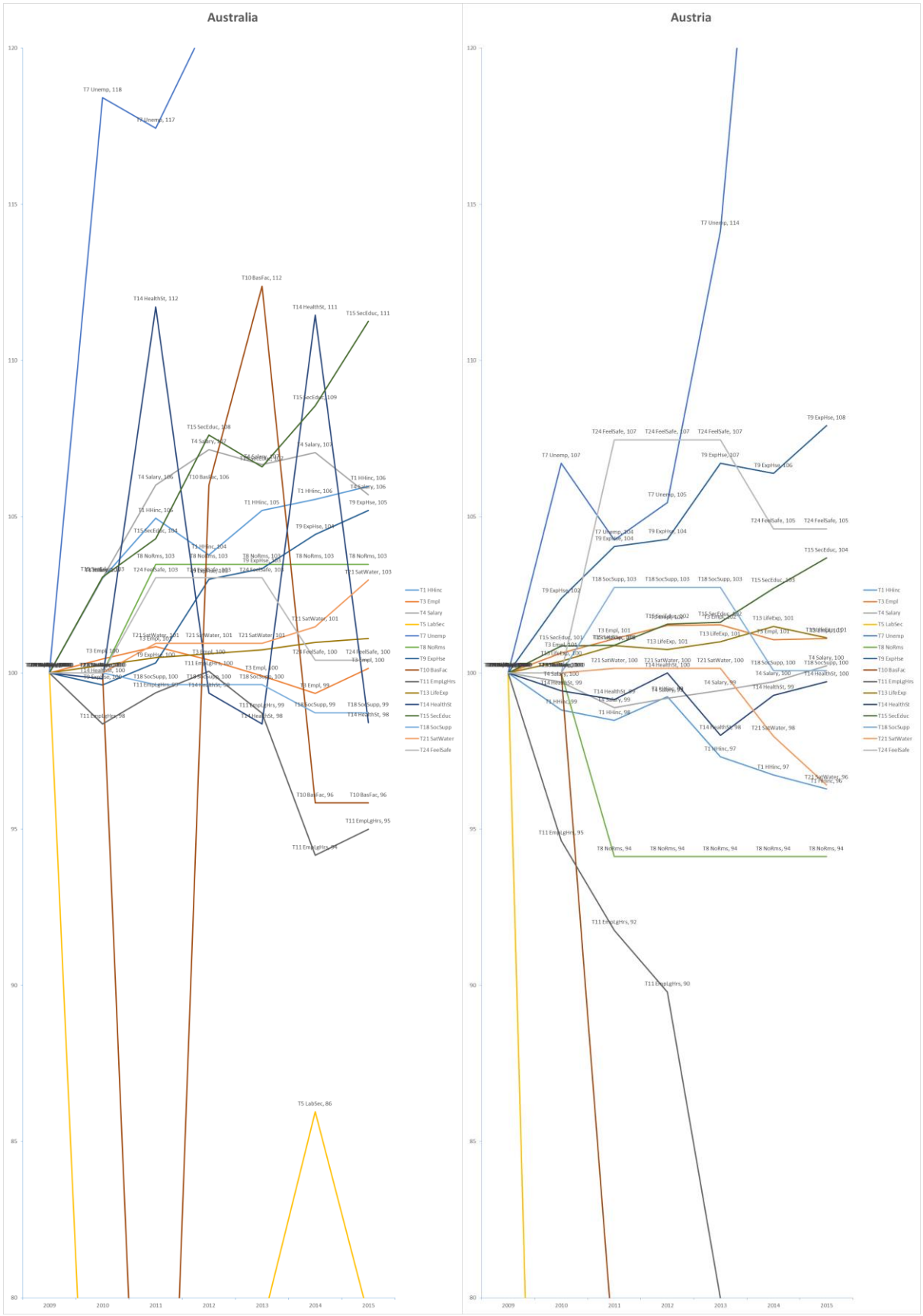
Class	1	2	3
Objects	19.0	9.0	6.0
Within-class variance	5.2	10.1	20.9
Min dist centroid	1.2	1.3	2.8
Aver dist centroid	2.1	2.8	4.1
Max dist centroid	3.6	4.9	5.2
	AUS	CZE	ESP
	AUT	EST	GRC
	BEL	HUN	ITA
	CAN	ISR	MEX
	CHE	KOR	PRT
	DEU	LVA	TUR
	DNK	POL	
	FIN	SVK	
	FRA	SVN	
	GBR		
	IRL		
	ISL		
	JPN		
	LUX		
	NLD		
	NOR		
	NZL		
	SWE		
	USA		

b) K-means clustering (number of classes = 4)

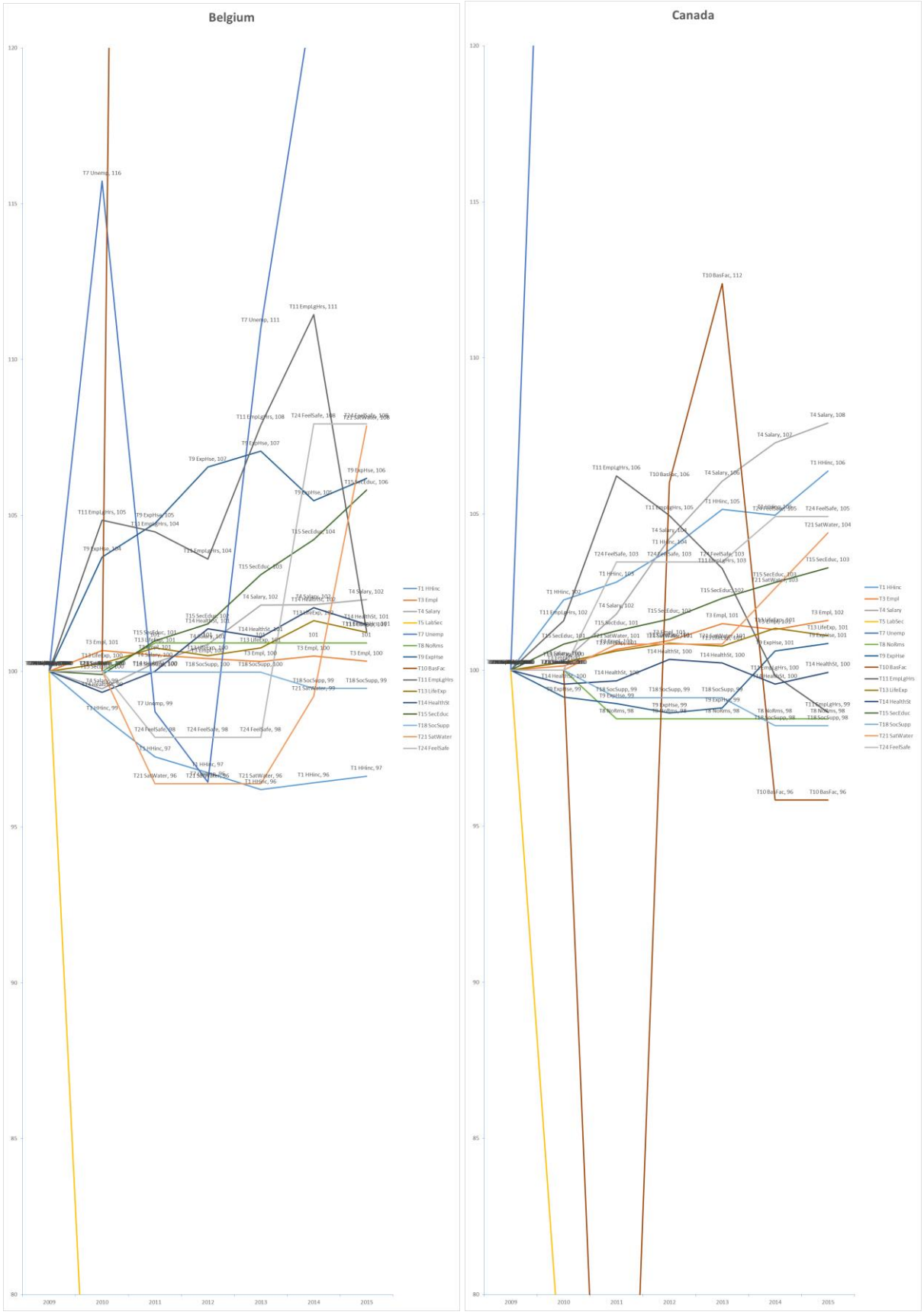


Class	1.0	2.0	3.0	4.0
Objects	13.0	7.0	7.0	7.0
Within-class varia	5.7	3.6	9.7	20.4
Min dist centroid	1.5	1.0	1.4	2.8
Aver dist centroid	2.2	1.7	2.7	4.1
Max dist centroid	3.4	2.5	4.9	5.1
	AUS	AUT	CZE	ESP
	BEL	DEU	EST	GRC
	CAN	FRA	HUN	ISR
	CHE	JPN	KOR	ITA
	DNK	NLD	LVA	MEX
	FIN	SVN	POL	PRT
	GBR	SWE	SVK	TUR
	IRL			
	ISL			
	LUX			
	NOR			
	NZL			
	USA			

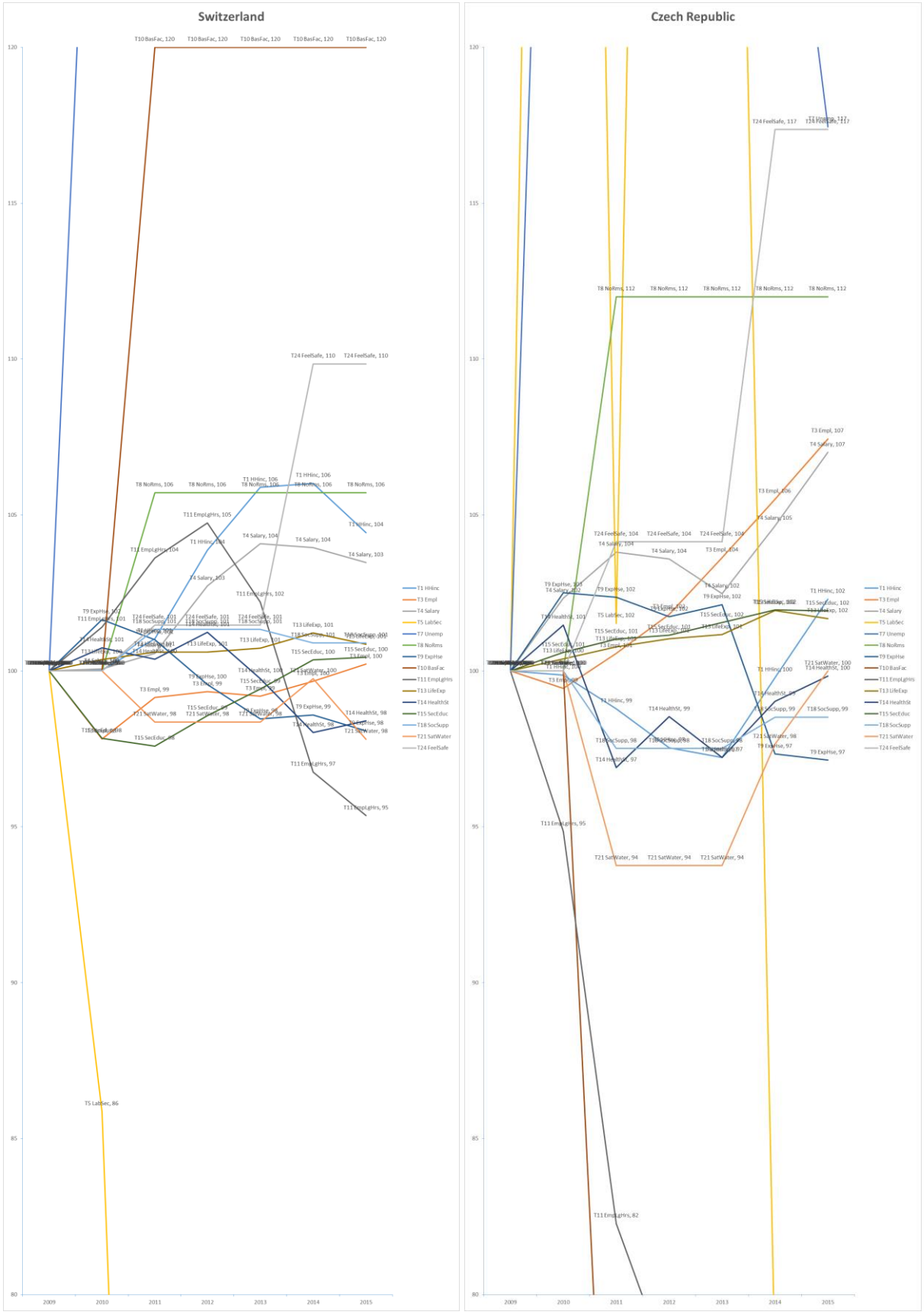
9.40. VARIABLES EVOLUTION PER COUNTRY – AUSTRALIA AND AUSTRIA



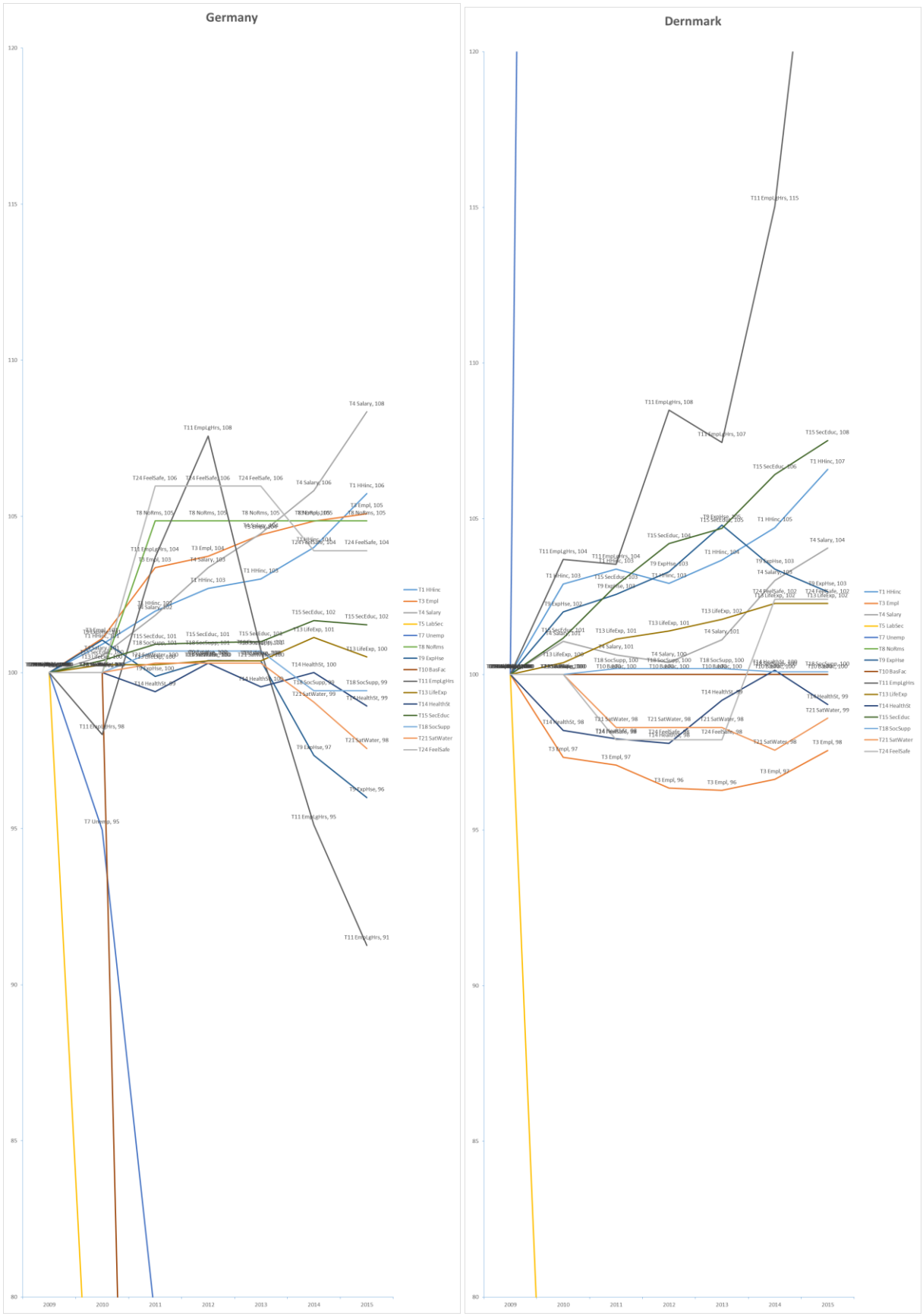
9.41. VARIABLES EVOLUTION PER COUNTRY – BELGIUM AND CANADA



