DESCRIPTIVE ANALYSIS OF ITALIAN INTERNET ACCESS LEVEL AND INTERNET-BASED INTERACTION WITH PUBLIC AUTHORITIES COMPARED TO EUROPEAN INDICATORS

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Data Science and Economics - Advanced Microeconomics
March 2021

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Abstract:

In the face of social and technological transformations of the global society and the rising importance of internet-based communications, we analyze the level of internet access among European countries, focusing on the Italian situation, and taking into account broadband access as well as the share of web-based interactions between citizens of European countries and their governments. The aim is to assess whether an increase in internet availability and quality relates to a bigger engagement of European citizens in interacting with their countries' administrations. A descriptive analysis of observational data reveals that a significant increase in internet connections (from 67% in 2011 to 89% in 2020 - European average) does not imply an increase in interaction between citizens and governments through web-based tools, and that, while altogether performing well in recent years, Italy shows significant deviations among regions that should be straighten out in order to ensure equality between its citizens.

Introduction:

One of the declared objectives of the European Union in the next decade is to invest in a secure and sustainable digital transformation[1]. In particular, emphasis is posed on *"A universal access to high quality connectivity, to have access to fair and non-discriminatory online services, and, more generally, ensuring that the same rights that apply offline equally apply online"*. The future of the relationship between European public authorities and their citizens lies in the cited formula: the transition from the traditional means of contacting public authorities to internet-based interactions could provide many advantages for both governments and citizens, but it also imply that many people could face strong difficulties in seeking information and get access to welfare policies. This paper address the issue of the digital access level and digital interaction with P.As for Italy, providing useful data to Italian political actors for directing their attention and resources where they are most needed in order to achieve the digital transformation Europe is seeking.

- Epistemic framework -

Before focusing on data analysis itself, we ought to define what are the reasons and implications of the economic oriented approach which will be taken towards the kind of evaluation hereby proposed, evaluation that can be roughly summarized by the general question: "How well are Europe and Italy doing in providing digital access for their citizens

1 Source: Speech by EVP Vestager on Europe's Digital Decade (europa.eu)

to public administration's services?". The utility of such research may be self-explanatory – a point on which we will return later on in the conclusions – but its scope and connotations are not; therefore, let us start by framing the philosophical scaffold in which we are operating. The relationship between citizens and public administrations can be approached from many theoretical sides (Haque, 1999), each implying a different vision of which role the state should play in such interaction; given the geopolitical subject of the analysis, European countries, this role is expressed in a liberal framework, not untouched by social ascendancies: historically, Europe's countries saw servicing their citizens as their responsibility, a tendency enforced by socialist principles which gain large support in the aftermath of the second world war, when most countries of Europe constituted themselves as social states; moreover, the European Union itself was born as the direct prosecution of this common perspective, considering the promotion of substantial equality between the different peoples of its member states as its main reason of existence. This principle still guides the action of the Union and, as it is evident from the aforementioned speech given by the Executive Vice-President Vestager regarding Europe's digital decade, is the premise on which the EU measures its success or failure in digital development. These considerations given, it seems quite apt to encase European countries' vision of the state's role in the liberal/social democracy paradigm: an ensurer of civil rights, tending to provide equality among its citizens, under the acceptance of a 'social contract' that demands obedience to laws in return for this effort. Therefore this framework also justify the choice of the indicators used in this analysis: high quality connectivity, represented by percentage of households with broadband connection to the internet, proxies for the reduction of the digital divide (Gore, 1996), while digital interaction with public authorities can be seen both as an indicator of the digitalisation of welfare-providing services and as one of the measures of the needs for social rights, which are provided in social states through the action of public administrations. This means that the latter indicator is an important component of the answer to the broader question: "Is Europe succeeding in the pursue of its equality objectives?". Regarding this last inquiry, it must be stated that it exiles the scope of this paper since it has not been constructed a model which could allow to answer said inquiry; however, we can – and we did – examine the reasons why a hypothetical research on this topic should take into account the same indicators (among others yet to be defined) that were chosen for answering our more specific question. At this point it has been explained why this analysis should be of any interest for European public authorities, defining and justifying the perspective by which the role of European P.As and their objectives are examined; however, we now need to address the most pressing question: how to carry out such examination? This query points directly to the selection of a model of research, that is how to define our object of study and the consequent selection of an apt methodology for the analysis. (Durkehim, 1895; Weber, 1922). As was anticipated in the first lines of this paragraph we will use an economic-oriented model, considering public administrations as 'Customer-driven agencies' (Barzelay and Armanjani, 1992): this paradigm was shaped and refined in many subsequent studies and adopted across many countries in the world, first in the US and British Commonwealth and later in all developed and developing countries, in many different incarnations that however share the same theoretical ground (Haque, 1999; Chadwick and May, 2003). It was first proposed by Osborne and Gaebler (1992) and adopted by the Clinton administration under the name of

'New Public Management' (NPM) (Gore, 1993); the changes that NPM went through during the different times and places in which it was implemented had however left unaltered its fundamental assumption (though the name used to define the concept was often changed to mark the differences with the original setting in which it was first developed), that is an emphasis on consumer orientation: the states' bureaucracies have to be reshaped following the microeconomics optimization assumptions, i.e. the maximization of profits and the minimization of costs; public authorities are encouraged to take a firm-like vision of their role as providers of services to citizens that are consequently identified as consumers. (Christensen, 1997; Kaul, 1996; OECD, 1993). In this analysis we will refer to the latest incarnation of this paradigm, identified in the 2003 work of Andrew Chadwick and Christopher May "*Interaction between states and citizens in the age of the Internet*": the two authors name it 'Managerial Model', adding the usage and impact of ICTs to the nub of the existing NPM theory. In their words, "I*n the managerial model of interaction ICTs are largely seen as a quantitative improvement on previous technologies. State services will continue as before but will be made more 'efficient', where 'efficiency' means increased speed of delivery combined with a reduction in costs*." In the same paper, the authors analyze, among UK's and US', European countries' policies on the role of public administrations in the digital era and, trough the analysis of EU's organs' reports, state that "*the managerial model of e-government is the focus for activities*". Indeed, these considerations strongly support the choice of this paradigm of research: since European and Italian authorities have adopted the managerial model as a standard for the interaction between public authorities and citizens, this research assume the character of an exploratory inquiry, taking the point of view of European P.A's and supplying a descriptive analysis on the behaviour of some of the key indicators of digital economy's and digital society's development; development that has its foundations in the possibility for customers to provide data and interact with the suppliers (OECD, 2016; Schmidthuber, Piller, Bogers and Hilgers, 2019); this, lastly, points once again to the choice of the indicators already mentioned above. One final consideration remain to be done before moving to the methods used in the data analysis; the scope of the research has been sufficiently explained, but nothing has yet been said about its implications, which, as is true for any gnoseologic process, are never neutral. As noted by many scholars[2], in the process of researching a social fact (Durkheim, 1895) we define a representation of it that is relative and not absolute: thus when referring to this representation we don't consider the one and only reality of it, but one among many relative images of the social fact. This imply that all the considerations that can be done about the object of this research are conditioned upon the paradigm chosen to define it, and if other conclusions are to be drawn in subsequent examinations, they too will refer to that paradigm. In this research we have defined the role of the P.As as that of customer-driven agencies; this imply a focus on economic indicators to define the actions of governments, the role of the citizens and the nature of the relationship between the two. This could lead to very different interpretations of what course of action P.As should take to improve their effectiveness, and indeed of what their very objectives should be. Critics of the economic approach have enlightened the fact that consider the governments as firms would lead to many such problems, and may result in inequalities among citizens and ultimately to disregard completely the P.As' duty of ensuring equal rights

2 L. Wittgenstein, M. Heidegger and M. McLuhan among the most prominent

to all citizens (Haque, 1999), causing the failure of welfare politics even though the economic indicators eventually used to define their effectiveness would suggest the contrary. At the same time, as researchers we have to consider the fact that governments around the globe *have* chosen this paradigm to define their agendas, and that in the current situation P.As cant' ignore the market's role in defining their action plans. Ultimately, the decision of what paradigm should be taken into account is up to the policy makers that will use the result of this examination. It's true that, since it was opted to use the managerial model, results tend to enlighten economic implications, however, as it will be made clear in the methodology section, the lack of data on costs and profits rules out many -if not all- critical points of this choice.

- *Methodology* -

This paragraph describes the methods used to carry out the analysis. Before doing so, however, we must make one final regard about the theoretical paradigm used: The managerial model has its center in the evaluation of P.As' costs and profits; these data are missing in the data sets found to carry out the research. Therefore, it's not possible to provide the most interesting results to readers and this thesis is bound to be an exploratory analysis of Italy's and Europe's digital transformation rather than an evaluation of the effectiveness of such process. Using the term "Exploratory analysis" it's meant that this analysis provide an epistemic framework that is robust and adaptable to broader, better informed researches without any change but the adding of other indicators and an eventual econometric model, fit to evaluate the new questions such research could raise; this modest work however can still provide useful data, pointing out areas that show problematic trends to the achievement of Europe's and Italy's objectives of digital development. Moreover, since the critiques to the managerial model are rooted in the analysis of those same indicators that are missing in this evaluation, we can bypass them and avoid the critical implications of choosing such paradigm. A more specific discussion about this point it's postponed to the conclusions. The analysis was carried out using Eurostat data sets on ICTs access level and usage in interaction with public authorities, collected among 2009 and 2020; these data are collected at individual and households level and grouped at European, national and regional level; the difference in grouping was used to evaluate general trends of European nations (grouping at national level) and compare them to the European average; a parallel analysis, focusing on Italy, took into account data grouped at regional level (regions of Italy, NUTS 2 grouping) and at the level of Italian regions' aggregates (Italian geographical Areas, NUTS 1 grouping), comparing them to Italian national average and European average. The data sets contain coefficients displaying percentage values of:

- access to internet: number of households with connection to internet.
- Broadband access: number of households with broadband connection to internet[3].
- individuals interacting with P.As through internet: number of individuals who have contacted P.As through the use of internet in the last 12 months.

3 The availability of broadband is measured by the percentage of households that are connectable to an exchange that has been converted to support xDSL-technology, to a cable network upgraded for internet traffic, or to other broadband technologies. It includes fixed and mobile connections.

Households are defined as habitations inhabited by at least one living person aged 16 to 74, so that empty houses are ruled out; The access of households to internet is measured as percentage of households where any member of the household has the possibility to access the internet from home. All percentages are computed upon the total number of households or individuals in the group considered (e.g. the percentage of households with access to internet at national level is computed by dividing the number of households with internet access in the specific nation by the total number of households in that nation). To see the coefficients' evolution over time, they have been plotted in a two dimensional Cartesian space using Y axis for coefficients and X axis for time; data points were mapped according to the years in which measurements were carried out and lines were drawn between them to show the evolution of the coefficients between years. Clearly, because discrete functions can't be precisely represented by this method and since the data are collected annually, these lines are an approximation of the exact changes occurred within the specific time period; even so, their steepness can effectively show the magnitude of change in the coefficients between different years. Along the geometric plotting of data points there were carried out bivariate regressions to show the general trend of change of coefficients through time, using the simple linear regression model $Y= \beta_0 + \beta_1 X + u$. It must be noted that, since in all data sets the number of observations of the regressor representing time is very small (between 11 at best and 9 at worst), the results are prone to measurement errors. However, since the variance between data points is generally small (with some interesting exceptions) the slope parameter β_1 is still representative of examined trends. Lastly, to verify the existence of the alternative hypothesis, i.e. the existence of a positive correlation between the increase in quantity of connections to internet and the increase in the number of individuals interacting with P.As through internet, it has been carried out a covariance analysis using Bravais - Pearson correlation coefficient. However, the data examined are insufficient to investigate such hypothesis in a convincing way; other variables play a role in the behaviour of such correlation: need for contacting P.As, indexes of digital skills, preferring other methods for contacting P.As, existence of national or regional programs to encourage web-based interactions with P.As, *etc.* At the same time, given the premises of the managerial model, some type of correlation should be expected, even if much of it could be masked from the lack of observable data on other variables.

Data discussion:

- Europe and Italy -

The analysis starts with the examination of Internet access level for European countries, including Italy, and the computation of the Euro Area average (28 countries, including United Kingdom). *Figure 1.1* show the different levels for each nation between 2011 and 2020 and the variations between years. We can immediately see some interesting facts: even if data prior to 2011 are missing, it is evident there has been a significant increase in internet connections. European average (Euro Area) moved from an initial value of 74% households with internet connection to 91% in 2020. It is also apparent that Luxembourg, Switzerland, Germany, United Kingdom and the northern countries of Europe were already very connected (with the exceptions of Latvia and Lithuania): the highest value of connected households in 2011 is 94% of total households, a record held by Iceland. These countries did not progress

much further, while still remaining above the European Average. All other countries developed significantly their internet access levels, with the most noticeable increment showed by Turkey, that in two years (from 2013 to 2015) gain 50% of its total increment with a constant slope of 11 percentage points per year, until reaching the European Average of 91 in 2020. Italy showed the most significant increase between 2012 and 2013, with a change of 6 percentage points, and capped at 85% level in 2019 (Italian data for 2020 are not yet available when this analysis is being written), 6 points below the European Average. The development of each nation is better captured by *Figure 1.2* that conveys the same information as figure 1.1, but using a box plot where the different levels of internet access are collected on the horizontal axis; each median value in the boxes represents the rounded up mode of the coefficients' range for each country, computed between 2011 and 2020 and corresponding to half of 2015. Countries are enlisted for increasing level of this median value but, to keep the time's representativeness of the quartile division, those with more than three missing values (Albania, Bosnia, Switzerland, Montenegro, Serbia and Kosovo) were excluded. Because of how the plot is constructed, there is a measurement error between 1 and 2 coefficient's points for countries with missing values (France, Italy, Turkey, North Macedonia and Iceland, that lack some measurements for certain years: for these countries, the second quartile does identify the mode of the coefficients' range but this does not correspond to the middle of 2015). It is therefore advisable to look at this graph only to get an idea of the magnitude of the development of internet connections and to classify European countries by their average level of development rather than to get the exact value of the coefficients for 2011 (minimum value), middle of 2012 (first quartile), middle of 2015 (second quartile), middle of 2017 (third quartile) and 2020 (maximum value)[4]. Following the trend of Internet access level, Broadband access' development across Europe show a similar behaviour, with some noticeable differences. As we can see from *Figure 2.1* and from *Figure 2.2* (for which have to be taken into account the same form-related issues presented for figure 1.2), Europe average increase is even greater, from 67% to 89%; northern countries remain at the top of the graph, but data points' distribution is more dense, sign that the period considered caught a moment of relatively gradual and smooth transition for those 'Virtuous' countries (with the important exception of Luxembourg that in just one year, from 2013 to 2014, gain 79.31% of its total increase in broadband access level). The opposite is true for the countries at the bottom line of the graph in 2011, including Italy: realizing quickly the importance of internet access' quality, they raced their way up, coming close to fill the gap with the European average. The most exemplar country in this regard is certainly Romania. In general, all countries in the Euro Area have understood the need for quality in internet access, as it is evident from the effort enlightened by this data and portrayed by figure 2.2. *Figure 2.3* focus on the Italian situation: after an initial rapid increase (from 55% to 68% between 2012 and 2013), the trend keeps a stable upward sloping of 3 percentage points per year until 2016, when it starts to show a fits and starts behaviour, capping finally at 84% in 2019. Following the analysis of residuals, the three coefficients' values for 2011, 2012 and 2013 years were considered outliers and removed from the computation of the slope parameter β_1 for Italy,

4 Minimum, maximum and quartiles identify correctly years only if the trend is steadily increasing over time. In case of countries like Luxembourg, where the value in 2020 is not the highest among those collected, box plots does not imply a correspondence with years.

which resulted in a value of 2.68 (Europe slope parameter is 2,30): based on this result, we can expect a value of broadband access level for 2020 of 87.3711 with a standard error of 0.1591. If both European and Italian trend won't change, Italy will then hit the European average in 2025. Having presented data on access levels to internet, we can now look at the demand for interaction with P.As through web-based tools, represented by *Figure 3.1*. To better visualize the trends the plot is split into facets, each representing a single country; it was computed a simple regression for each facet and provided the slope parameters' values for Euro Area and Italy, which trends are plotted together for better comparison in *Figure 3.2.* Italy exhibit a very low level of interaction with P.As compared to other similar countries, such as Spain, and a stagnant trend whilst Europe is moving towards a greater engagement with a steady increment. As the managerial model suggests, we would expect to see a general increase in interaction with P.As; and indeed, the European average show a positive slope equal to 1.679 (standard error is 0.09201) but, as it is evident from figure 3.1, this is due to some countries having a very high level of interactions rather then a general increase corresponding to higher connectivity levels. An extreme example is again Romania, which had showed a very decisive gain in internet access, but with an oppositely low increment in interactions with P.As. This is true also for Italy, which has a β_1 of 0.4667 (standard error is 0.1857), roughly one fifth of its increase in connectivity. Generally, Euro Area show a good variety of trends in this regard; the percentage of individuals which has contacted their governments through web-based tools is increasing in many countries, but the behaviour of the different countries' indicators appears to be too random to reject the null hypothesis of no correlation between the increase in quantity and quality of internet access and the interaction with P.As. A more in-depth analysis was carried out to examine this question further. The covariance analysis using Bravais – Pearson coefficient between increase in broadband connections and level of interaction with P.As for Europe return a value of 0.5538594; a plot of the relation was then drawn (*Figure 4.1.1)* to better visualize the trend. As was foreseen, the distribution of the interaction's values seems too random when explained uniquely by the increase in broadband access; however, the existence of a weak positive correlation of 0.31616 (with a standard error of 0.02574 and a p-value of 2×10^{-16}) between the two variables considered may not be solely due to the fact that these indicators are generally (for European average) increasing with time, and might yield some meaningful assumption about the results obtained by the implementation of the managerial model across Europe: the distributions of data points around the regression curve for different level of interactions with P.As seem to follow certain trends, maybe attributable to the differences in development of both broadband access and interactions with P.As. among European countries. To evaluate better the model's goodness of fit there were carried out some statistical tests, which results are summarized by *Figure 4.1.2*: the analysis of the residuals suggest that the relation is linear and values follow a normal distribution*;* however, the presence of outliers and the observed heteroscedasticity among the considered variables suggest that the model could provide better results if other factors were taken into account. Overall, the suggestion is that the model manage to partially explain the relation between increase of the two considered variables in some countries, but seems off for others; more interestingly, the fitness of the model seem to increase considering geopolitical aggregates of nations, and we can verify this hypothesis looking again at data summarized by figures 2.1 and 3.1. The underlying assumptions are that

the trend could be better explained by looking at each country's general position towards digital development, and taking into account cultural and political differences between European nations, rather then by simply looking at the supply of digital services (that were assumed to be fairly equal among European countries, but have not been examined in this research). Considering these founds, the same correlation was studied in the particular case of Italy (*Figure 4.2.1)*; the facts that the correlation coefficient between the interactions with P.As and broadband access' levels is higher (0.7473207) and so is the corresponding p-value (0.02064) suggest that at national level appears to be indeed a stronger correlation between the two variables, but also that other factors interfering in the relation magnify their effects; putting together these considerations, we can confirm the hypothesis presented above, i.e. the existence of factors at national level that have decisive impact in the success of European digital policies' implementation. In the case of Italy, the increase of interaction explained on digital access is lower then the European average (β1 = 0.12128), implying that those factors work against European objectives. These considerations are supported by the evidences provided in *Figure 4.2.2*: the correlation does no longer appear to be linear and removing outliers, as was done in the analysis of Broadband access, residual plot assumes a parable shape; as expected, disrupting effects on the values' distribution are much more considerable.
A better model could use a quadratic transformation to counterbalance the distortion; such model ($Y= \beta_0 + \beta_1 X + \beta_2 X^{\wedge 2} + u$) presented a lower p-value (0.00476); using it for further analysis could provide better results, but it is unlikely that it could provide meaningful results without considering more variables. There are some doubts this distortion could be caused by the scarce number of observations; however, as will be shown in the next part of the analysis, it is probable that this is rather due to specific geopolitical factors. To conclude the dissertation about the explanatory capacities of this model, it must be again reminded that the questions raised can't be satisfactorily examined by the use of a such simple model as the one implemented here; however it was sufficient to show that there is more to be examined, and that the focus should be shifted to national settings.