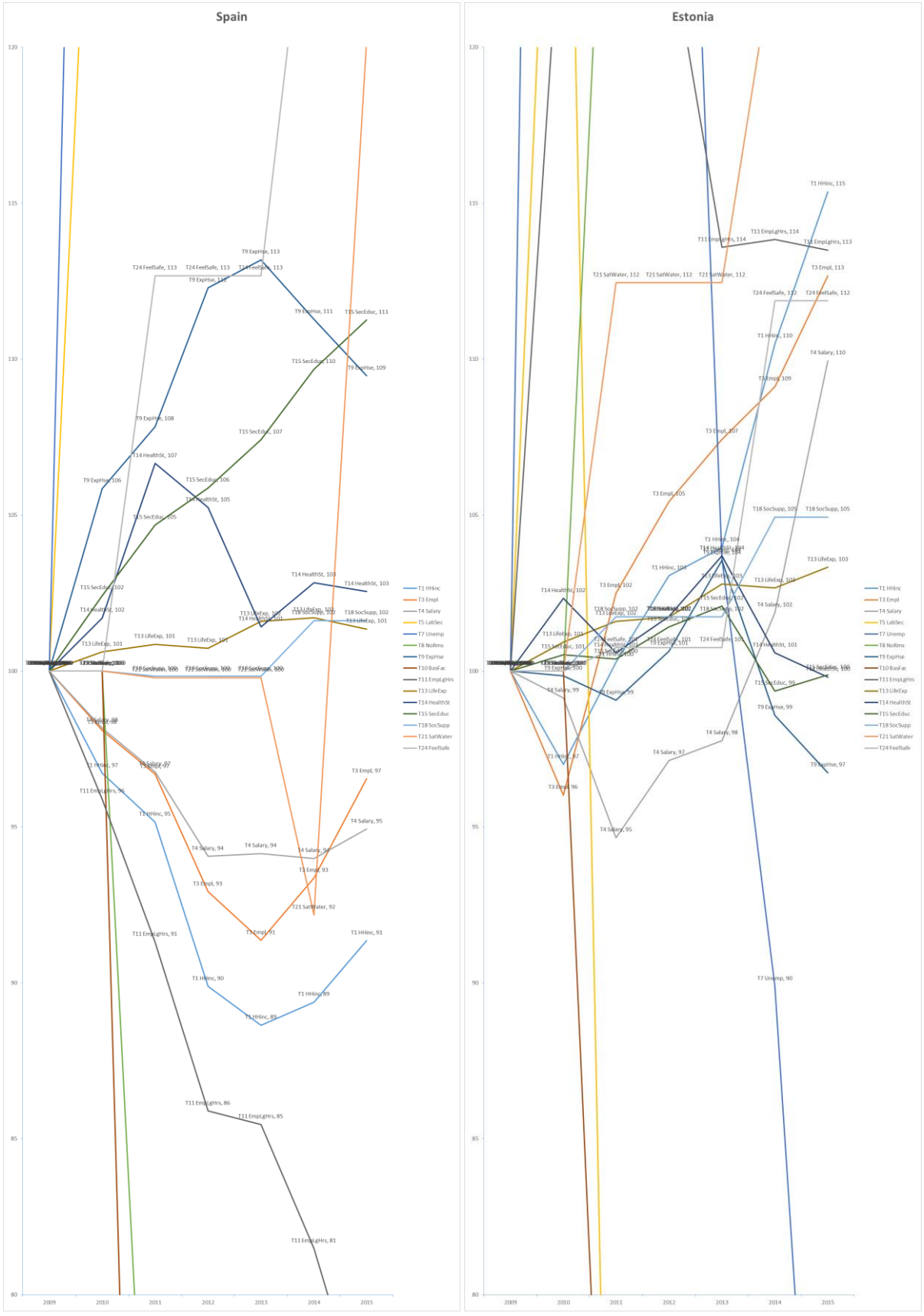
9.42. VARIABLES EVOLUTION PER COUNTRY – SWITZERLAND AND CZECH REPUBLIC



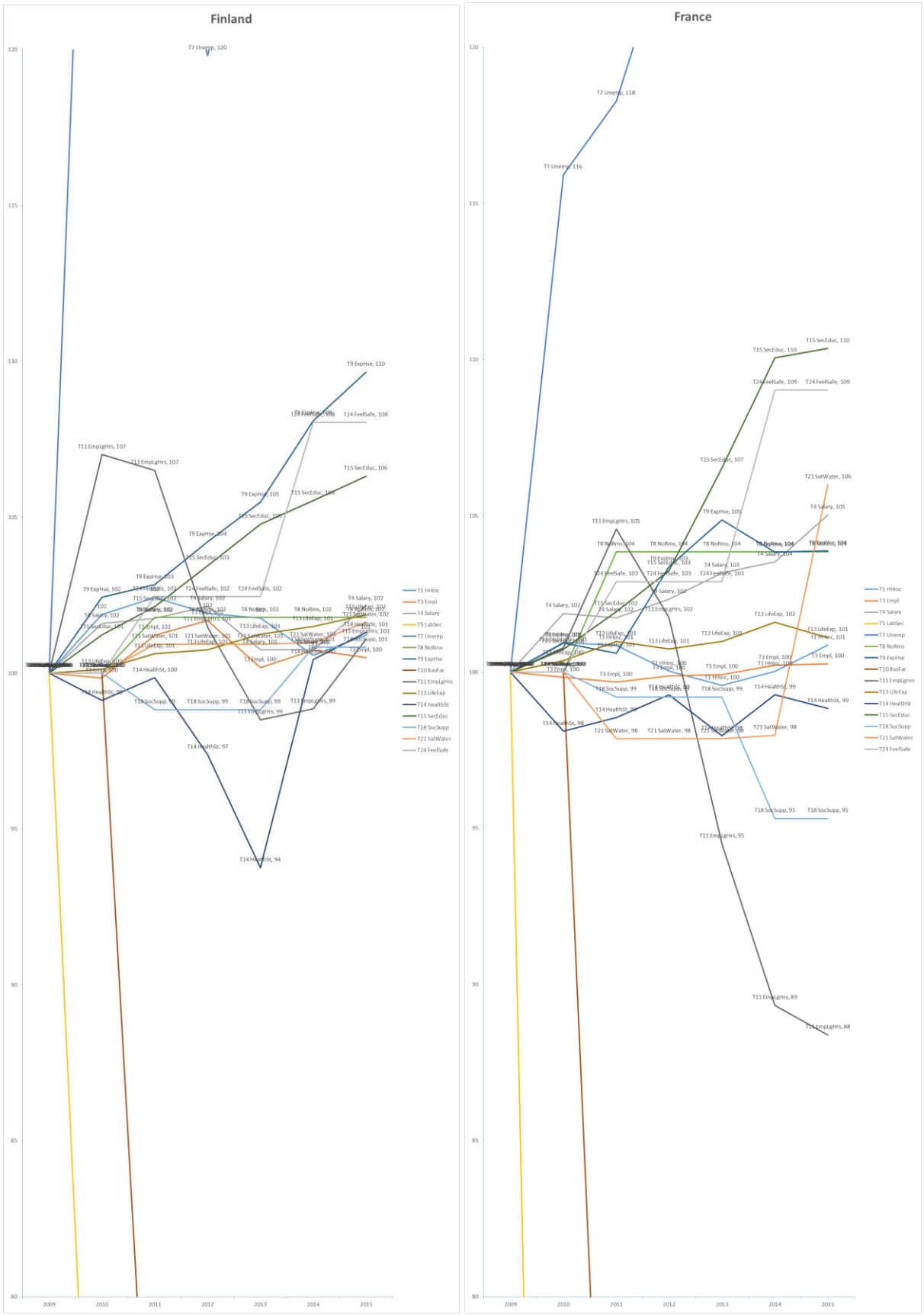
9.43. VARIABLES EVOLUTION PER COUNTRY – GERMANY AND DENMARK



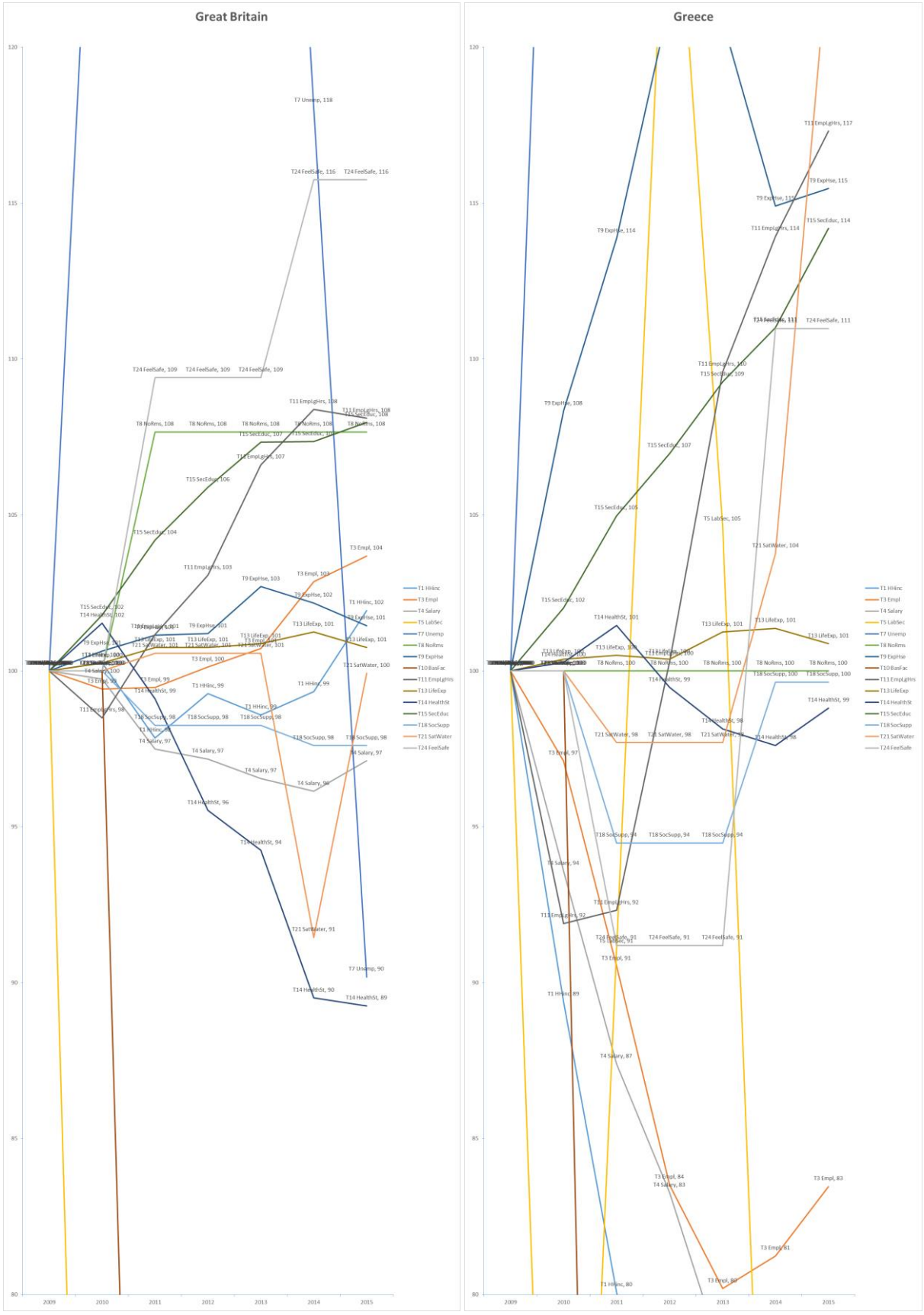
9.44. VARIABLES EVOLUTION PER COUNTRY – SPAIN AND ESTONIA