- Regions of Italy -

The second part of the data discussion focus on the analysis of Italian regions, following a parallel path to that used in the first half of the research. The first data set contain information about internet access level; *Figure 5.1* provide some interesting visualization inputs, drawing the values for all regions between 2011 and 2020 plus the European and Italian average. We can note that all regions lay below the European curve for most of the time considered, with the exceptions of Emilia-Romagna in 2018 and of the autonomous province of Trento in 2019: these are the only Italian region which managed to catch up with the European average, and did so only recently. Most of the others regions in 2019 ended above the Italian average of 84, but below that of the EU. What is most interesting however, is the geographical separation of the country which emerge clearly from the plotting of the curves: in 2011 the percentages of households with internet connection were included between 50% (Puglia) and 67% (Bolzano, Trento and Lombardia) and even if southern regions were already at the bottom of the graph, values were almost perfectly distributed along the Italian mean. In the subsequent years, particularly since 2014, while other regions increase the rate of their development, the southern area was unable to follow effectively and since 2015 begin to slow

down. The result is clear in the 2019's picture: A first group of Regions, corresponding to the geographical south of Italy is nested between 76 and 80 percentage points, while all other regions are grouped between 85% and 90%, with the autonomous province of Trento leading at the 92% level. Summarizing, while the average Italian level of internet connections improved of 23 percentage points in the time considered, inequalities between geographic areas of Italy were also increasing rather then being resolved, resulting in a wide gap of 5 percentage points between southern regions and the rest of the country in 2019. *Figure 5.2* provide the same intuitions, but suggest also that the difference in development speed is not the most meaningful observation: the cause for such inequalities is perhaps better explained by the initial disproportion already present, and just made worse by the recent slowdown of southern regions[5]. Almost identical considerations can be made regarding Broadband connections levels, portrayed by *Figure 6.1* and *Figure 6.2*: while the magnitude of the development in broadband connections was greater then the European average for all Italian regions, only the autonomous province of Trento and the region of Marche were able to reach and surpass the EU's level, while Lombardy and Emilia-Romagna (that, along with Marche, was excluded from figure 6.2 because of missing values inducing rounding errors) managed to catch up in 2018. The geographical division first spotted in internet access levels is still present in the case of broadband access, with the same gap of 5% between southern regions and the rest of the Country. The most noticeable difference with internet access level's values is the jump made by all Italian regions between 2009 and 2010, and again between 2012 and 2013: much of the vertical distance covered by the indicators resides in these two years, and, even if we can't compare the first increase, since data from those years are unavailable for the internet access' measurement, it is clearly visible that the second escalation is much steeper then the corresponding one in figure 5.1, and shared between all regions as well; looking again at figure 2.1, we can establish that throughout 2012 Italy performed better than any other European country. To conclude the part of the analysis focusing on Italy, it is drawn one final plot representing Italian residents' demand for interacting with P.As through web-based tools, grouped by regions and geographical areas (*Figures 7.1.1, 7.1.2, 7.1.3)*. The results presented are more interesting than what could appear at first glance, and deserve some discussion: first of all, there are some differences in the level of demand for interaction with P.As, and they appear again geographically distributed; this could be explained by higher services' supply levels from different local authorities, or quality of services supplied, or perhaps by cultural reasons; since we have rejected the hypothesis of a correlation between internet access and demand for interaction, this can't be explained by the difference in regional's internet access levels showed before. Another interesting fact is that the steepness of the regression curves are generally very similar between regions, despite the different levels of demand: it could signify that some modifiers operate at national level; once again, the possibility of a geopolitical explanation seems plausible. Without more data on the supply side and on the type of interaction demanded, any guess would be hazardous; however, we are observing for the third time the appearance of a certain geographical distribution in the access to internet and demand for interaction with P.As.' variables' values. Whatever the

5 The usual recommendations are to be observed when looking at box plots: in this case minimum and maximum values are correctly representing 2011 and 2019 respectively for all regions, but Emilia-Romagna and Marche miss one measurement each, meaning that their means do not fall exactly on 2015

reason for such distribution may be, data show that all regions of Italy are not increasing their demand for interaction with P.As by much, and in many cases the trend is very weak.

Conclusions:

The data examined are insufficient to address the effectiveness of the managerial paradigm adopted by public authorities in providing services to their citizens; since costs and revenues data are missing, there is no way to state what Europe and Italians' P.As should do to improve their action, and even to evaluate what they are already doing through an economic perspective. It is not all to bad, however, since this fact offers a way out to the debate around the role of governments as suppliers of services and about what this mean for their citizens. Moreover, simple as it is, this research could provide suggestions on how to improve the overall situation, regardless of the paradigm chosen: basing on Europe's declared digital strategy and objectives, it was assumed an interest for all countries to a sheer improvement in digital access' quality and quantity, and to a better level of interaction with their citizens through digital means. Considering this, the analysis held useful information for policy makers regardless of their opinion on the managerial model; increasing in connectivity is important not only for an economic-oriented perspective, so that the results of this evaluation can be generalized and used as they are for any policy application related to digital society improvement. As for the findings of the research, they can be divided into three groups: the first, descriptive of the Italian and European position on digital development, address informative issues: It has been viewed how Italy improved throughout the decade, and what is left to be done regarding quantity and quality of connections; at regional level it was observed a trend in connectivity increase that, although positive, is forcing regions further apart, exacerbating differences and causing inequalities among citizens. The second group of results is related to the analysis itself, and to the goodness of the model used; while it was clear since the beginning that, lacking a better econometric modeling of the managerial paradigm, much of the descriptive capabilities of the statistical evaluation would have been lost, the linear model used provided insights on how to improve it for subsequent analysis and was apt to unravel a geographic variation which traces have been found both among nations of Europe and among regions of Italy, for all indicators examined: this fact may prove useful for further examinations and relates directly to the third group of findings. Said group, which class the most fragile assertions, is also the most interesting: it provides prescriptive indications for policy makers interested in improving the digital development of the areas they administer; given the aforementioned geographical trend, it is unlikely that actions taken at European or regional level prove effective in this regard: to achieve the digital transformation Europe is seeking, one should look at the national state of affairs, find the factors that work against it and resolve them with national politics rather then implementing local solutions. As for the primary concern of the research, bearing in mind what was already said regarding the goodness of the model, the null hypothesis of the absence of a correlation between broadband access level and individual interaction with public authorities through the use of internet can't be rejected: further analysis are required to investigate better the nature of the weak correlation found and provide certain results.

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Appendix A – Pictures:

Figure 1.1

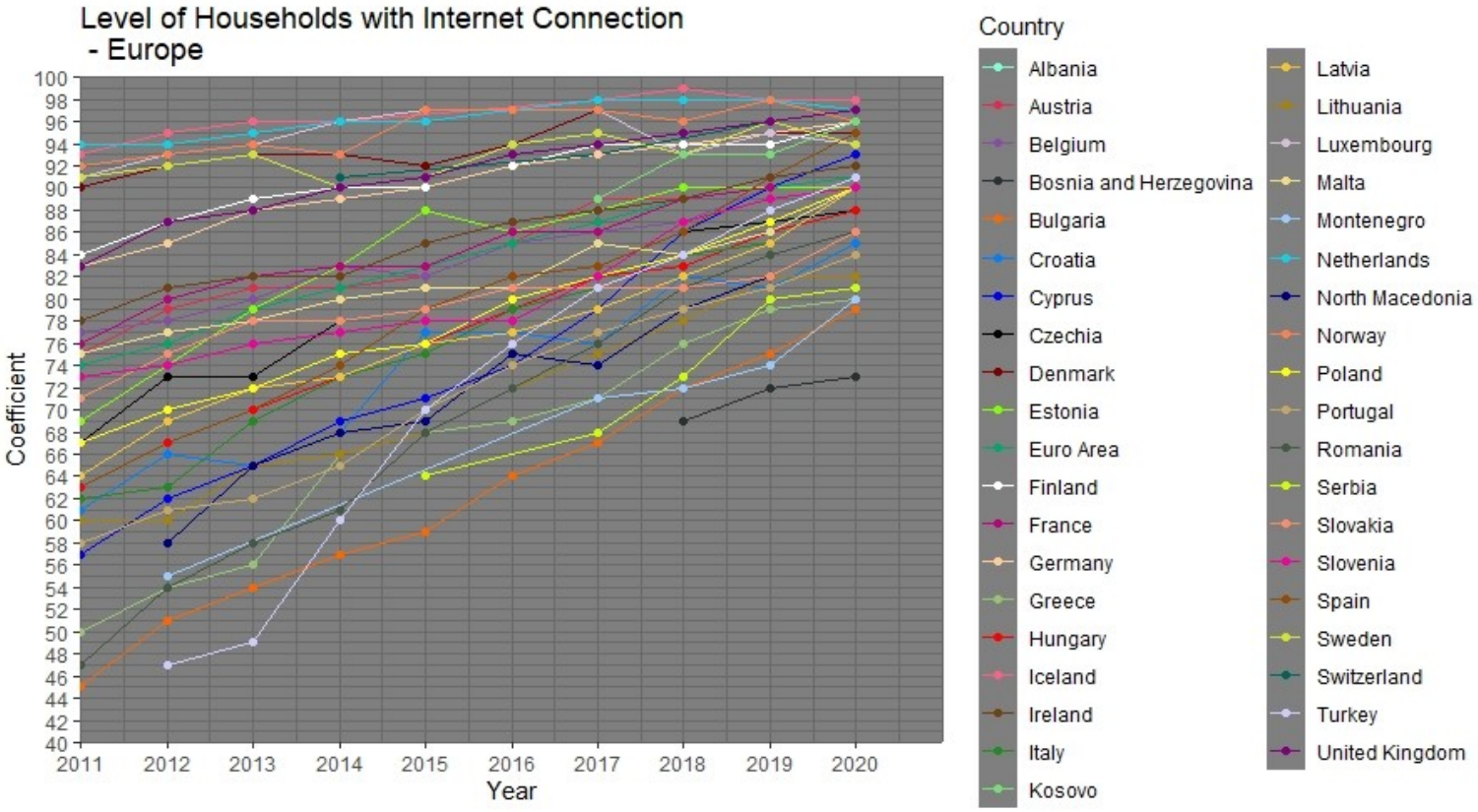


Figure 1.2

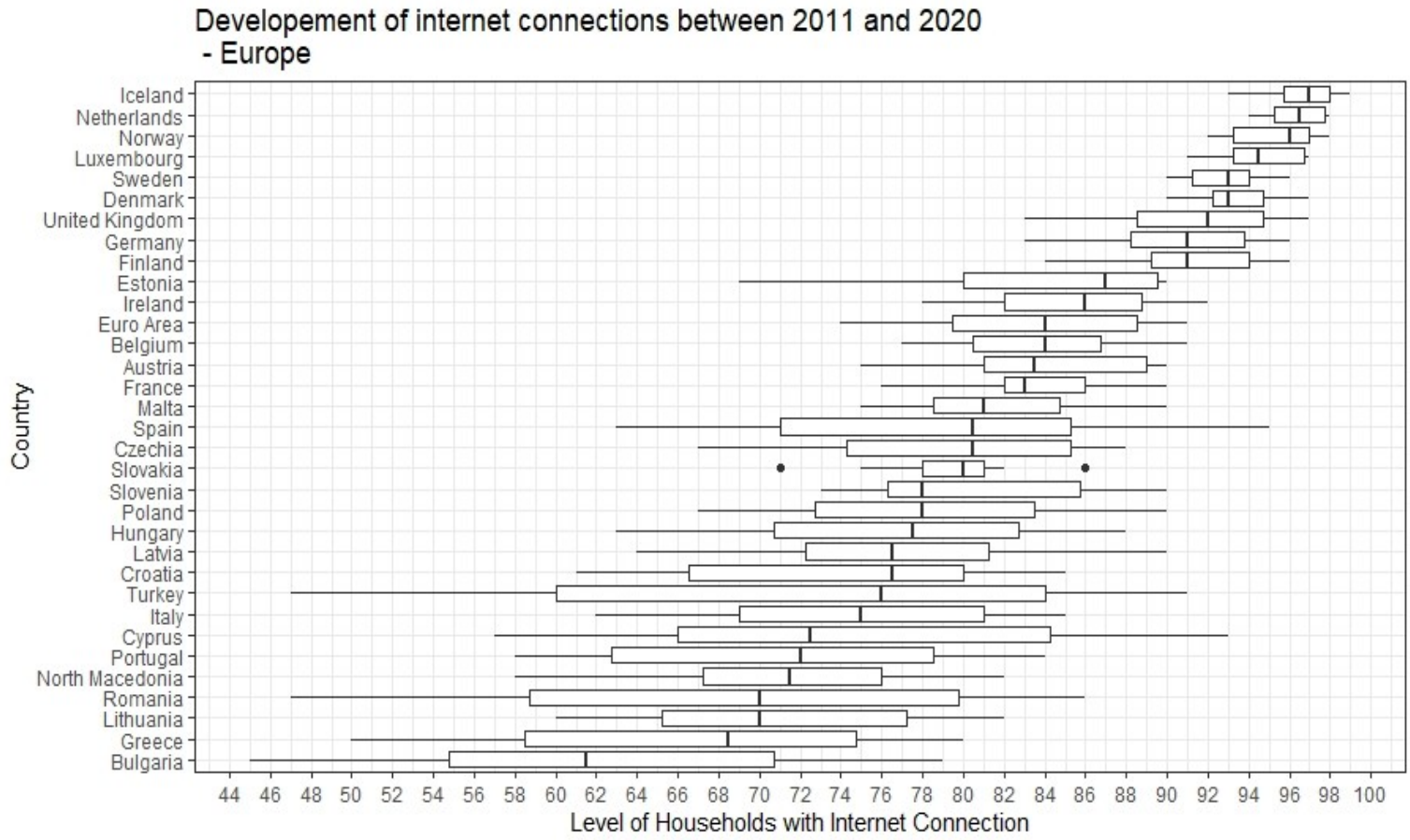


Figure 2.1

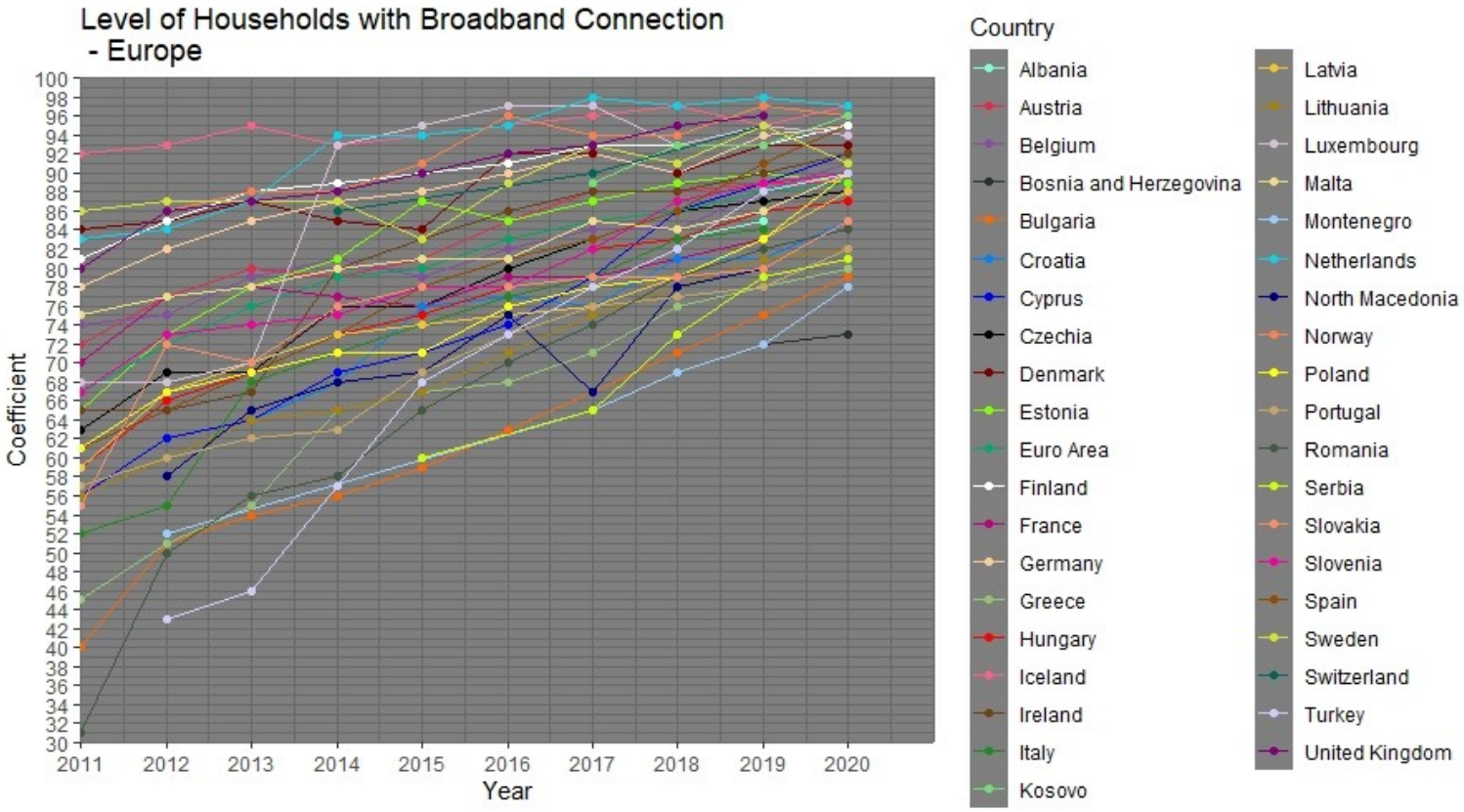


Figure 2.2

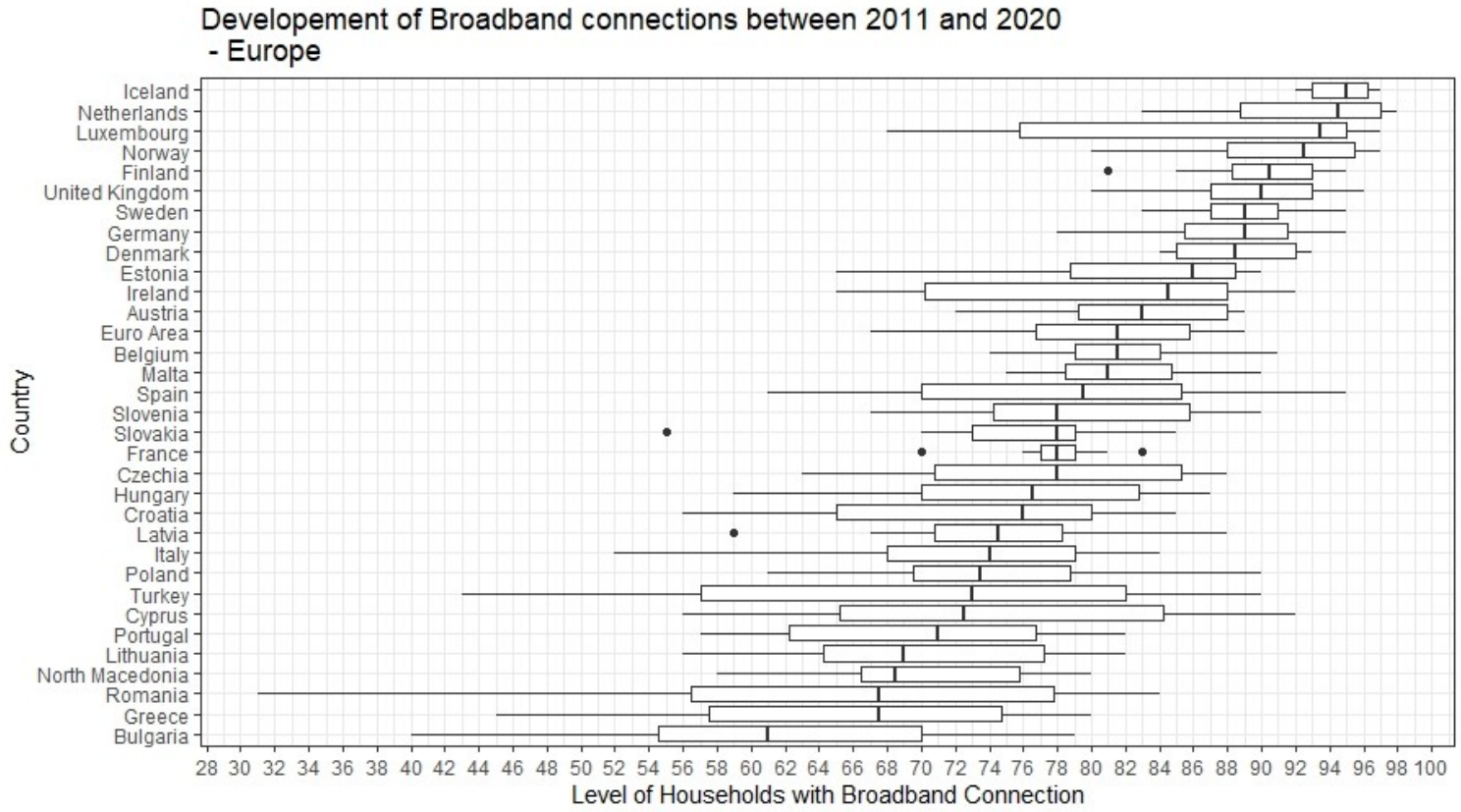


Figure 2.3

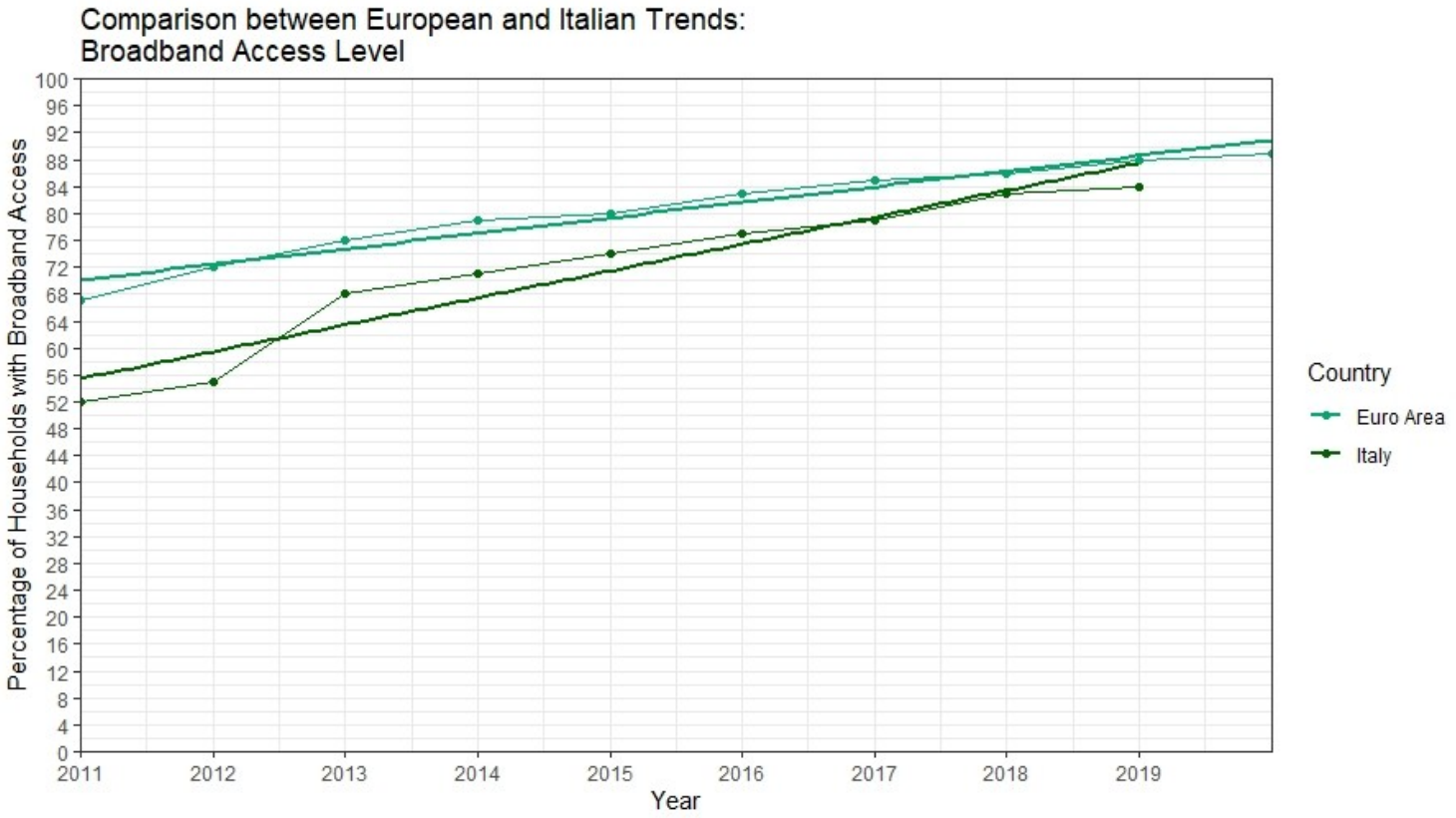


Figure 3.1.1

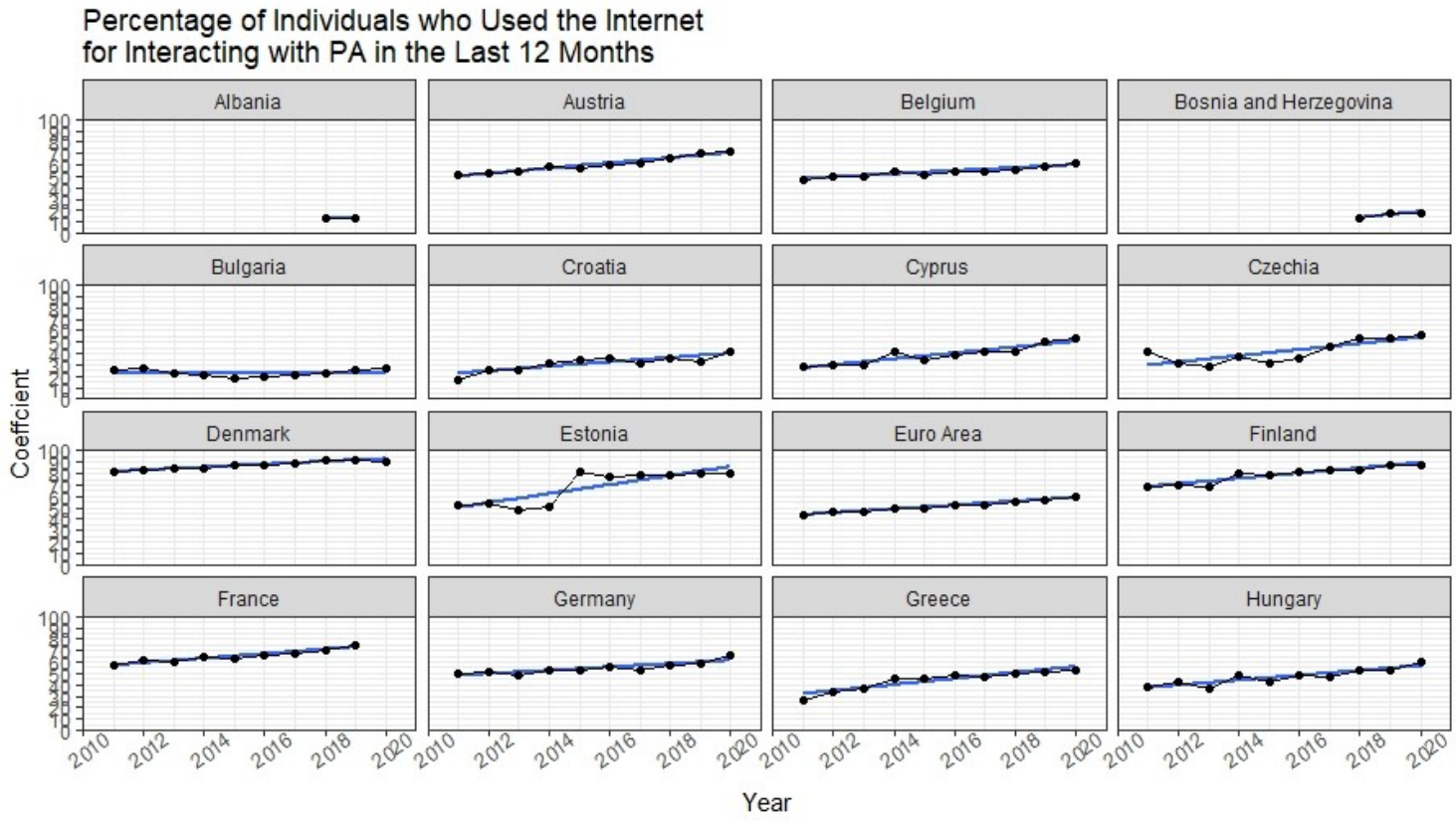