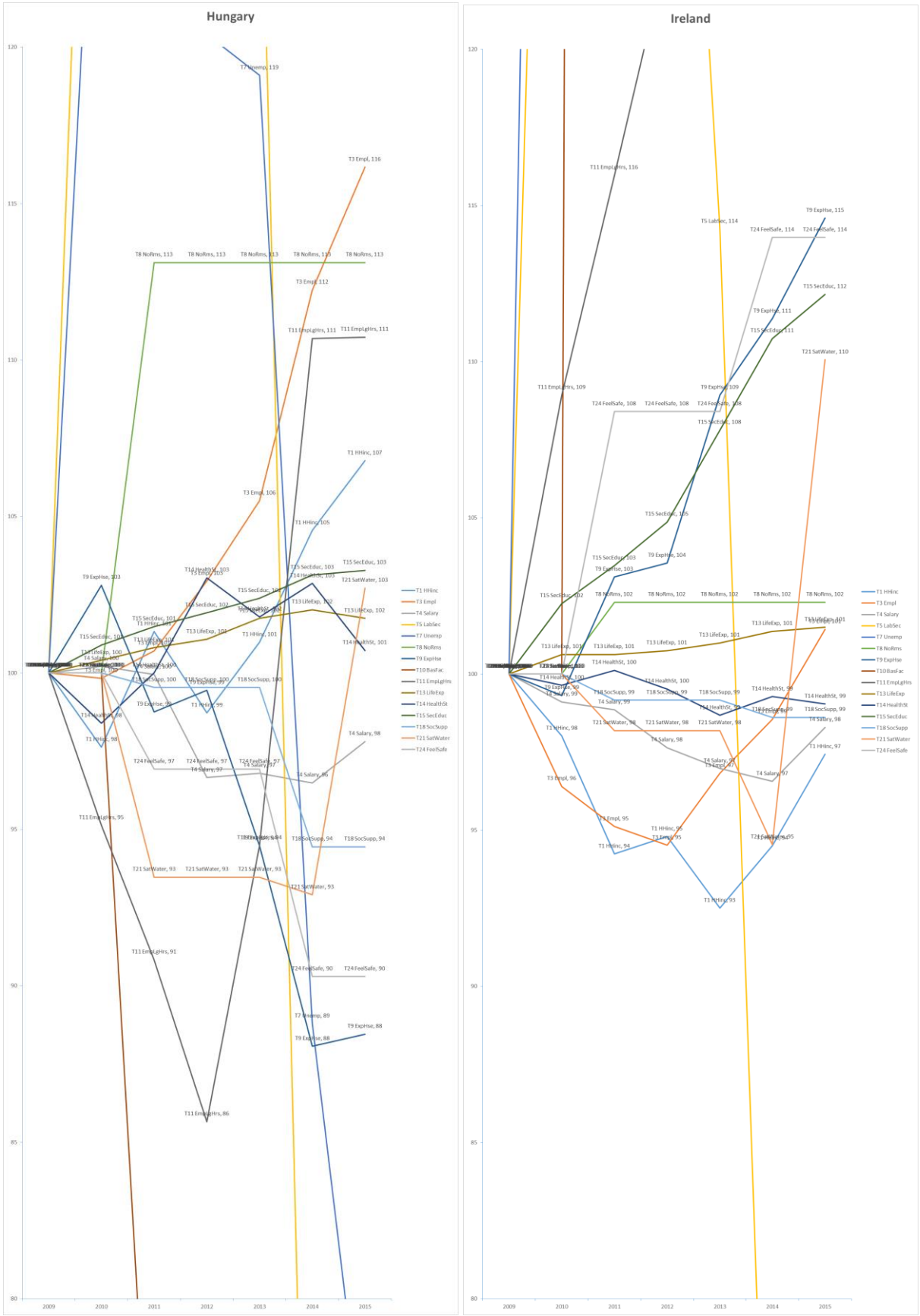
9.45. VARIABLES EVOLUTION PER COUNTRY – FINLAND AND FRANCE



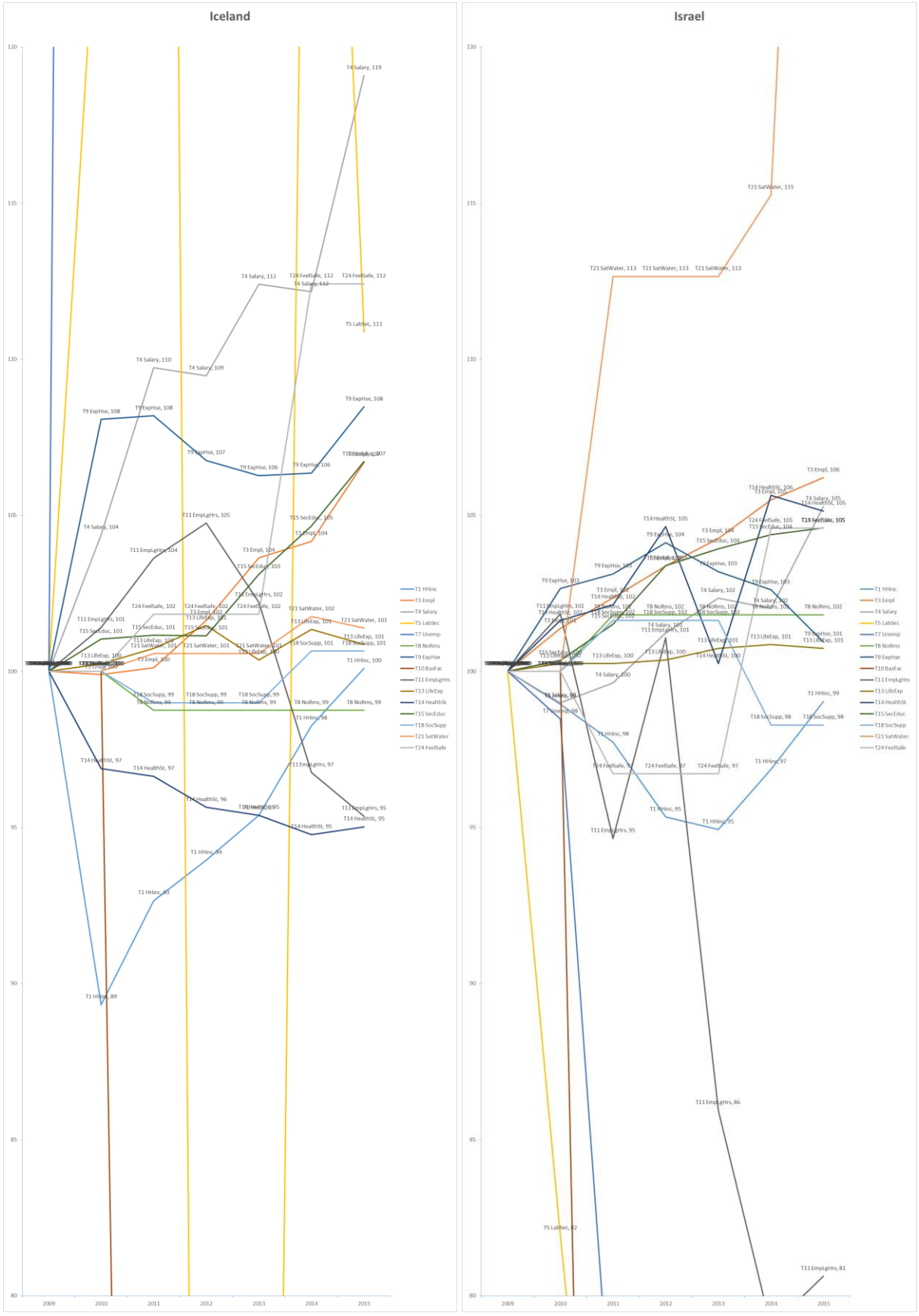
9.46. VARIABLES EVOLUTION PER COUNTRY – GREAT BRITAIN AND GREECE



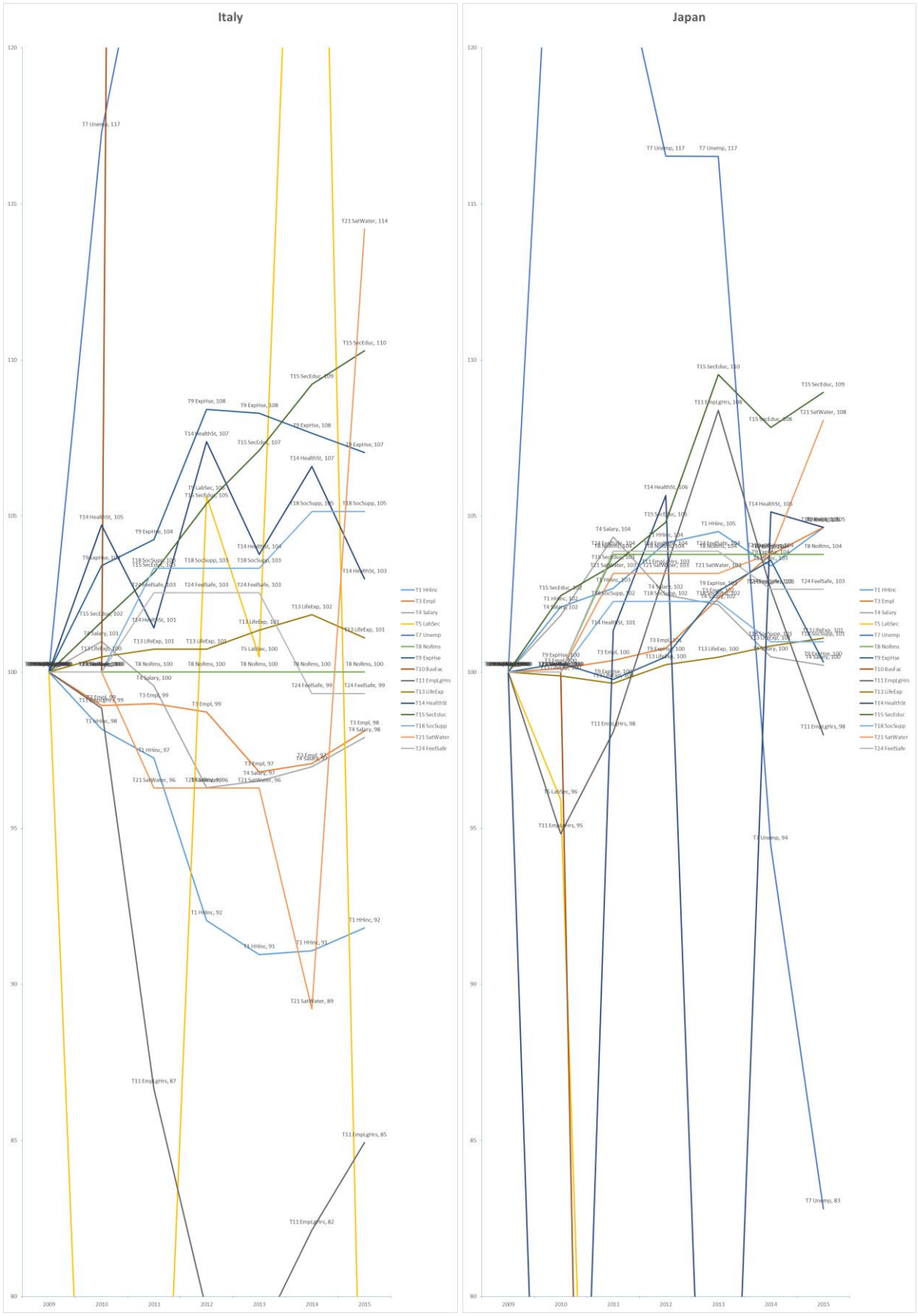
9.47. VARIABLES EVOLUTION PER COUNTRY – HUNGARY AND IRELAND



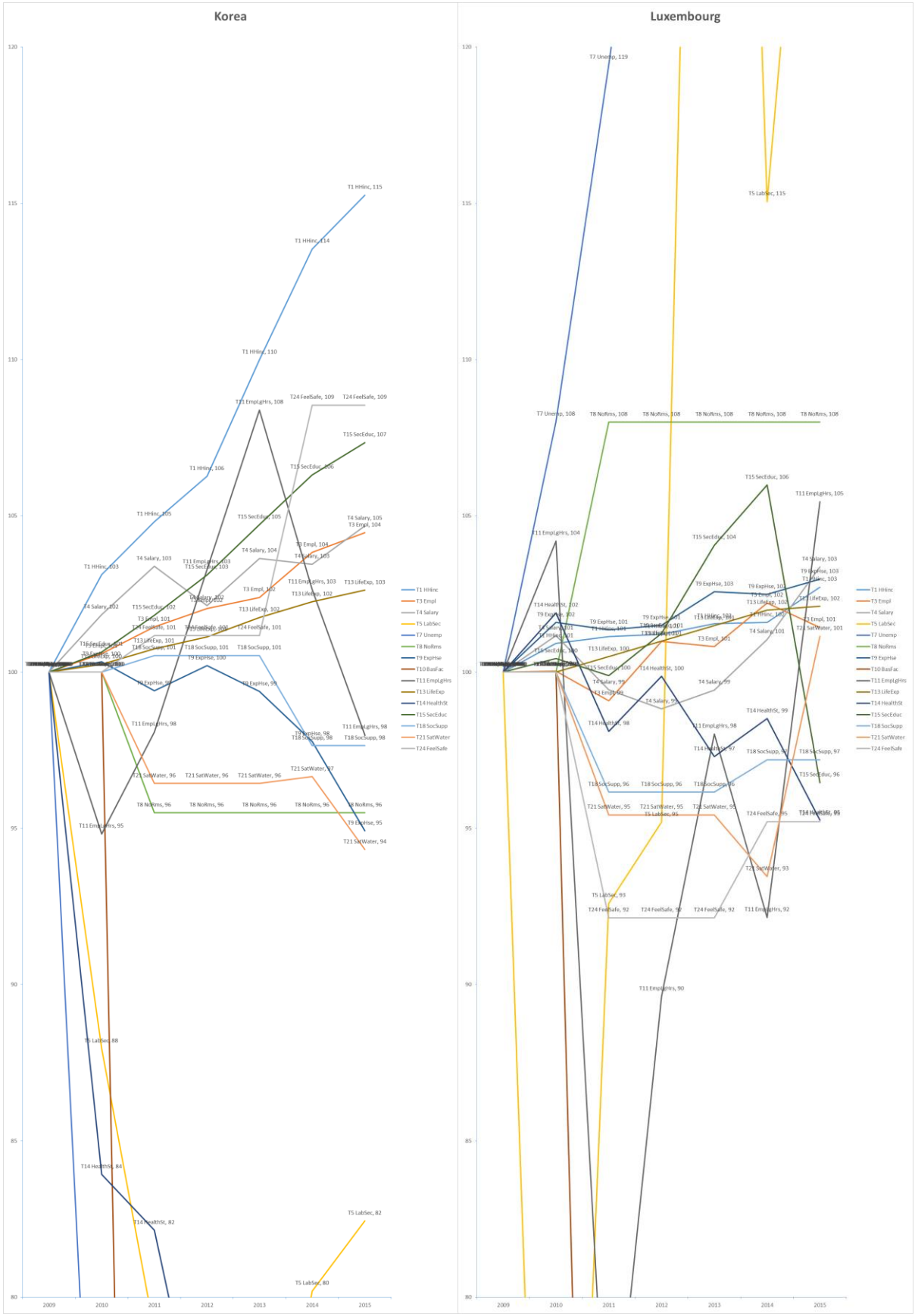
9.48. VARIABLES EVOLUTION PER COUNTRY – ICELAND AND ISRAEL



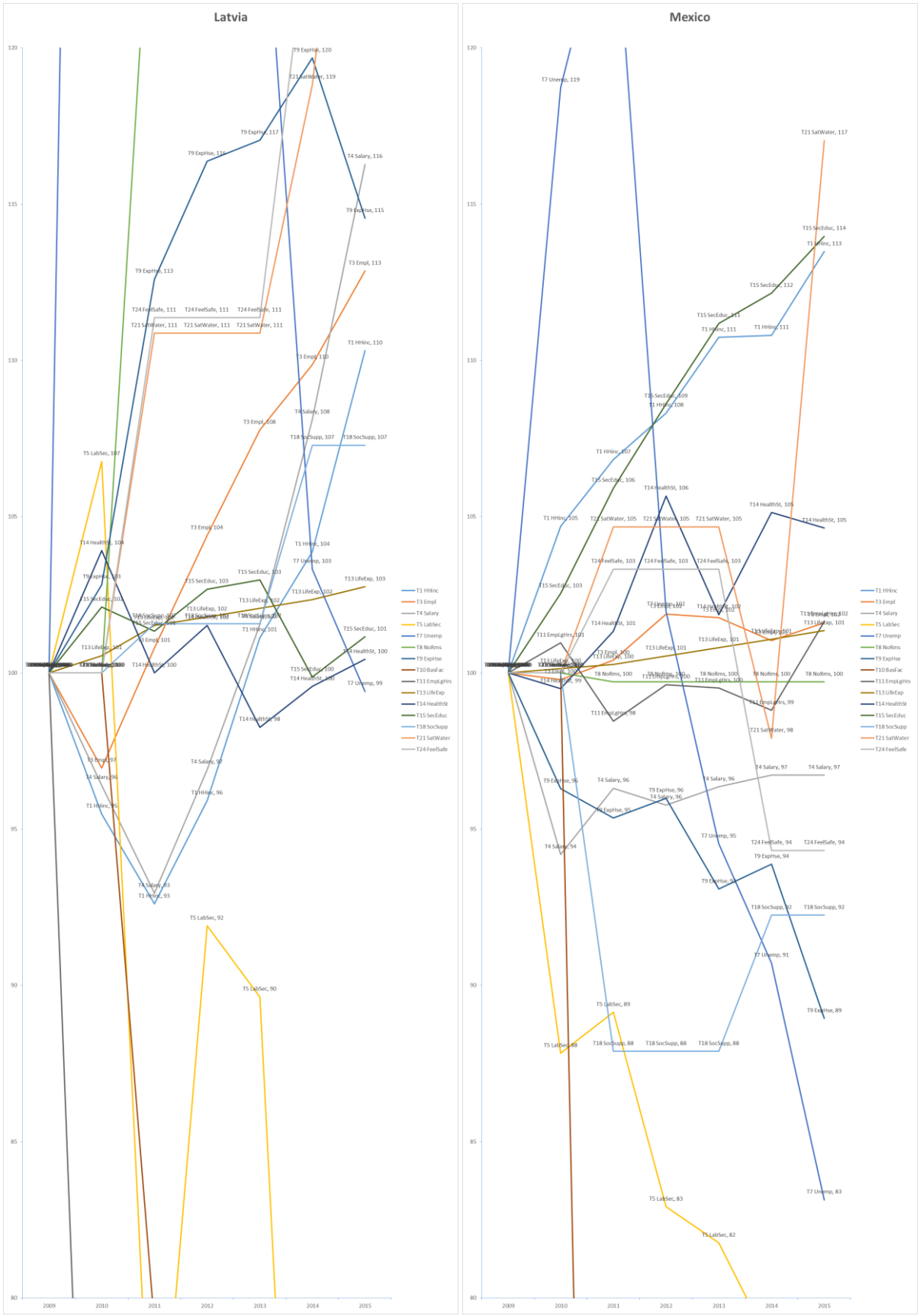
9.49. VARIABLES EVOLUTION PER COUNTRY – ITALY AND JAPAN



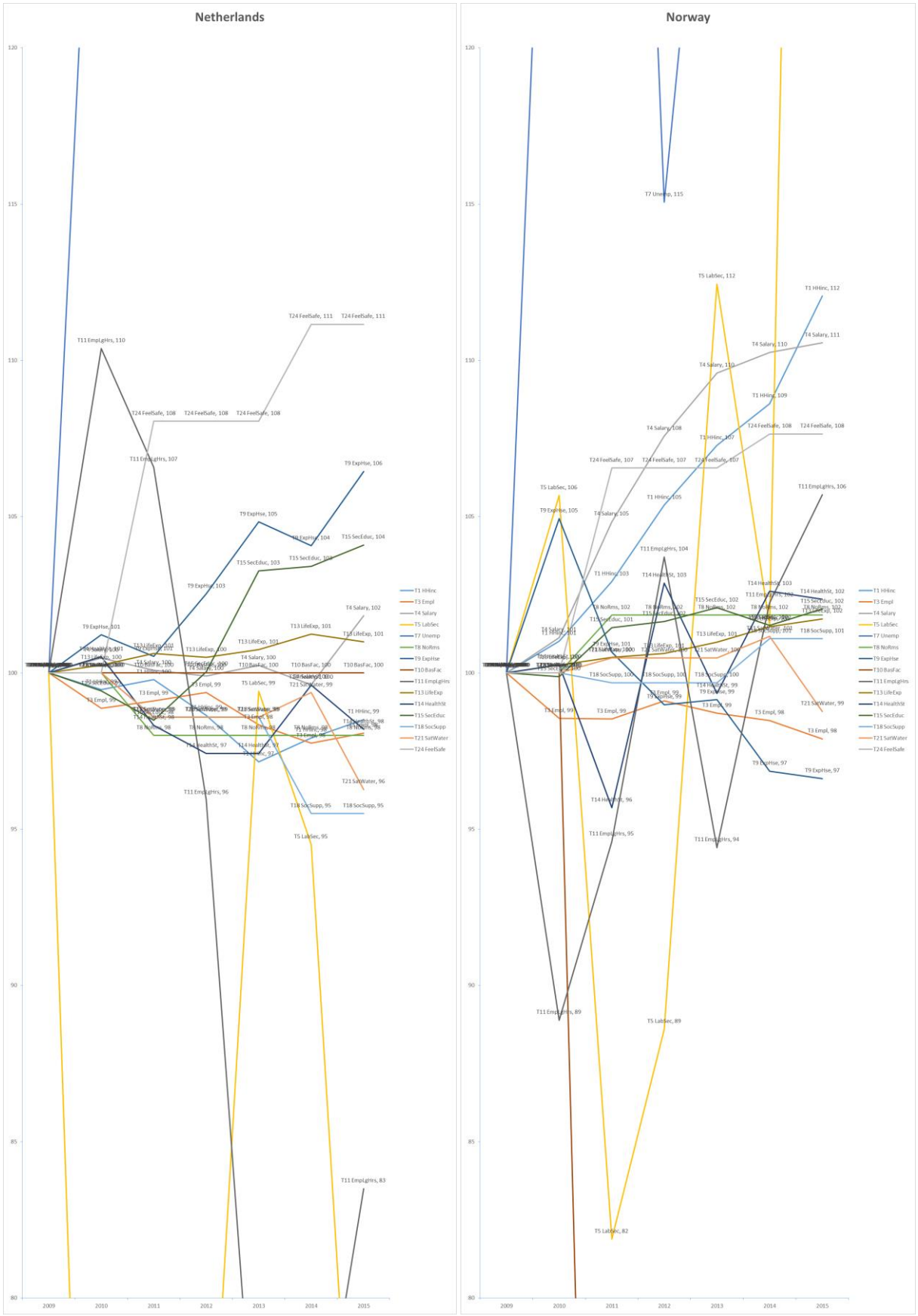
9.50. VARIABLES EVOLUTION PER COUNTRY – KOREA AND LUXEMBOURG



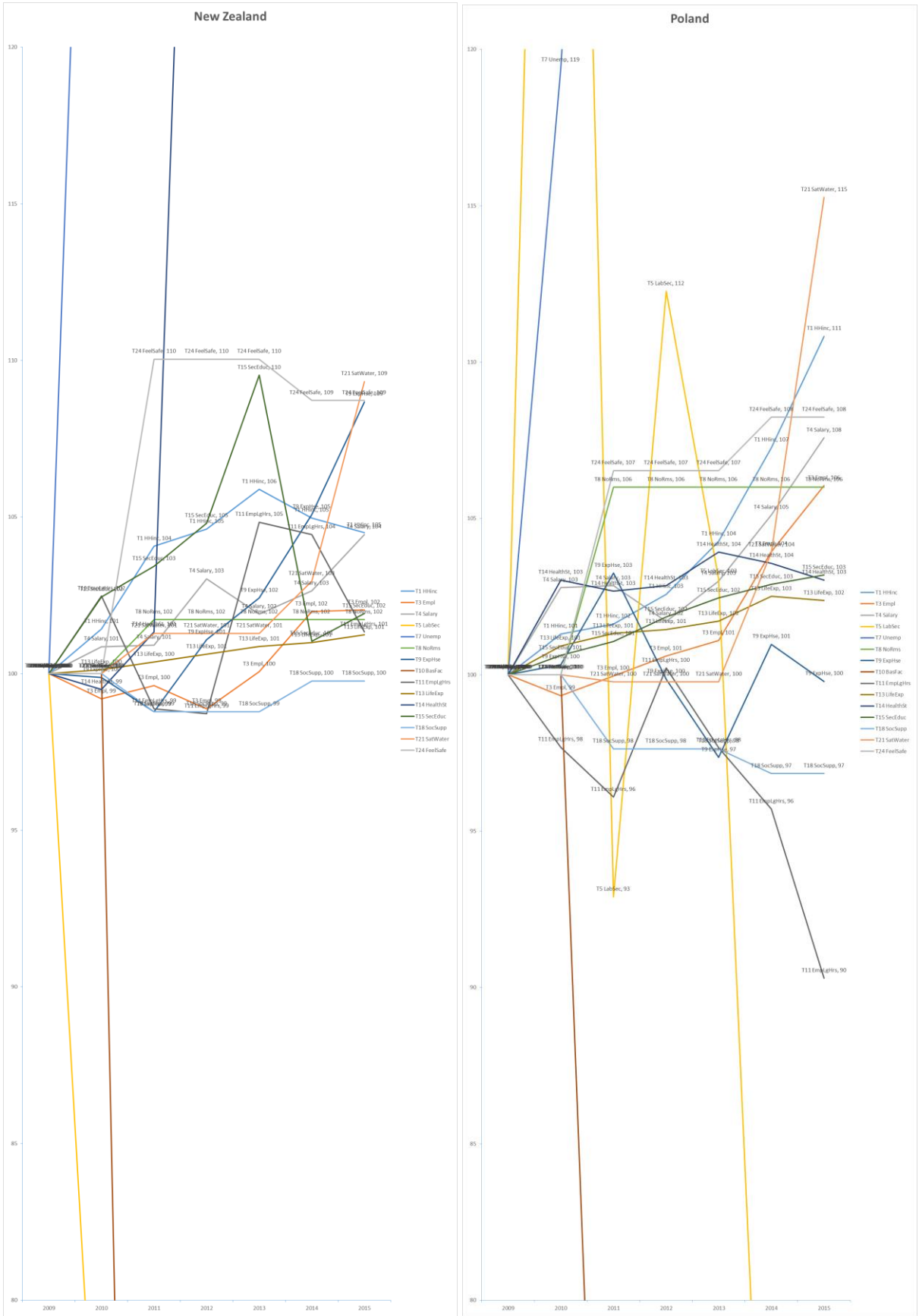
9.51. VARIABLES EVOLUTION PER COUNTRY – LATVIA AND MEXICO



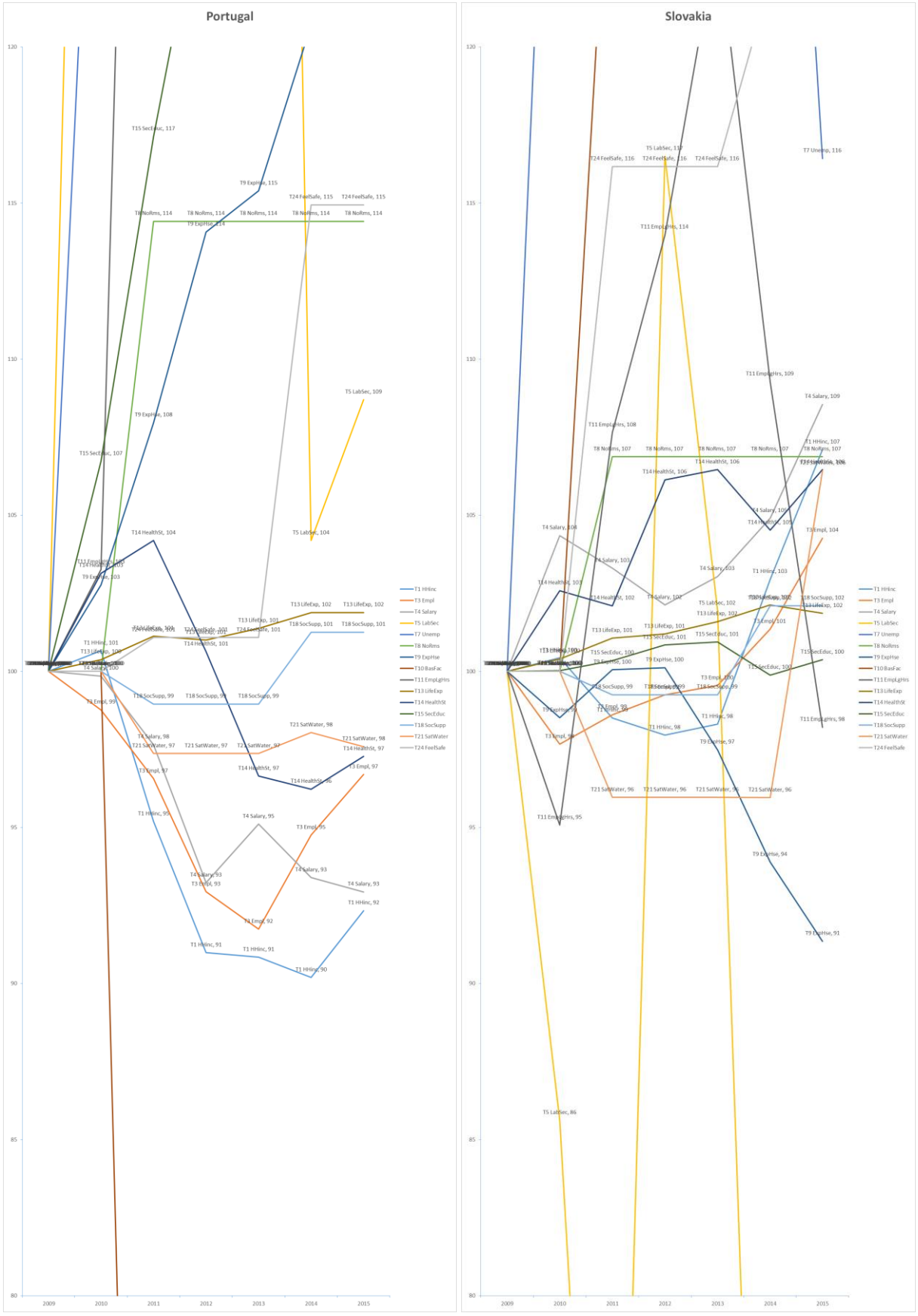
9.52. VARIABLES EVOLUTION PER COUNTRY – NETHERLANDS AND NORWAY