Figure 3.1.2

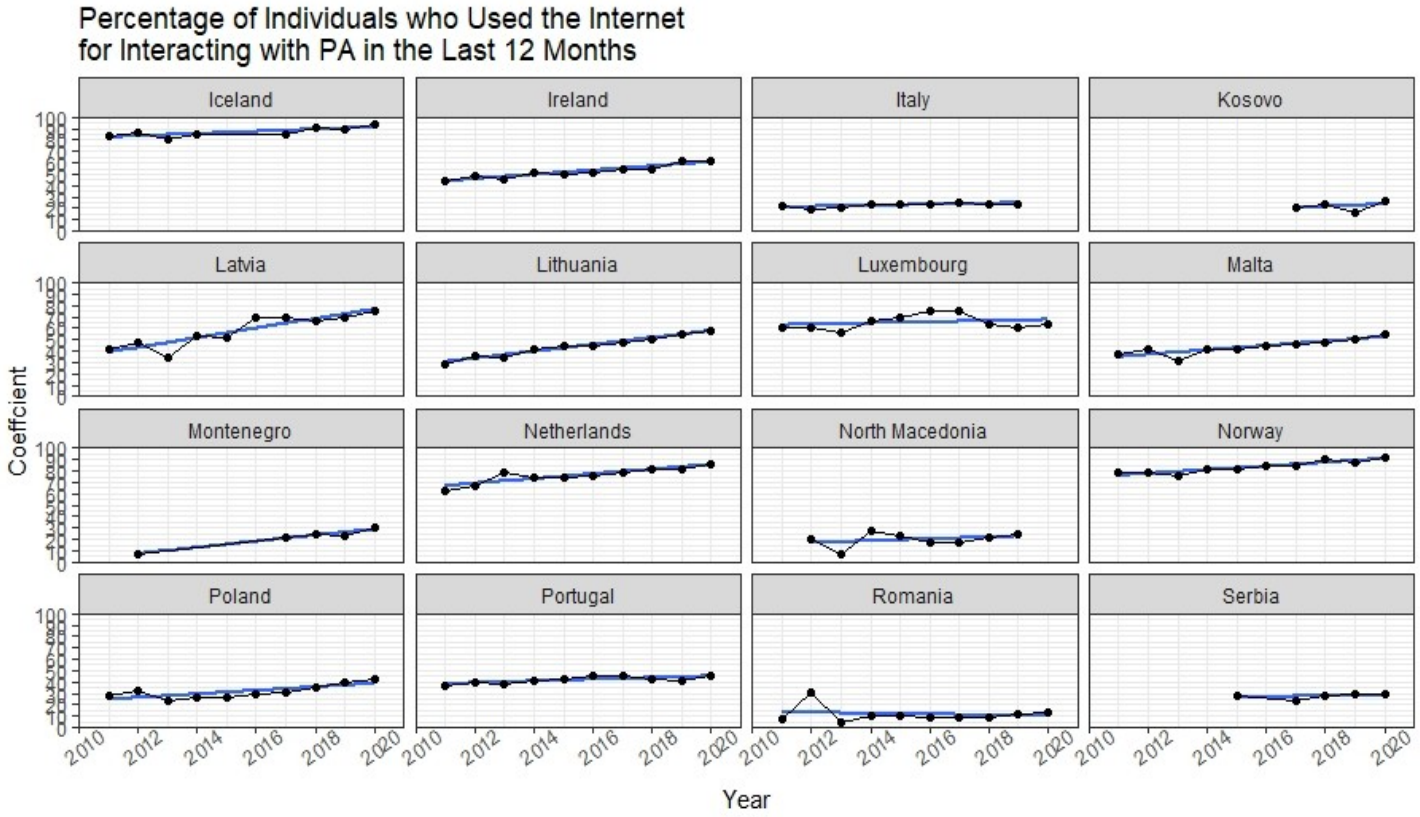


Figure 3.1.3

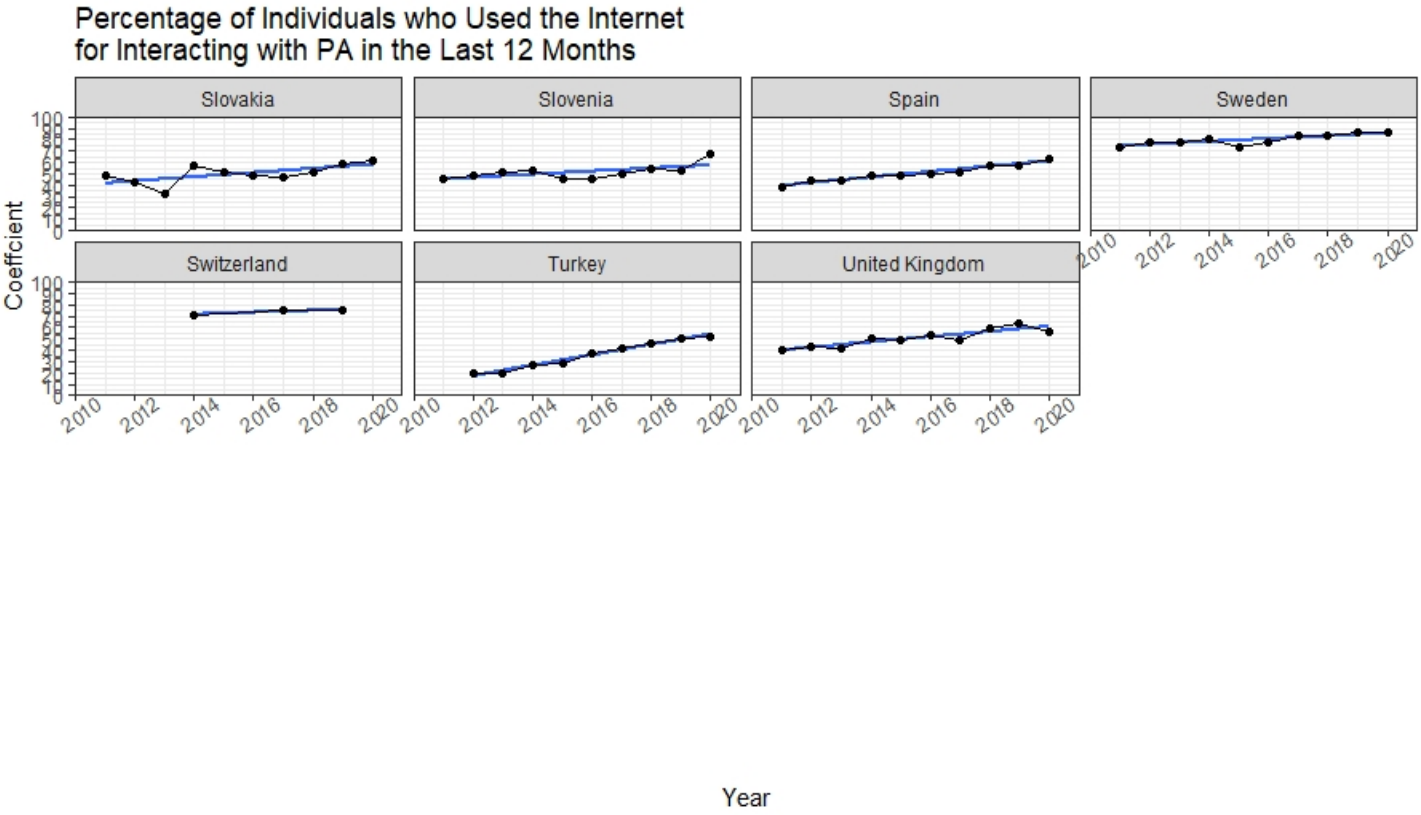


Figure 3.2

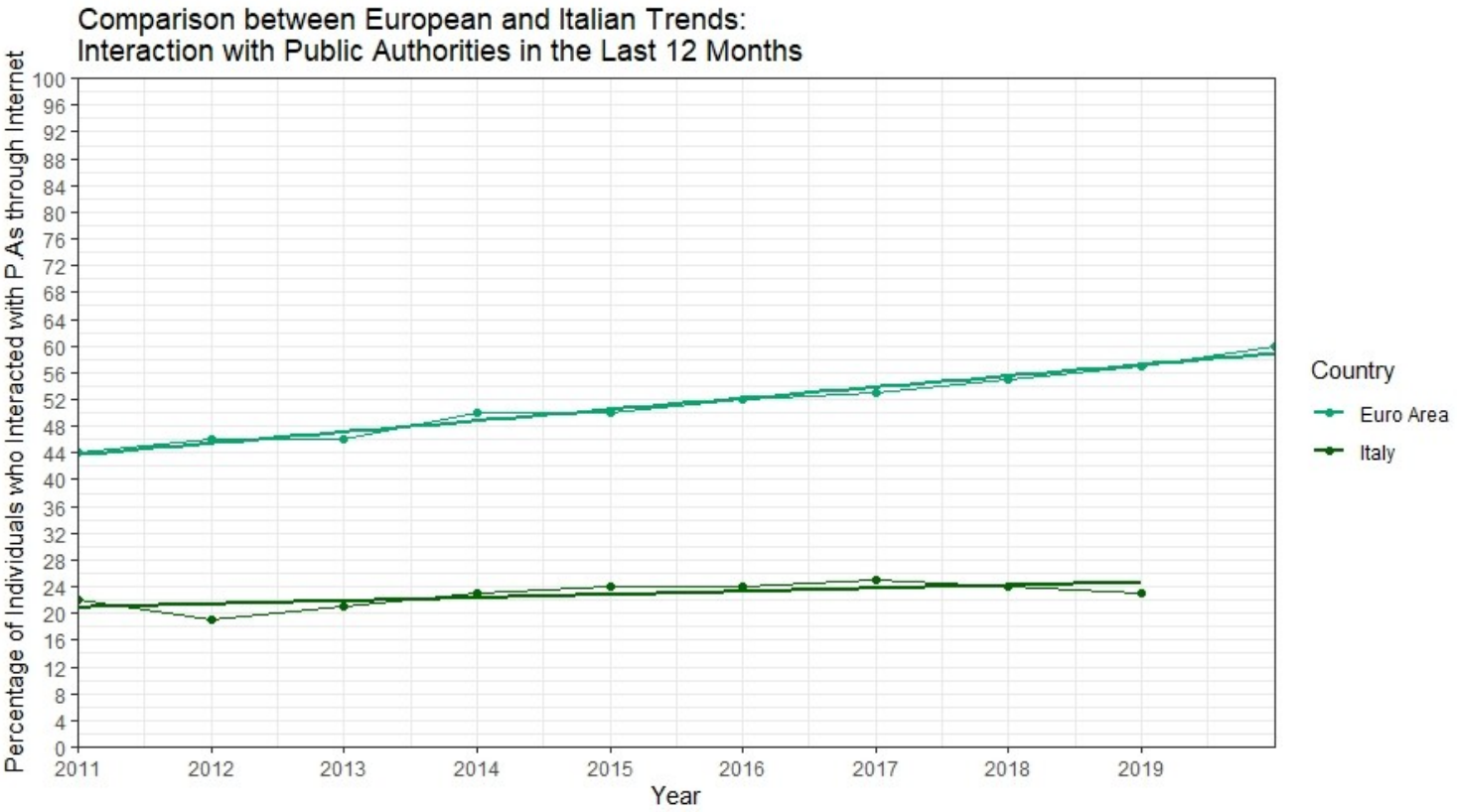