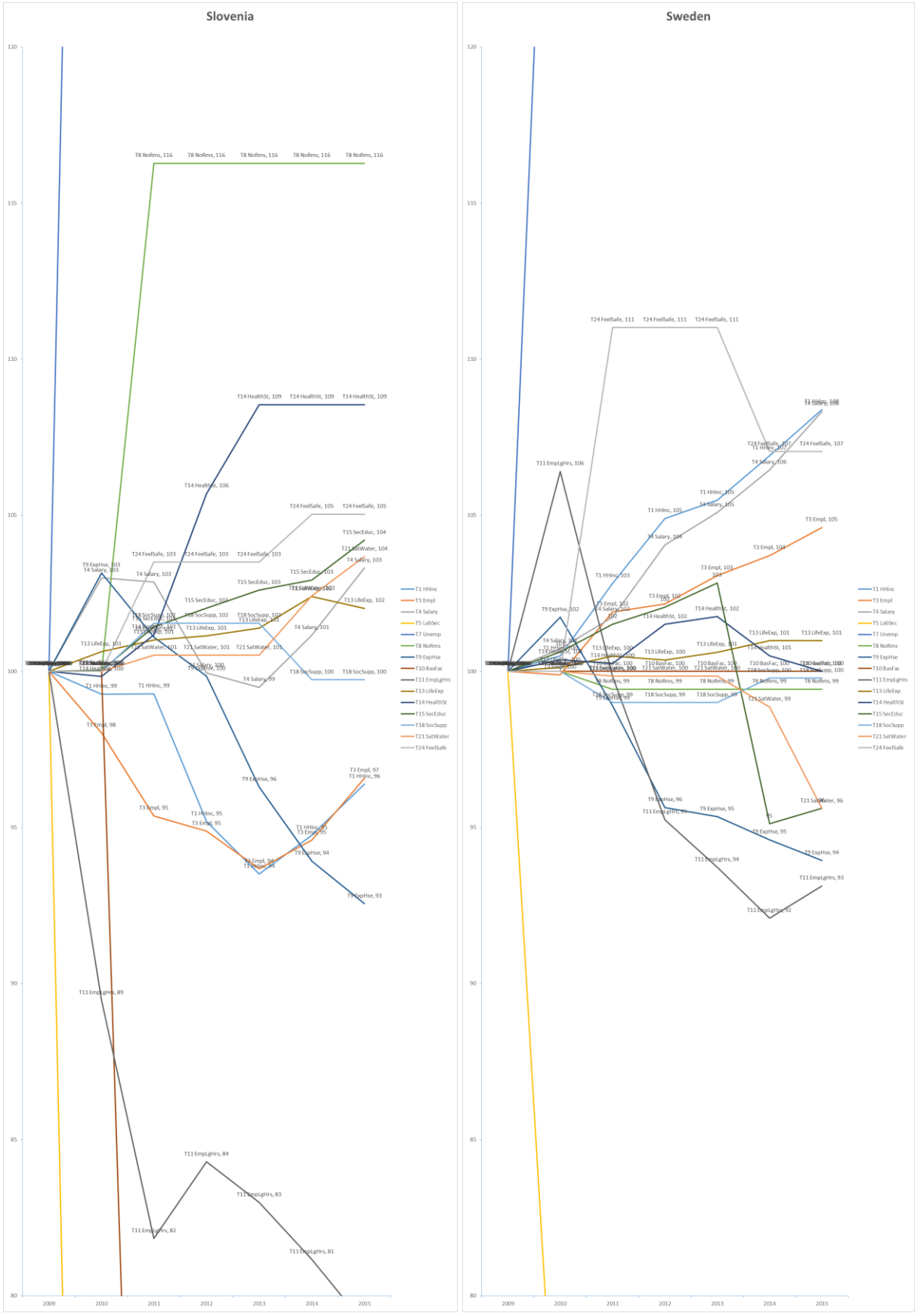
9.53. VARIABLES EVOLUTION PER COUNTRY – NEW ZEALAND AND POLAND



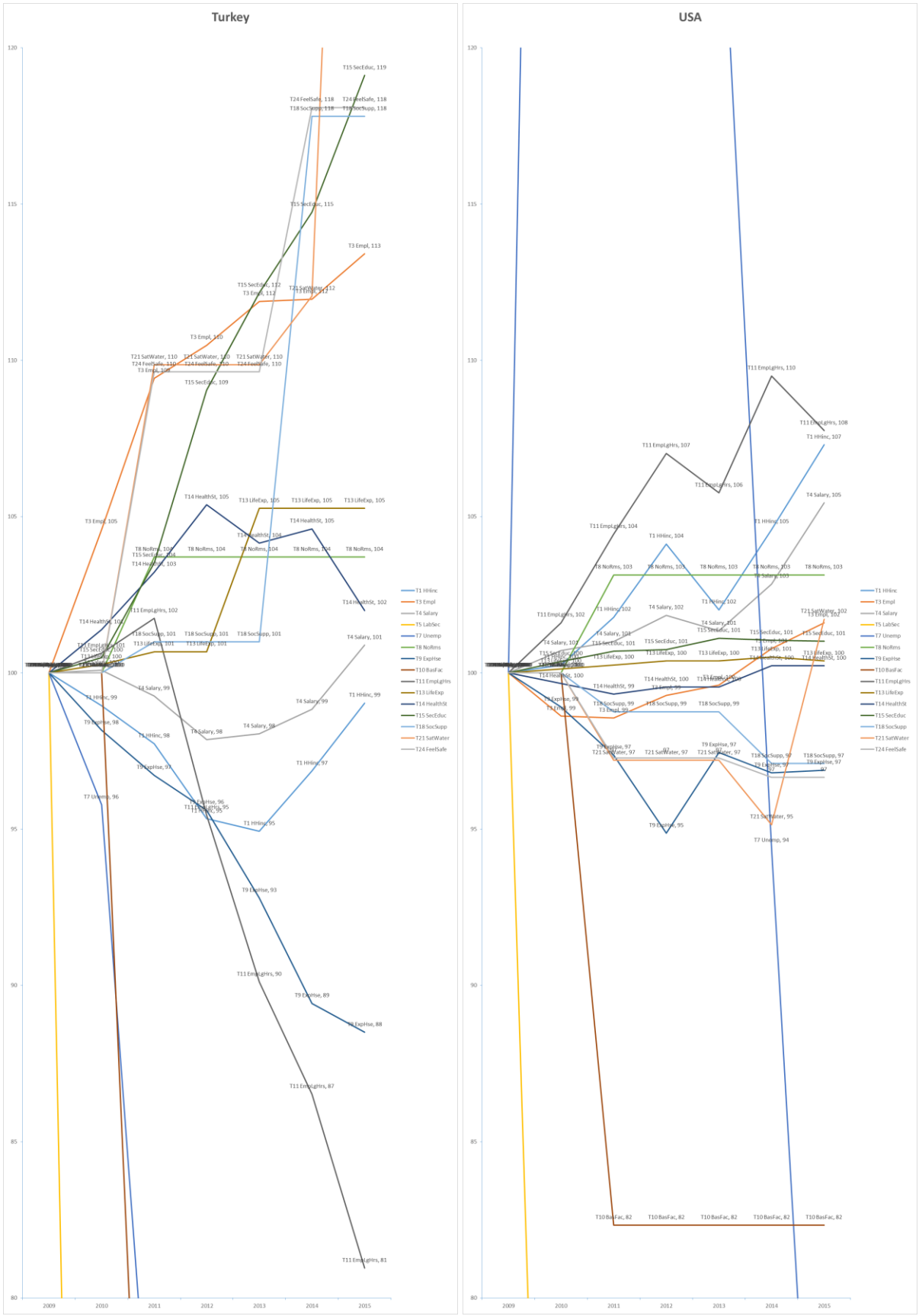
9.54. VARIABLES EVOLUTION PER COUNTRY – PORTUGAL AND SLOVAKIA



9.55. VARIABLES EVOLUTION PER COUNTRY – SLOVENIA AND SWEDEN



9.56. VARIABLES EVOLUTION PER COUNTRY – TURKEY AND USA



9.57. VARIABLES EVOLUTION PER COUNTRY – TABLE 1

		T1 HHinc	T3 Empl	T4 Salary	T5 LabSec	T7 Unemp	T8 NoRms	T9 ExpHse	T10 BasFac	T11 EmpLgHr	T13 LifeExp	T14 HealthSt	T15 SecEduc	T18 SocSupp	T21 SatWater	T24 FeelSafe
AUS	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	103	100	103	62	118	100	100	100	98	100	100	103	100	100	100
	2011	105	101	106	64	117	103	100	59	99	100	112	104	100	101	103
	2012	104	100	107	69	121	103	103	106	100	101	99	108	100	101	103
	2013	105	100	107	79	132	103	103	112	99	101	98	107	100	101	103
	2014	106	99	107	86	163	103	104	96	94	101	111	109	99	101	100
	2015	106	100	106	79	174	103	105	96	95	101	98	111	99	103	100
AUT	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	99	101	100	38	107	100	102	100	95	100	99	101	100	100	100
	2011	98	101	99	36	104	94	104	78	92	101	99	101	103	100	107
	2012	99	102	99	49	105	94	104	78	90	101	100	102	103	100	107
	2013	97	102	99	58	114	94	107	78	80	101	98	102	103	100	107
	2014	97	101	100	55	133	94	106	78	77	101	99	103	100	98	105
	2015	96	101	100	53	145	94	108	78	75	101	100	104	100	96	105
BEL	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	99	101	99	65	116	100	104	100	105	100	99	100	100	100	100
	2011	97	101	100	44	99	101	105	253	104	101	100	101	100	96	98
	2012	97	100	101	64	96	101	107	253	104	100	101	102	100	96	98
	2013	96	100	102	63	111	101	107	253	108	101	101	103	100	96	98
	2014	96	100	102	74	122	101	105	253	111	102	102	104	99	99	108
	2015	97	100	102	68	126	101	106	253	101	101	101	106	99	108	108
CAN	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	102	100	100	76	147	100	99	100	102	100	100	101	100	100	100
	2011	103	101	102	72	154	98	99	59	106	101	100	101	99	101	103
	2012	104	101	104	73	139	98	99	106	105	101	100	102	99	101	103
	2013	105	101	106	70	137	98	99	112	103	101	100	102	99	101	103
	2014	105	101	107	70	134	98	101	96	100	101	100	103	98	103	105
	2015	106	102	108	71	120	98	101	96	99	101	100	103	98	104	105
CHA	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	100	98	100	86	138	100	102	100	101	100	101	98	100	100	100
	2011	101	99	101	41	142	106	101	120	104	101	100	98	101	98	101
	2012	104	99	103	55	133	106	100	120	105	101	101	99	101	98	101
	2013	106	99	104	67	129	106	98	120	102	101	100	99	101	98	101
	2014	106	100	104	62	151	106	99	120	97	101	98	100	101	100	110
	2015	104	100	103	57	153	106	98	120	95	101	98	100	101	98	110
CZE	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	100	99	102	193	152	100	103	100	95	100	101	101	100	100	100
	2011	99	101	104	102	135	112	102	65	82	101	97	101	98	94	104
	2012	98	102	104	190	146	112	102	65	78	101	99	101	98	94	104
	2013	97	104	102	159	150	112	102	65	76	101	97	102	98	94	104
	2014	100	106	105	78	131	112	97	65	65	102	99	102	99	98	117
	2015	102	107	107	55	117	112	97	65	66	102	100	102	99	100	117
DEU	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	101	101	101	68	95	100	101	100	98	100	100	100	100	100	100
	2011	102	103	102	58	79	105	100	31	104	100	99	101	101	100	106
	2012	103	104	103	63	69	105	100	31	108	100	100	101	101	100	106
	2013	103	104	104	69	66	105	100	31	101	100	100	101	101	100	106
	2014	104	105	106	61	63	105	97	31	95	101	100	102	99	99	104
	2015	106	105	108	53	58	105	96	31	91	100	99	102	99	98	104
DNK	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	103	97	101	59	264	100	102	100	104	100	98	101	100	100	100
	2011	103	97	101	43	324	100	103	100	104	101	98	103	100	98	98
	2012	103	96	100	40	370	100	103	100	108	101	98	104	100	98	98
	2013	104	96	101	34	312	100	105	100	107	102	99	105	100	98	98
	2014	105	97	103	38	291	100	103	100	115	102	100	106	100	98	102
	2015	107	98	104	37	291	100	103	100	130	102	99	108	100	99	102
ESP	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	97	98	98	136	171	100	106	100	96	101	102	102	100	100	100
	2011	95	97	97	165	209	67	108	40	91	101	107	105	100	100	113
	2012	90	93	94	213	259	67	112	40	86	101	105	106	100	100	113
	2013	89	91	94	200	305	67	113	40	85	102	101	107	100	100	113
	2014	89	93	94	151	304	67	111	40	81	102	103	110	102	92	127
	2015	91	97	95	128	268	67	109	40	76	101	103	111	102	120	127
EST	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	97	96	99	139	204	100	100	100	126	101	102	101	100	100	100
	2011	100	102	95	56	191	135	99	62	140	102	101	100	102	112	101
	2012	103	105	97	48	148	135	101	62	124	102	102	101	102	112	101
	2013	104	107	98	48	104	135	104	62	114	103	104	102	102	112	101
	2014	110	109	102	40	90	135	99	62	114	103	101	99	105	123	112
	2015	115	113	110	35	64	135	97	62	113	103	100	100	105	136	112
FIN	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	102	100	102	64	144	100	102	100	107	100	99	101	100	100	100
	2011	102	101	102	55	127	102	103	70	107	101	100	102	99	101	102
	2012	102	102	102	51	120	102	104	70	101	101	97	103	99	101	102
	2013	102	100	101	59	126	102	105	70	99	101	94	105	99	101	102
	2014	101	101	101	51	143	102	108	70	99	101	100	106	101	101	108
	2015	101	100	102	59	169	102	110	70	101	102	101	106	101	102	108
FRA	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	101	100	102	21	116	100	101	100	101	100	98	101	100	100	100
	2011	101	100	102	18	118	104	101	61	105	101	99	102	99	98	103
	2012	100	100	102	28	124	104	103	61	102	101	99	103	99	98	103
	2013	100	100	103	28	131	104	105	61	95	101	98	107	99	98	103
	2014	100	100	104	22	138	104	104	61	89	102	99	110	95	98	109
	2015	101	100	105	23	140	104	104	61	88	101	99	110	95	106	109

9.58. VARIABLES EVOLUTION PER COUNTRY – TABLE 2

		T1 HHinc	T3 Empl	T4 Salary	T5 LabSec	T7 Unemp	T8 NoRms	T9 ExpHse	T10 BasFac	T11 EmpLgHr	T13 LifeExp	T14 HealthSt	T15 SecEduc	T18 SocSupp	T21 SatWater	T24 FeelSafe
GBR	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	100	99	100	40	134	100	101	100	98	100	102	102	100	100	100
	2011	98	99	97	42	139	108	101	41	101	101	99	104	98	101	109
	2012	99	100	97	37	146	108	101	73	103	101	96	106	98	101	109
	2013	99	101	97	33	147	108	103	77	107	101	94	107	98	101	109
	2014	99	103	96	21	118	108	102	66	108	101	90	107	98	91	116
	2015	102	104	97	21	90	108	101	66	108	101	89	108	98	100	116
GRC	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	89	97	94	53	146	100	108	100	92	100	100	102	100	100	100
	2011	80	91	87	91	227	100	114	24	92	100	101	105	94	98	91
	2012	73	84	83	129	372	100	121	24	100	100	99	107	94	98	91
	2013	68	80	78	105	475	100	121	24	110	101	98	109	94	98	91
	2014	68	81	79	61	502	100	115	24	114	101	98	111	100	104	111
	2015	66	83	78	51	469	100	115	24	117	101	99	114	100	123	111
HUN	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	98	100	100	146	132	100	103	100	95	100	98	101	100	100	100
	2011	101	101	100	140	127	113	99	71	91	101	100	101	100	93	97
	2012	99	103	97	165	120	113	99	71	86	101	103	102	100	93	97
	2013	101	106	97	129	119	113	94	71	94	102	102	102	100	93	97
	2014	105	112	96	61	89	113	88	71	111	102	103	103	94	93	90
	2015	107	116	98	70	75	113	88	71	111	102	101	103	94	103	90
IRL	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	98	96	99	158	192	100	99	100	109	101	100	102	100	100	100
	2011	94	95	99	154	243	102	103	496	116	101	100	103	99	98	108
	2012	95	95	98	143	260	102	104	496	123	101	100	105	99	98	108
	2013	93	97	97	114	236	102	109	496	124	101	99	108	99	98	108
	2014	94	99	97	66	196	102	111	496	122	101	99	111	99	95	114
	2015	97	101	98	52	158	102	115	496	137	101	99	112	99	110	114
ISL	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	89	100	104	127	321	100	108	100	101	100	97	101	100	100	100
	2011	93	100	110	214	393	99	108	0	104	101	97	101	99	101	102
	2012	94	102	109	15	337	99	107	0	105	101	96	101	99	101	102
	2013	95	104	112	18	237	99	106	0	102	100	95	103	99	101	102
	2014	98	104	112	151	135	99	106	0	97	101	95	105	101	102	112
	2015	100	107	119	111	129	99	108	0	95	101	95	107	101	101	112
ISR	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	99	101	99	82	98	100	103	100	102	100	102	100	100	100	100
	2011	98	102	100	65	75	102	103	21	95	100	102	102	102	113	97
	2012	95	103	101	65	47	102	104	28	101	100	105	103	102	113	97
	2013	95	104	102	53	41	102	103	41	86	101	100	104	102	113	97
	2014	97	105	102	50	33	102	103	48	79	101	106	104	98	115	105
	2015	99	106	105	41	31	102	101	53	81	101	105	105	98	150	105
ITA	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	98	99	101	58	117	100	103	100	99	100	105	102	100	100	100
	2011	97	99	100	65	126	100	104	323	87	101	101	103	103	96	103
	2012	92	99	96	106	164	100	108	323	80	101	107	105	103	96	103
	2013	91	97	97	100	200	100	108	323	79	101	104	107	103	96	103
	2014	91	97	97	145	225	100	108	323	82	102	107	109	105	89	99
	2015	92	98	98	70	203	100	107	323	85	101	103	110	105	114	99
JPN	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	102	100	102	96	131	100	100	100	95	100	50	102	100	100	100
	2011	103	100	104	46	124	104	100	17	98	100	101	103	102	103	104
	2012	104	101	102	55	117	104	100	23	103	100	106	105	102	103	104
	2013	105	102	102	46	117	104	103	34	108	100	59	110	102	103	104
	2014	103	104	100	36	94	104	104	40	103	101	105	108	101	104	103
	2015	105	105	100	43	83	104	100	44	98	101	105	109	101	108	103
KOR	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	103	101	102	88	66	100	100	100	95	100	84	101	100	100	100
	2011	105	101	103	79	71	96	99	19	98	101	82	102	101	96	101
	2012	106	102	102	76	51	96	100	26	103	101	74	103	101	96	101
	2013	110	102	104	71	67	96	99	37	108	102	78	105	101	96	101
	2014	114	104	103	80	43	96	98	44	103	102	73	106	98	97	109
	2015	115	104	105	82	72	96	95	48	98	103	73	107	98	94	109
LUX	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	101	100	101	52	108	100	102	100	104	100	102	100	100	100	100
	2011	101	99	99	93	119	108	101	36	73	100	98	100	96	95	92
	2012	101	101	99	95	132	108	101	36	90	101	100	101	96	95	92
	2013	102	101	99	166	151	108	103	36	98	101	97	104	96	95	92
	2014	102	102	101	115	136	108	102	36	92	102	99	106	97	93	95
	2015	103	101	103	134	160	108	103	36	105	102	95	96	97	101	95
LVA	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	95	97	96	107	194	100	103	100	56	101	104	102	100	100	100
	2011	93	101	93	72	195	128	113	79	51	102	100	101	102	111	111
	2012	96	104	97	92	173	128	116	79	57	102	102	103	102	111	111
	2013	101	108	102	90	127	128	117	79	51	102	98	103	102	111	111
	2014	104	110	108	57	103	128	120	79	55	102	100	100	107	119	125
	2015	110	113	116	54	99	128	115	15	53	103	100	101	107	133	125
MEX	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	105	100	94	88	119	100	96	100	101	100	99	103	100	100	100
	2011	107	100	96	89	125	100	95	20	98	100	101	106	88	105	103
	2012	108	102	96	83	102	100	96	27	100	101	106	109	88	105	103
	2013	111	102	96	82	95	100	93	39	100	101	102	111	88	105	103
	2014	111	101	97	78	91	100	94	47	99	101	105	112	92	98	94
	2015	113	102	97	70	83	100	89	51	102	101	105	114	92	117	94

9.59. VARIABLES EVOLUTION PER COUNTRY – TABLE 3

		T1 HHinc	T3 Empl	T4 Salary	T5 LabSec	T7 Unemp	T8 NoRms	T9 ExpHse	T10 BasFac	T11 EmpLgHr	T13 LifeExp	T14 HealthSt	T15 SecEduc	T18 SocSupp	T21 SatWater	T24 FeelSafe
NLD	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	99	99	100	50	135	100	101	100	110	100	101	99	100	100	100
	2011	100	99	100	58	161	98	101	100	107	101	98	98	99	99	108
	2012	99	99	100	71	194	98	103	100	96	100	97	100	99	99	108
	2013	97	98	100	99	262	98	105	100	73	101	97	103	99	99	108
	2014	98	98	100	95	299	98	104	100	73	101	100	103	95	99	111
	2015	99	98	102	67	328	98	106	100	83	101	98	104	95	96	111
NOR	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	101	99	101	106	141	100	105	100	89	100	100	100	100	100	100
	2011	103	99	105	82	156	102	101	36	95	100	96	101	100	100	107
	2012	105	99	108	89	115	102	99	36	104	101	103	102	100	100	107
	2013	107	99	110	112	132	102	99	36	94	101	99	102	100	100	107
	2014	109	98	110	102	171	102	97	36	102	101	103	102	101	101	108
	2015	112	98	111	185	212	102	97	36	106	102	102	102	101	99	108
NZL	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	101	99	101	71	148	100	100	100	102	100	99	102	100	100	100
	2011	104	100	101	63	147	102	99	21	99	100	101	103	99	101	110
	2012	105	99	103	75	235	102	101	28	99	101	150	105	99	101	110
	2013	106	100	102	58	194	102	102	41	105	101	150	110	99	101	110
	2014	105	102	103	61	200	102	105	48	104	101	153	101	100	103	109
	2015	105	102	104	64	194	102	109	53	101	101	149	102	100	109	109
POL	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	101	99	103	163	119	100	100	100	98	101	103	101	100	100	100
	2011	102	100	103	93	148	106	103	56	96	101	103	101	98	100	107
	2012	103	101	102	112	170	106	100	56	100	101	103	102	98	100	107
	2013	104	101	103	103	183	106	97	56	98	102	104	102	98	100	107
	2014	107	104	105	65	158	106	101	56	96	103	104	103	97	104	108
	2015	111	106	108	46	143	106	100	56	90	102	103	103	97	115	108
PRT	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	101	99	100	166	135	100	103	100	103	100	103	107	100	100	100
	2011	95	97	98	174	147	114	108	36	163	101	104	117	99	97	101
	2012	91	93	93	268	182	114	114	36	179	101	101	126	99	97	101
	2013	91	92	95	196	219	114	115	36	184	101	97	134	99	97	101
	2014	90	95	93	104	199	114	121	36	188	102	96	145	101	98	115
	2015	92	97	93	109	171	114	122	36	169	102	97	151	101	98	115
	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	100	98	104	86	139	100	99	100	95	100	103	100	100	100	100
	2011	99	99	103	57	142	107	100	129	108	101	102	100	99	96	116
	2012	98	99	102	117	145	107	100	129	114	101	106	101	99	96	116
	2013	98	100	103	102	154	107	97	129	124	102	106	101	99	96	116
	2014	103	101	105	53	143	107	94	129	109	102	105	100	102	96	122
	2015	107	104	109	43	116	107	91	129	98	102	106	100	102	106	122
SVN	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	99	98	103	23	178	100	103	100	89	101	100	100	100	100	100
	2011	99	95	103	22	205	116	101	48	82	101	101	101	102	101	103
	2012	95	95	100	28	240	116	100	48	84	101	106	102	102	101	103
	2013	94	94	99	30	292	116	96	48	83	101	109	103	102	101	103
	2014	95	95	101	29	299	116	94	48	81	102	109	103	100	102	105
	2015	96	97	103	23	266	116	93	48	79	102	109	104	100	104	105
SWE	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	100	100	101	72	139	100	102	100	106	100	100	101	100	100	100
	2011	103	102	102	56	133	99	99	100	100	100	100	102	99	100	111
	2012	105	102	104	67	131	99	96	100	95	100	102	102	99	100	111
	2013	105	103	105	66	128	99	95	100	94	101	102	103	99	100	111
	2014	107	104	106	65	126	99	95	100	92	101	101	95	100	99	107
	2015	108	105	108	56	122	99	94	100	93	101	100	96	100	96	107
TUR	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	99	105	100	17	96	100	98	100	101	100	101	100	100	100	100
	2011	98	109	99	14	73	104	97	62	102	101	103	104	101	110	110
	2012	95	110	98	14	65	104	96	62	95	101	105	109	101	110	110
	2013	95	112	98	20	67	104	93	62	90	105	104	112	101	110	110
	2014	97	112	99	24	58	104	89	62	87	105	105	115	118	112	118
	2015	99	113	101	22	61	104	88	62	81	105	102	119	118	152	118
USA	2009	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2010	100	99	101	46	186	100	99	100	102	100	100	100	100	100	100
	2011	102	99	101	38	186	103	97	82	104	100	99	101	99	97	97
	2012	104	99	102	34	157	103	95	82	107	100	100	101	99	97	97
	2013	102	100	101	31	127	103	97	82	106	100	100	101	99	97	97
	2014	105	101	103	25	94	103	97	82	110	101	100	101	97	95	97
	2015	107	102	105	22	65	103	97	82	108	100	100	101	97	102	97

9.60. GENERAL TREND OF EACH VARIABLE PER DIMENSION AND COUNTRY

	ESSENTIALS					ASPIRATIONAL					BASICS		ELEMENTARY		
	Employm	SecEduc	SocSupp	SatWater	FeelSafe	HHincom	Salary	NoRms	LifeExp	HealthSt	ExpHse	BasFac	LabSec	Unemp	EmpLgHr
AUS	flat	up	down	up	flat	up	up	up	flat	down	up	vary	down+	up+	down
AUT	up	up	flat	flat	up	down	flat	down	flat	flat	up	down+	down+	up+	down+
BEL	flat	up	flat	vary	up	down	up	flat	up	up	up	up+	down+	up+	up
CAN	up	up	down	up	up	up	up	down	flat	flat	flat	vary	down+	up+	vary
CHE	flat	flat	flat	flat	up	up	up	up	flat	vary	vary	up	down+	up+	vary
CZE	up	up	down	down	up	vary	up	up	up	down	vary	down+	vary+	up+	down+
DEU	up	up	flat	down	up	up	up	up	flat	flat	down	down+	down+	down+	vary
DNK	down	up	flat	down	vary	up	up	flat	up	down	up	flat	down+	up+	up
ESP	down	up	flat	up	up	down	down	down+	up	up	up	down+	up+	up+	down+
EST	up	flat	up	up	up	up	vary	up	up	up	vary	down+	down+	vary+	up
FIN	up	up	flat	up	up	up	up	up	up	vary	up	down+	down+	up+	up
FRA	flat	up	down	vary	up	up	up	up	up	down	up	down+	down+	up+	down
GBR	up	up	flat	flat	up	vary	down	up	flat	down	up	down+	down+	vary+	up
GRC	down+	up	down	up	vary	down+	down+	flat	flat	flat	up	down+	vary+	up+	vary
HUN	up	up	down	down	down	up	down	up	up	up	down+	down+	vary+	vary+	vary
IRL	down	up	flat	vary	up	down	down	flat	flat	flat	up	up+	vary+	up+	up+
ISL	up	up	flat	flat	up	vary	up	flat	flat	down	up	flat	vary+	up+	vary
ISR	up	up	vary	up+	vary	down	up	flat	flat	up	up	down+	down+	down+	down+
ITA	down	up	up	vary	up	down	down	flat	up	up	up	up+	vary+	up+	down+
JPN	up	up	up	up	up	up	flat	up	flat	vary+	flat	down+	down+	vary	vary
KOR	up	up	vary	down	up	up	up	down	up	down+	down	down+	down+	down+	vary
LUX	up	vary	down	vary	down	up	up	up	up	down	up	down+	vary+	up+	vary
LVA	up	up	up	up	up	vary	vary	up	up	vary	up	down+	down+	up	down+
MEX	up	up	down	up	vary	up	down	flat	flat	up	down	down+	down+	down+	vary
NLD	down	up	down	flat	up	down	flat	down	flat	vary	up	flat	down+	up+	down+
NOR	down	up	flat	flat	up	up	up	flat	up	up	down	down+	vary+	up+	vary
NZL	up	up	flat	up	up	up	up	up	flat	up+	up	down+	down+	up+	up
POL	up	up	down	up	up	up	up	up	up	up	vary	down+	vary+	up+	down
PRT	down	up+	vary	down	up	down	down	up	up	vary	up	down+	vary+	up+	up+
SVK	vary	flat	vary	vary	up	vary	up	up	up	up	down	up	vary+	up+	vary
SVN	down	up	flat	up	up	down	vary	up	up	up	down	down+	down+	up+	down+
SWE	up	vary	flat	down	up	up	up	flat	flat	up	down	flat	down+	up+	down
TUR	up	up	up	up+	up	down	vary	up	up	up	down	down+	down+	down+	down
USA	up	flat	down	vary	down	up	up	up	flat	flat	down	down	down+	vary+	up
Sum up	20	28	5	14	26	18	19	19	18	14	18	5	1	24	9
Sum down	9	0	11	7	3	11	8	5	0	8	18	23	22	5	13