Figure 4.1.1

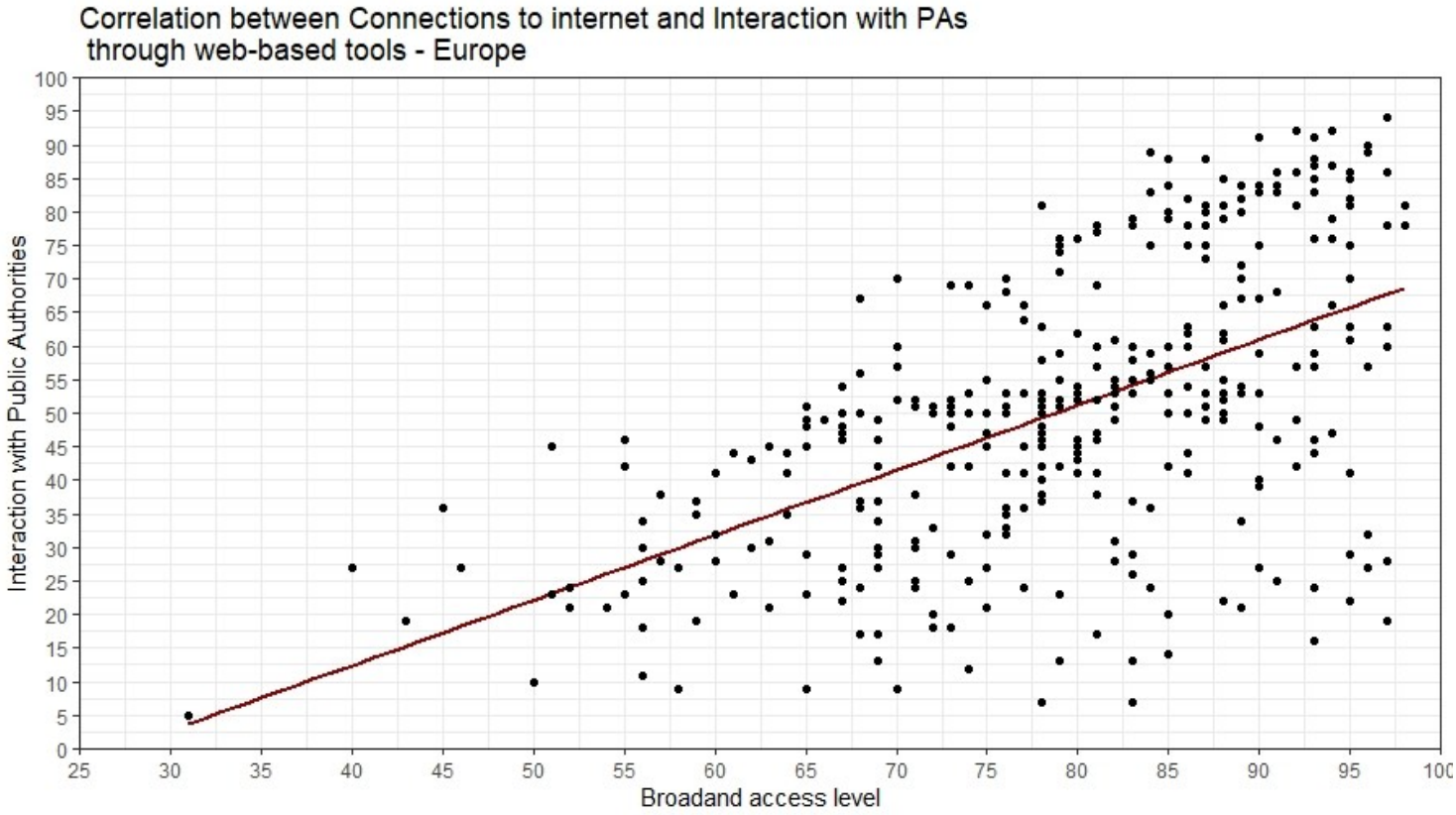


Figure 4.1.2

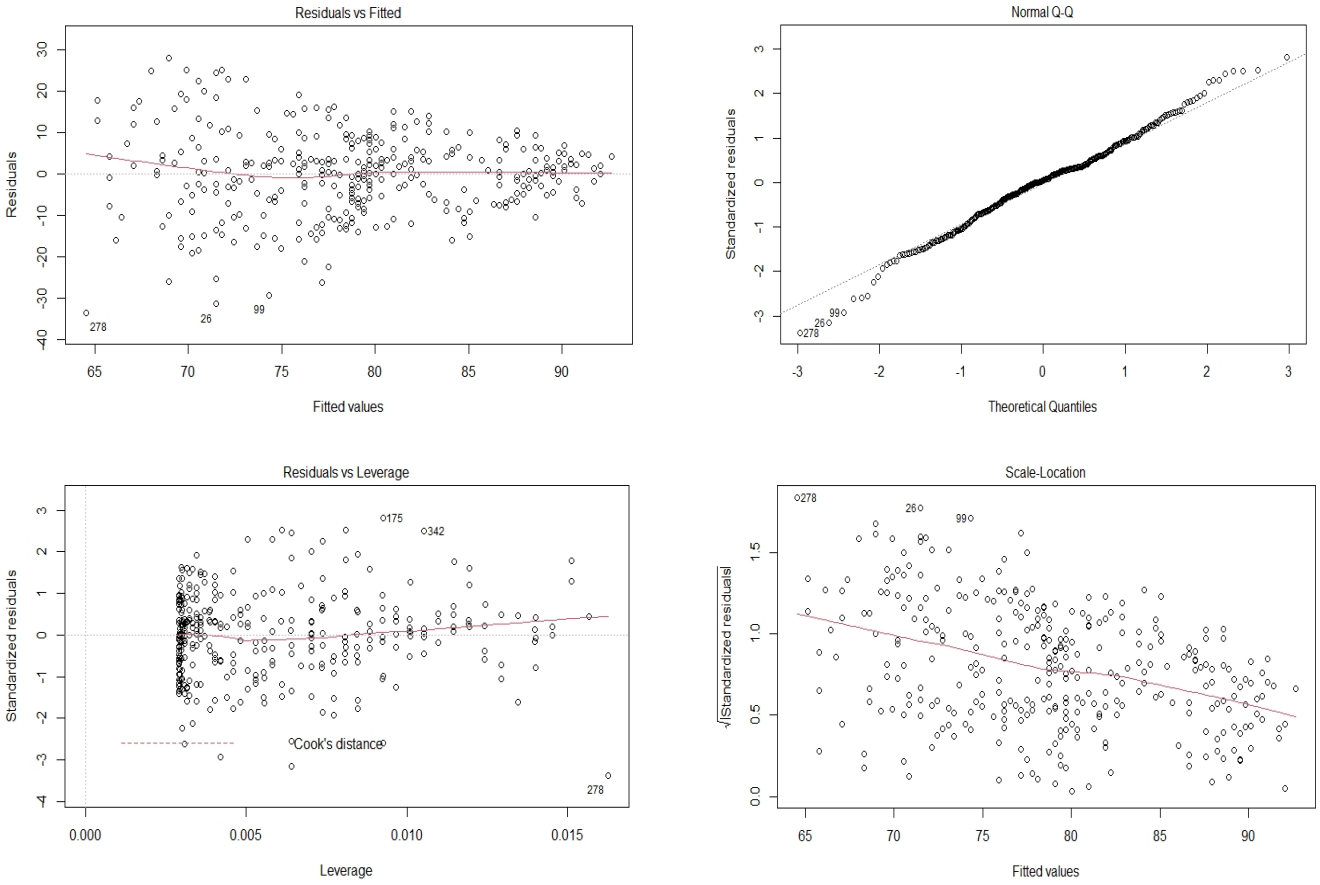
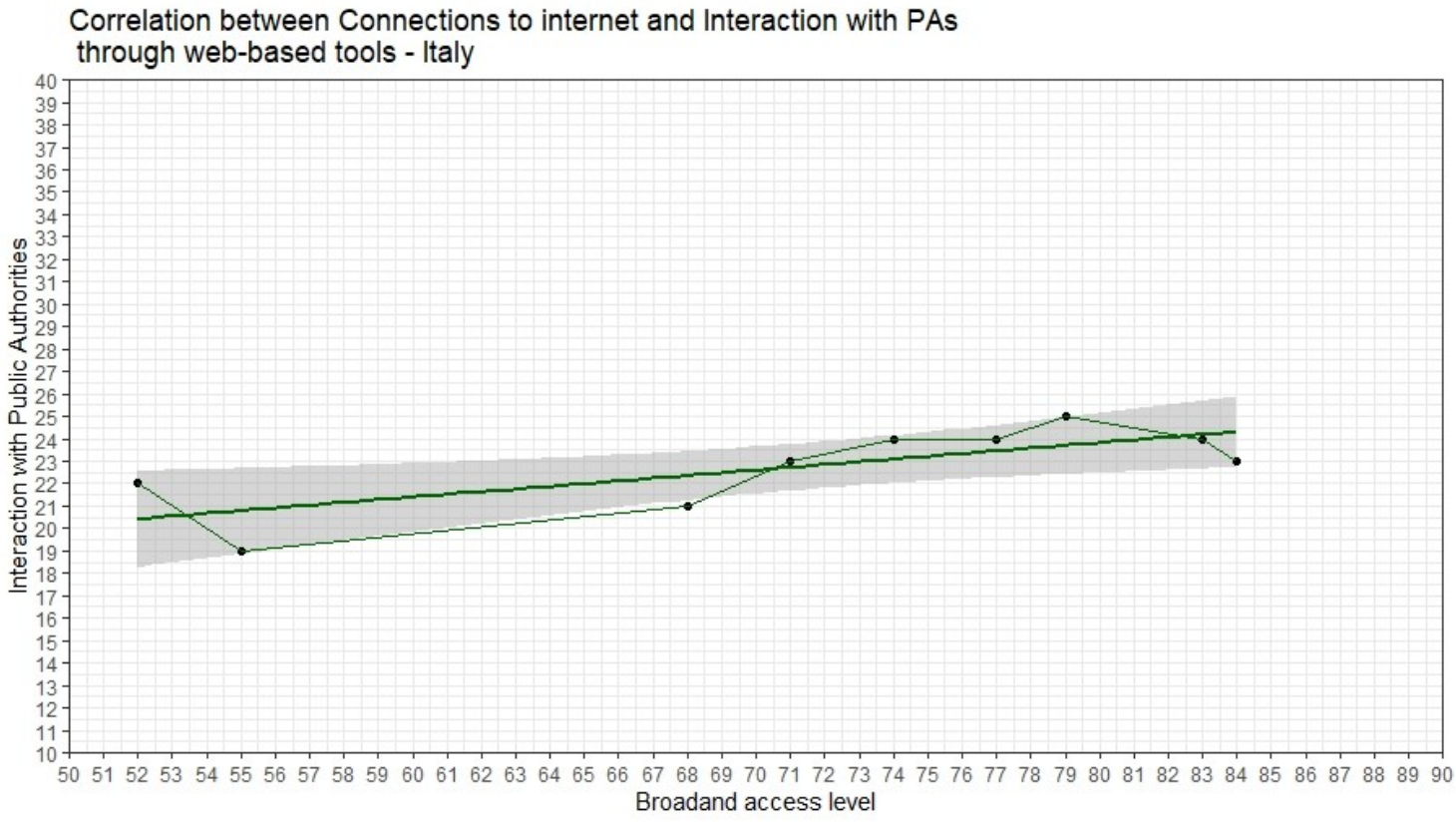