9.61. NUMBER OF VARIABLES WITH UP/DOWN TREND PER AXIS AND DIMENSION

	SOCIAL (Axe 1 - 44.6%)				INDIVIDUAL (Axe 2 - 12.3%)			
	QUALITY LIFE		INDISPENSABLE		INDEP WELFARE		IMPACT WELFARE	
	up	down	up	down	up	down	up	down
AUS	5	2	2	2	3	1	4	3
AUT	3	2	2	3	4	1	1	4
BEL	5	1	4	1	4	0	5	2
CAN	6	2	1	1	4	1	3	2
CHE	4	0	2	1	2	0	4	1
CZE	6	3	1	2	3	3	4	2
DEU	6	1	0	4	3	3	3	2
DNK	4	3	3	1	2	2	5	2
ESP	5	4	3	2	4	2	4	4
EST	8	0	1	2	4	1	5	1
FIN	8	0	3	2	5	1	6	1
FRA	6	2	2	3	3	2	5	3
GBR	4	2	2	2	4	1	2	3
GRC	2	4	2	1	3	3	1	2
HUN	6	4	0	2	2	5	4	1
IRL	2	3	4	0	4	1	2	2
ISL	4	1	2	0	4	0	2	1
ISR	5	1	1	4	4	1	2	4
ITA	5	3	3	1	5	1	3	3
JPN	7	0	0	2	5	1	2	1
KOR	6	3	0	4	3	3	3	4
LUX	5	3	2	1	2	3	5	1
LVA	7	0	2	3	6	1	3	2
MEX	5	2	0	4	3	3	2	3
NLD	2	4	2	2	3	2	1	4
NOR	6	1	1	2	2	3	5	0
NZL	8	0	3	2	5	1	6	1
POL	9	1	1	2	4	2	6	1
PRT	4	4	3	1	3	3	4	2
SVK	5	0	2	1	2	1	5	0
SVN	6	2	1	4	3	3	4	3
SWE	5	1	1	3	2	2	4	2
TUR	8	1	0	5	5	2	3	4
USA	4	2	1	3	1	4	4	1

9.62. COUNTRY GROUPS BASED ON UP/DOWN TREND OF VARIABLES PER AXIS

SOCIAL (Axe 1 - 44.6%)				INDIVIDUAL (Axe 2 - 12.3%)			
QUALITY LIFE		INDISPENSABLE		INDEP WELFARE		IMPACT WELFARE	
up	down	up	down	up	down	up	down
EST	CZE	BEL	DEU	FIN	CZE	BEL	AUT
FIN	DNK	DNK	ISR	ITA	DEU	DNK	ESP
JPN	ESP	ESP	KOR	JPN	GRC	EST	ISR
LVA	GRC	FIN	MEX	LVA	HUN	FIN	KOR
NZL	HUN	IRL	SVN	NZL	KOR	FRA	NLD
POL	IRL	ITA	TUR	TUR	LUX	LUX	TUR
TUR	ITA	NZL			MEX	NOR	
	KOR	PRT	AUS	AUS	NOR	NZL	AUS
AUS	LUX		AUT	AUT	PRT	POL	BEL
BEL	NLD	AUS	CZE	BEL	SVN	SVK	CAN
CAN	PRT	AUT	ESP	CAN	USA		CZE
CZE		CHE	EST	CZE		AUS	DEU
DEU	AUS	FRA	FIN	DEU	AUS	CAN	DNK
ESP	AUT	GBR	FRA	ESP	AUT	CHE	FRA
FRA	BEL	GRC	GBR	EST	CAN	CZE	GBR
HUN	CAN	ISL	HUN	FRA	DNK	DEU	GRC
ISR	DEU	LUX	JPN	GBR	ESP	ESP	IRL
ITA	FRA	LVA	LVA	GRC	EST	HUN	ITA
KOR	GBR	NLD	NLD	IRL	FIN	ITA	LVA
LUX	ISL	SVK	NOR	ISL	FRA	KOR	MEX
MEX	ISR		NZL	ISR	GBR	LVA	PRT
NOR	MEX	CAN	POL	KOR	IRL	PRT	SVN
SVK	NOR	CZE	SWE	MEX	ISR	SVN	SWE
SVN	POL	DEU	USA	NLD	ITA	SWE	
SWE	SVN	EST		POL	JPN	TUR	CHE
	SWE	HUN	BEL	PRT	LVA	USA	EST
AUT	TUR	ISR	CAN	SVN	NLD		FIN
CHE	USA	JPN	CHE		NZL	AUT	HUN
DNK		KOR	DNK	CHE	POL	GBR	ISL
GBR	CHE	MEX	GRC	DNK	SVK	GRC	JPN
GRC	EST	NOR	IRL	HUN	SWE	IRL	LUX
IRL	FIN	POL	ISL	LUX	TUR	ISL	NOR
ISL	JPN	SVN	ITA	NOR		ISR	NZL
NLD	LVA	SWE	LUX	SVK	BEL	JPN	POL
PRT	NZL	TUR	PRT	SWE	CHE	MEX	SVK
USA	SVK	USA	SVK	USA	ISL	NLD	USA

Note: return to Section 4.6.1

9.63. LIST OF COUNTRIES

AUS	Australia	**ISR**	Israel
AUT	Austria	**ITA**	Italy
BEL	Belgium	**JPN**	Japan
CAN	Canada	**KOR**	Korea
CHE	Switzerland	**LUX**	Luxembourg
CZE	Czech Republic	**LVA**	Latvia
DEU	Germany	**MEX**	Mexico
DNK	Denmark	**NLD**	Netherlands
ESP	Spain	**NOR**	Norway
EST	Estonia	**NZL**	New Zealand
FIN	Finland	**POL**	Poland
FRA	France	**PRT**	Portugal
GBR	Great Britain	**SVK**	Slovakia
GRC	Greece	**SVN**	Slovenia
HUN	Hungary	**SWE**	Sweden
IRL	Ireland	**TUR**	Turkey
ISL	Iceland	**USA**	United States of America

9.64. DESCRIPTION OF STUDY VARIABLES

Table A1 (T1) - Household net-adjusted disposable income (USD at PPP, per capita, 2015)

Table A3 (T3) - Employment rate (age 15 to 64, as % population with same age)

Table A4 (T4) - Average annual gross earnings per full-time employee (USD at 2016 PPP)

Table A5 (T5) - Labor market insecurity (monetary loss from unemployment, share previous earn.)

Table A7 (T7) - Long-term unemployment rate (% labor force unemployed more than one year)

Table A8 (T8) - Rooms per person (average number)

Table A9 (T9) - Household expenditure on housing (% household gross adjusted disposable income)

Table A10 (T10) - Dwellings without basic sanitary facilities (% people w/o dedicated flushing toilet)

Table A11 (T11) - Employees working very long hours (% employees working more than 50h/week)

Table A13 (T13) - Life expectancy at birth (years)

Table A14 (T14) - Perceived health status (% adults self-reporting above “good”)

Table A15 (T15) -Upper secondary education attainment per adults (% people 25-64)

Table A18 (T18) - Social support (% people that can rely on friends or relatives)

Table A21 (T21) -Satisfaction with water quality (% people in the population)

Table A24 (T24) - Feelings of safety when walking alone at night (% people)

9.65. CONTRIBUTED PAPER TO ISI WSC 2019

The evolution of the OECD countries after the 2008 financial crisis
Simultaneous data analysis of the "How's Life" datasets between 2009 and 2015

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Abstract:
The financial crisis of 2008 affected virtually every country in the World due to the connectivity of the global markets. Despite the significant contrasts in the starting points, there is the common perception that different economies recovered at distinct paces at least in part due to the policies and methods adopted by the authorities to address the financial crisis. In this context, the OECD "How's Life" datasets were analyzed with the objective of trying to detect trajectories in countries that could partially be explained by the macroeconomic measures adopted after the crisis. With the support of the OECD secondary data for the period 2009-2015, this novel study involved not only univariate, bivariate, and cluster evaluations but also a three-way data analysis based on the STATIS method. Among the existing multivariate methodologies, STATIS is the most comprehensive and flexible method to assess the evolution of a large (and possibly varying) number of individuals and variables over several years. With the identification of country trajectories in association with the evolution of variables, the findings may be relevant for business organizations with regard to defining strategic directions and making operational decisions.

Keywords:
OECD How's Life/Better Life; PCA; Three-Way Data Analysis; STATIS; 2008 Financial Crisis.

1. Introduction:

Although the financial crisis of 2008 was not an entire surprise for people from within the industry with a critical mindset, the reality is that the large majority of the insiders and outsiders perceived the developments as a "Black Swan": something totally unpredictable and thus, unavoidable. Regardless of the differences in perspectives, the 2008 crisis started in the USA but quickly propagated and contaminated not only the European but also the Asian markets due to the global connectivity and scale of the financial and business operations.

The global financial crisis affected several countries in different ways and to varying extents. Furthermore, the impacted countries were in different positions in terms of macroeconomic aspects among other dimensions, which resulted in a multitude of different starting points for the post-crisis recovery. Nonetheless, the analysis of the growth path of the OECD countries based on the "How's Life" datasets unveiled a number of distinct progressions associated to the different evolution of variables dependent on the policies adopted by governments and authorities to address the critical financial circumstances. The identification of different recovery trajectories and variables' evolution may provide valuable information for the processes of business decision-making.

At the request of the President of France in 2010, a team led by Joseph Stiglitz produced a report on the measurement of social and economic progress. This seminal paper represented a breakthrough in relation to the traditional and common way of gauging progress based on GDP alone, which reinforced the OECD initiative related to the collection of data on multiple types of variables linked to the quality and conditions of life. Since 2005, the OECD "How's Life" program has been gathering data and information in relation to the member countries (currently 35) and some partner countries.

From 2011 onwards, the "How's Life" program has been supporting the "Better Life Index" initiative that permits the individual weighting of the different variables to generate results that are

tailored to meet the priorities of each user. Although the OECD approach permits to depart from a narrow and limited GDP perspective as discussed by various authors in several papers, the evolution of the multiple variables in the 35 member countries (plus six partners) permits to produce a space analysis over time. In addition to a global and intra-country assessment, a multivariate three-way data analysis provides trajectories for the evolution of the countries in the context of the selected variables.

The available OECD data relates to the current well-being variables (25) in the period from 2005 to 2015 (or 2016 in some cases) but presents several gaps for a few countries and in some years. This secondary data is credible, consistent, and reliable which permits to have confidence in the results obtained through a multivariate spatial analysis. Even though the OECD "How's Life" reports are frequently used as an important reference for the 11 well-being dimensions, the datasets permit to develop a multivariate analysis at three dimensions in order to characterize the evolution of the current well-being variables and assess the recovery of the countries after the 2008 crisis.

2. Methodology:

The STATIS (Structuration des Tableaux À Trois Indices de la Statistique) (Escoufier, 1987; Lavit, 1988) method permits to analyze cubes of data and obtain a joint assessment of a set of quantitative tables. In particular, this technique is useful for the analysis of data evolution over time and so, it is related to techniques such as DPCA (Double Principal Components Analysis) and MFA (Multiple Factorial Analysis). The currently available computing capacity allows the analysts to avoid the complexity resulting from the evaluation of each table and variable by employing an integrated graphic representation of the data collected on periodic occasions. The focus on the relative position of the individuals provided by the STATIS analysis results from the graphic displays that summarize the most important aspects related to large data sets involving multiple variables. Despite the loss of some information detail, the representations resulting from a multidimensional method (such as STATIS) are easy to interpret visually which permits to unveil the main features of the data.

For a set of S data tables, the STATIS method represents each study by an object W_s and the study is defined by three elements (X_s, Q_s, D) with D (observations weight) being constant and with Q_s being equal to either I_p or $(diagV)^{-1}$ (for normalized data). For a table X_s (n x p) (with s = 1, …, S), the representative object is obtained by: $W_s = X_s Q_s X^t_s$ (size n x n). For the object distances and graphical representation of the tables, the STATIS method uses the Hilbert-Schmidt inner-product which indicates the existing degree of association between data tables: $\langle Ws|Ws' \rangle_{HS} = T_r(DW_sDW_{s'})$, where T_r (trace) is the sum of the diagonal elements. The joint analysis of multiple data tables permits to have a varying number of variables (STATIS, for object relations) or objects (Dual-STATIS, for variable relations) over time and to collect data with or without a defined periodicity.

This method involves four stages: (i) global analysis based on an interstructure comparing the data table structures with the support of the existing distances and graphic representation; (ii) identification of a compromise table W representing all the data tables in order to avoid the complexity of analyzing the various tables in an independent and separate way; (iii) detailed analysis resulting from the study of the intrastructure which permits to evaluate the similarities and differences between the tables based on their compromise positions; and (iv) analysis of the trajectories presented by each component (objects or variables) of the various data tables over time to appraise the evolution.

3. Result:

The OECD data related to the "How's Life" program for the member and associated countries (35 plus 6 countries in total) involved a varying number of observations and variables during the period from 2009 to 2015. Likewise, it was decided to focus the study on 34 member countries (excluding Chile and the associated countries due to their extensive data gaps) and to use the data for the 15 most complete variables only. Although there were some missing values (c. 5.5% that were imputed through maximum likelihood estimates or correlations), it was possible to produce a joint analysis of the several data tables based on the STATIS and PCA (Principal Components Analysis) methods with a focus on the various individual countries.

The tables related to quantitative data collected for the same countries (34) and variables (15) in different years (7), and permitted to perform the simultaneous analysis and exploration of the entire set of data tables. The study individuals were the countries (Australia, Austria, Belgium, Canada, Switzerland, Czech Republic, Germany, Denmark, Spain, Estonia, Finland, France, United Kingdom, Greece, Hungary, Ireland, Iceland, Israel, Italy, Japan, Korea, Luxembourg, Latvia, Mexico, Netherlands, Norway, New Zealand, Poland, Portugal, Slovak Republic, Slovenia, Sweden, Turkey,

and United States) while the variables involved several of the indicators measured by the initiative in accordance with the datasets of the "How's Life" report of 2017.

The study variables are: Household net-adjusted disposable income (USD at PPP, per capita, 2015); Employment rate (age 15 to 64, as % population with same age); Average annual gross earnings per full-time employee (USD at 2016 PPP); Labor market insecurity (monetary loss from unemployment, share previous earnings); Long-term unemployment rate (% labor force unemployed more than one year); Rooms per person (average number); Household expenditure on housing (% household gross adjusted disposable income); Dwellings without basic sanitary facilities (% people w/o dedicated flushing toilet); Employees working very long hours (% employees working more than 50h/week); Life expectancy at birth (years); Perceived health status (% adults self-reporting above "good"); Upper secondary education attainment per adults (% people 25-64); Social support (% people that can rely on friends or relatives); Satisfaction with water quality (% people in the population); and Feelings of safety when walking alone at night (% people).

The analysis produced at a global level permitted to obtain a view on the general evolution and trends with regard to the conditions of life in the OECD countries during the period from 2009 to 2015 (i.e., after the 2008 global financial crisis). For this purpose, each of the years in the analysis period was treated as an observation (center of gravity), and the study variables were the selected indicators (15) of the "How's Life" program. The statistical effect of the outlier observations related to Mexico and Turkey (on four variables each), Korea (on three variable), and Spain and Greece (on two variables each) was attenuated due to the standardization of data given the different units of the study variables.

In this context, the PCA conducted to eigenvalues (and associated eigenvectors) for the correlation matrix indicating that the first two axes largely explained the results given their combined variability (85.6% of the total inertia). The representation on the first principal plan (Figure 1) indicated that the first axis related to the evolution over time of the dimensions associated with the quality and material conditions of life. In the period 2009 to 2011, the stimulus packages in the OECD countries permitted an evolution of the variables, but there was a stagnation between 2011 and 2013 mainly due to aspects related to unemployment and income. The growth phase was resumed in the years 2014 and 2015. In relation to axis 2, there was a contrast between the initial and final years (mainly 2009 and 2015) and the intermediate years (2011 to 2013, with 2010 and 2014 being almost neutral). This trough (Guttman effect) revealed a decline in essential aspects after the 2008 global crisis until 2012 (pick year of the crisis), which was gradually recovered and surpassed by the OECD (as a whole) in 2015.

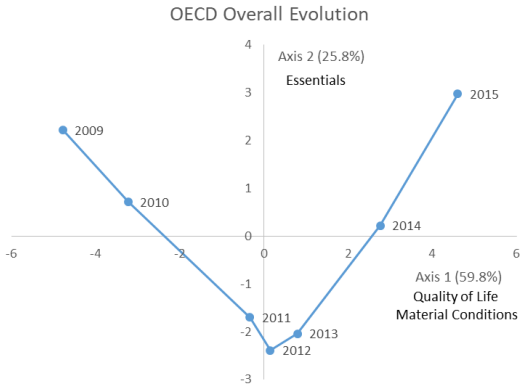

Fig. 1 – OECD evolution in 2009-2015

The study used normalized objects to analyze the interstructure. The first two axes represented 98.37% of the inertia (with the first axis alone contributing 95.26%) and so, it was viable to assess the interstructure based on the first principal plan. The representation on the first principal plan (Figure 2) revealed that there was a common structure for all the objects (representing the data tables) in the period from 2009 and 2015. Apart from being possible to detect a sequential evolution from 2009 to 2015 with a good quality of the representations (the projected norms on the first axis were close to 1), it was interesting to notice that objects 2009 to 2011 were in opposition to the data tables of 2012 to 2015 in terms of axis 2 (despite its reduced inertia).

With a view to obtaining the compromise Euclidean image, the PCA of the compromise table produced the eigenvalues and associated inertias. For the purpose of the study, it was decided to focus on the interpretation of the first two axes which represented a combined 56.9% inertia. The meaning of each axis could be interpreted based on the correlation coefficient between the principal component of compromise and the initial variables. In terms of axis 1, there was an opposition between variables ranging from the indispensable needs (on the left) to the quality and conditions of life (on the right)

and so, axis 1 could be understood as the level of development from a social and collective progress point-of-view. The aspects more exposed to axis 1 were the absence of basic facilities, unemployment, and labor security in opposition to employment, water quality, security, salary, and household income. In addition, axis 2 addressed aspects that were dependent on personal welfare and wealth and thus, ranged from the requirements that were independent of financial means and capabilities to dimensions that were impacted by the circumstance at an individual level. In particular, the axis 2 presented secondary education, employment, housing expenditures, and water quality in opposition to labor security and unemployment (with negative impact) plus salary, income, health status, and life expectancy (positively affecting the individuals).

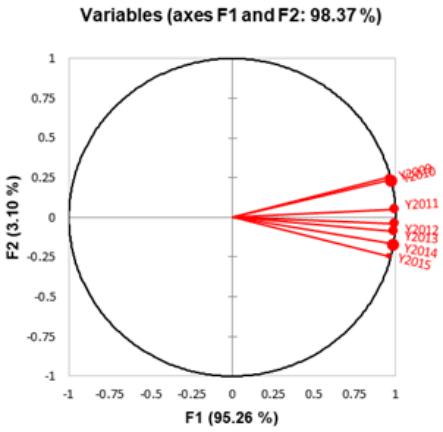

Fig. 2 – Representation of interstructure

With the interpretation of the axes, it was possible to present the compromise positions of the various countries on the first principal plan (intrastructure) which represented the average positions of the countries during the study period (Figure 3). Based on K-means clustering, it was interesting to note a cluster (#1) of Central and Northern European plus North American and Australasia countries. In addition, there was a cluster (#2) of countries including the Southern and some Central European countries, and another cluster (#3) of Eastern European countries plus Korea. Finally, there were three countries (Mexico, Turkey, and Greece) in a cluster (#4) of their own. On axis 1, there was a clear progression of the compromise positions (from cluster #4 towards cluster #1) in terms of the social progress and development (with cluster #2 being positioned in a somewhat more neutral position). In particular, countries as Turkey, Mexico, Greece, and Latvia were positioned on the "Basics" and "Elementary" quadrants of the indispensable aspects in terms of social progress. On the other hand, countries as Switzerland, Norway, Canada, and the USA were located on the "Essentials" and "Aspirational" quadrants of social progress relative to the society quality-of-life and material conditions.

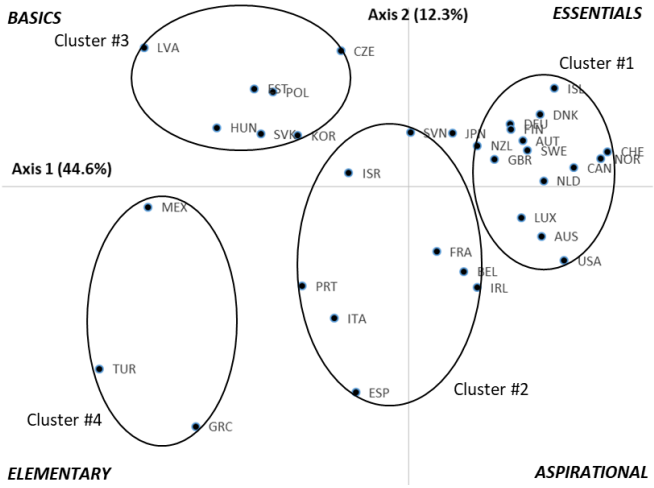

Fig. 3 – Countries' compromise positions and clusters

In terms of axis 2, cluster #3 appeared to be located at the level of assurance of the basic aspects regardless of individual wealth circumstances while cluster #4 seemed to be facing conditions where the personal welfare was decisive. Although clusters #1 and #2 were located in a more intermediate position in relation to axis 2, there were some significant country oppositions within each of these two clusters. In fact, there were countries with compromise positions indicating that the quality of individual life was more independent from the personal circumstances (perhaps due to the existing government policies) while others were more impacted by the wealth at an individual level. In particular, Latvia and Czech Republic ("Basics" quadrant) plus Iceland and Denmark ("Essentials" quadrant) displayed positions that were the least dependent on personal wealth despite the significant opposition at a social level, which could reflect insipid vs. developed social mechanisms where the individual welfare either could not be achieved with or did not require private financial means. At the other extreme of axis 2, Turkey and Greece (even more than Spain and Italy) were countries where the personal wealth was decisive in terms of the impact on the circumstances and welfare at the individual level, which suggested that the physical infrastructure could exist but was available only to those whom could afford the associated costs.

The trajectories of the various countries permitted to have a more detailed appreciation of the evolution of each country during the seven-year period of the analysis. A long trajectory indicated a country that had developed more in terms of the variables structure than the average of the variables for the OECD countries, while a short trajectory revealed that the country had progressed in line with the variables' averages for the countries in the OECD. In this context, it was relevant to note that the countries with the most differentiated evolution were part of cluster #4 (Turkey, Greece, and Mexico) while two countries in cluster #2 (Spain and Italy) and three countries in cluster #3 (Estonia, Latvia, and Slovakia) also presented a significant evolution. In addition, there were seven countries in cluster #1 (Germany, Iceland, Netherlands, New Zealand, Norway, UK, and the USA) and one country in cluster #2 (Ireland) that presented a noticeable evolution.

However, it was worth noting that the cluster #1 countries (plus Ireland) evolved primarily along axis 2 in the direction of reducing the dependency on individual wealth to ensure the essential dimensions at a personal level (except for New Zealand). At the same time, the countries with the most significant evolutions in clusters #2, #3, and #4 displayed progression along not only axis 2 but also axis 1. Having said that, some of these countries (Latvia, Estonia, Slovakia, and Turkey) developed towards a higher quality and conditions of life at the society level (axis 1) which did not occur in Mexico, Greece, Italy, and Spain. With regard to axis 2, these countries displayed a trend towards an increased dependency on personal wealth to secure the necessary dimensions at the individual level (with the exception of Latvia and Estonia). Overall, the cluster #1 countries were located in the "Essentials" quadrant and reinforcing this position (with the USA and Ireland in the "Aspirational" quadrant but moving in the "Essentials" direction). Similarly, the Cluster #3 countries (Latvia, Estonia, and Slovakia) were in the "Basics" quadrant and progressing towards the "Essentials" area while the cluster #2 and #4 countries were located in the "Elementary" area but moving away from the "Essentials" (with the exception of Turkey and the recent recovery of some countries such as Italy, Spain, and Greece).

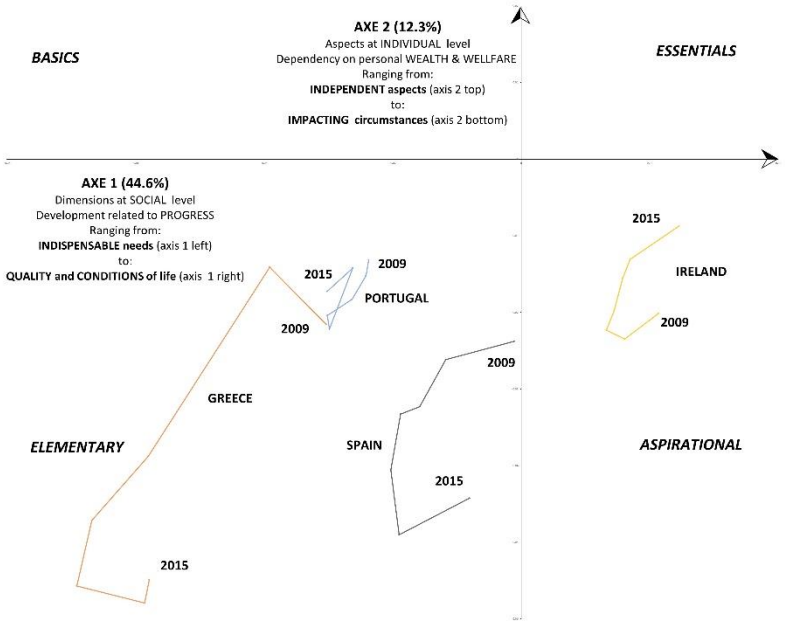

Fig. 4 – Trajectories of bailed-out countries

The trajectories of Ireland, Greece, Portugal, and Spain (Figure 4) were of particular interest given the bail-out programs and associated restructuring plans plus austerity measures implemented in these countries during the course of the study period (in addition to the initial stimulus packages adopted by the OECD countries after 2008). The trajectories were complemented by an analysis of the variables' variation in each country to appreciate the impact and extent of the local government and European measures and policies. In the case of Ireland, there was a trajectory inflection from 2010 onwards mainly based on the favorable movement of variables as labor insecurity, unemployment, house expenses, working long hours, and secondary education. At the same time, Greece and Spain presented long trajectories with inflections from 2014 resulting from favorable employment, unemployment, working long-hours, secondary education, and water satisfaction (in Greece) plus household income, employment, labor insecurity, unemployment, water satisfaction, and feeling safe (in Spain). Although Portugal also benefited from a bail-out program, the country trajectory was much shorter and presented an inflection from 2013 onwards which was mainly due to favorable (but limited) movements in relation to employment, labor insecurity, unemployment, house expenses, secondary education, and feeling safe.

4. Discussion and Conclusion:

Although the OECD "How's Life" datasets were not complete for all member and partner countries nor the entire set of variables, it was possible to select 34 countries and 15 variables over a period of seven years with a reduced number of data gaps. The global analysis of the datasets permitted to detect a Guttman effect in the evolution of the OECD countries given the general progress (with a stagnation phase from 2011 to 2013) in terms of quality and conditions of life over time (axis 1). At the same time, there was a significant decline in relation to essential aspects (due to the volatility of the variables associated to the individual, family, and government budgets) until 2012 but the general recovery afterward permitted to exceed the 2009 levels by 2015 (axis 2).

In this context, the STATIS interstructure revealed not only the existence of a common structure for the objects representing the annual data tables, but also a sequential evolution with a good representation of the years. However, it was insightful to notice the contrasting interstructure opposition of the years 2009-2011 relative to 2012-2015. Furthermore, the correlation coefficients of the compromise principal components and the initial variables permitted to interpret the meaning of the axes based on the variables' oppositions. So, axis 1 relates to the social quality and conditions of life while axis 2 is associated with the dependency on the wealth circumstances at an individual level.

The compromise positions revealed the countries with more prominent positions. With regard to axis 1 (social aspects), there were countries with a more distinctive position in terms of not only the "Basic" and "Elementary" aspects but also with regard to the "Essentials" and "Aspirational" dimensions. The compromise positions and annual data permitted to also identify the existence of four main clusters with a distribution along axis 1 ranging from the "Elementary" (cluster #4) and Basics" quadrants (cluster #3) to the more central positions (cluster #2) and the "Essentials" and "Aspirational" quadrants (cluster #1). There were countries with long trajectories in all clusters but most countries tended to evolve towards the "Essentials" quadrant and so, the cluster #1 countries progressed mainly along axis 2 and the cluster #3 countries had a more predominant evolution in relation to axis 1, while the clusters #2 and #4 countries displayed a mixed evolution on both axes.

Although the OECD "How's Life" program departed from an economic and financial perspective mainly rooted on GDP, many of the decisive variables with regard to the longest country trajectories appeared to be directly (or at least semi-directly) related to the income and revenues generated at the individual, family, and government levels. Nonetheless, the identified critical variables revealed the importance of complementary aspects for the efficiency of business operations and results, namely in relation to social aspects and environmental priorities. It is worth noting that the countries with the largest stimulus packages in 2008-2010 (with the objective of emerging stronger out of the crisis) did not appear to have started to benefit from these investments yet which might be a reflection of their starting positions and/or an indication of insufficient time elapsed.

Apart from the fiscal and financial stimulus, government investments and expenditures, and support to families and businesses, some countries benefited from international bail-out programs (over and above the stimulus packages of 2008-2010) from approx. 2011 onwards. It is clear from the results that the bailed-out countries (Greece, Ireland, Portugal, and Spain) have been able to inflect their downward trajectories (albeit to distinct extents) and thus, have started to make progress towards the "Essentials" quadrant at different paces. In this process, the variables identified as being the most important and decisive represented a compromise and require a well-judged balance involving aspects of an economic, financial, social, and environmental nature.

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