Figure 4.2.1



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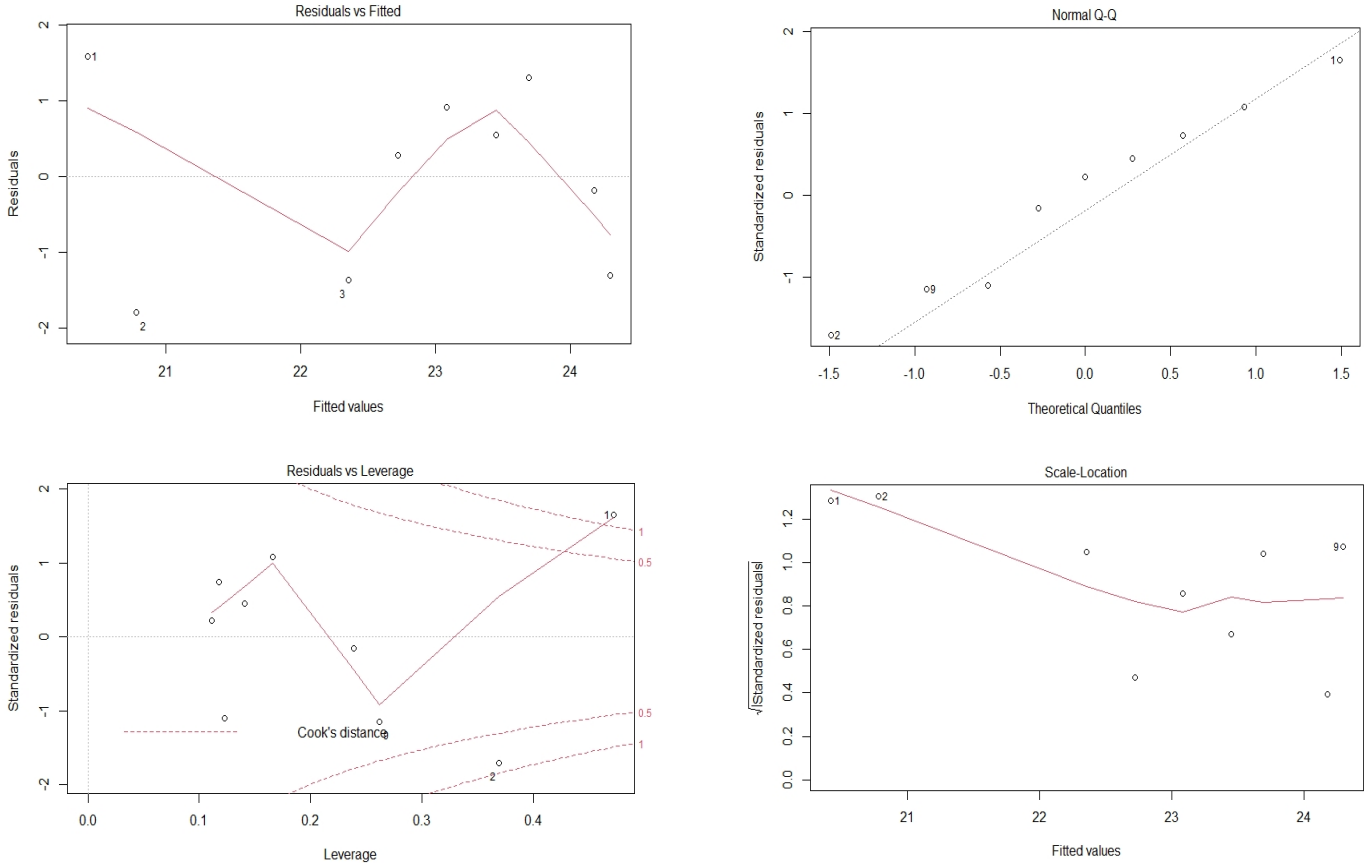

Figure 5.1

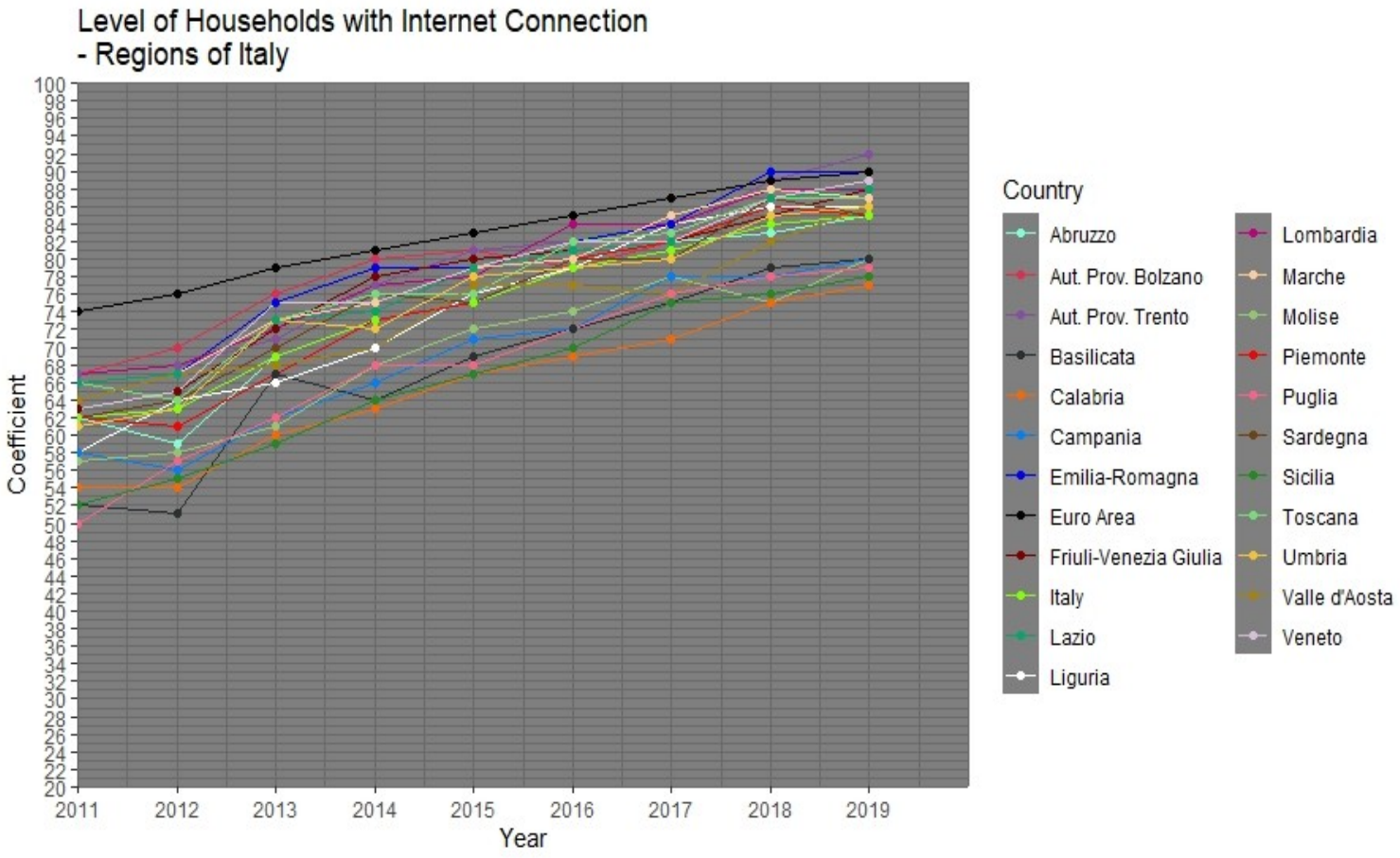

Figure 5.2

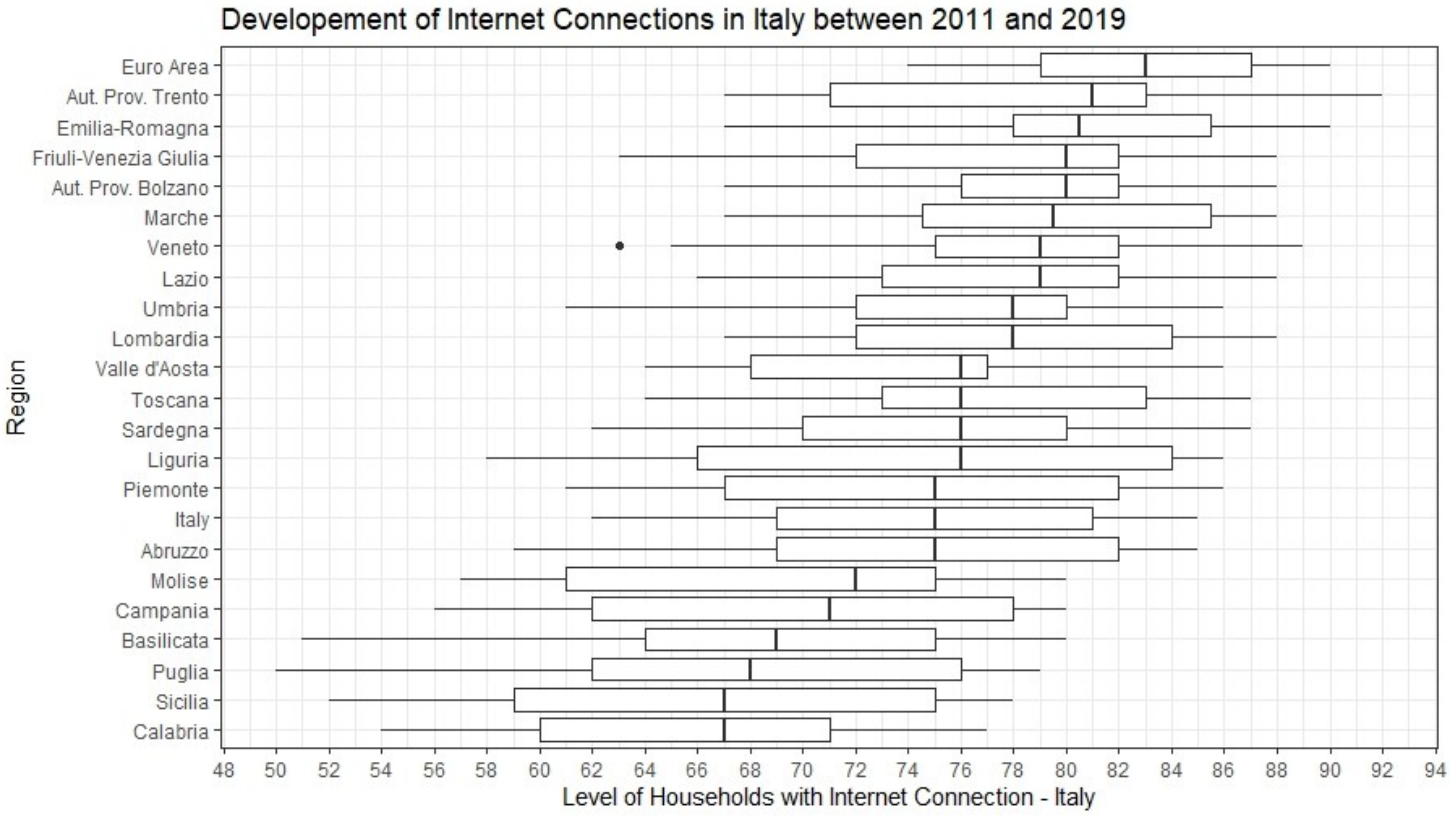

Figure 6.1

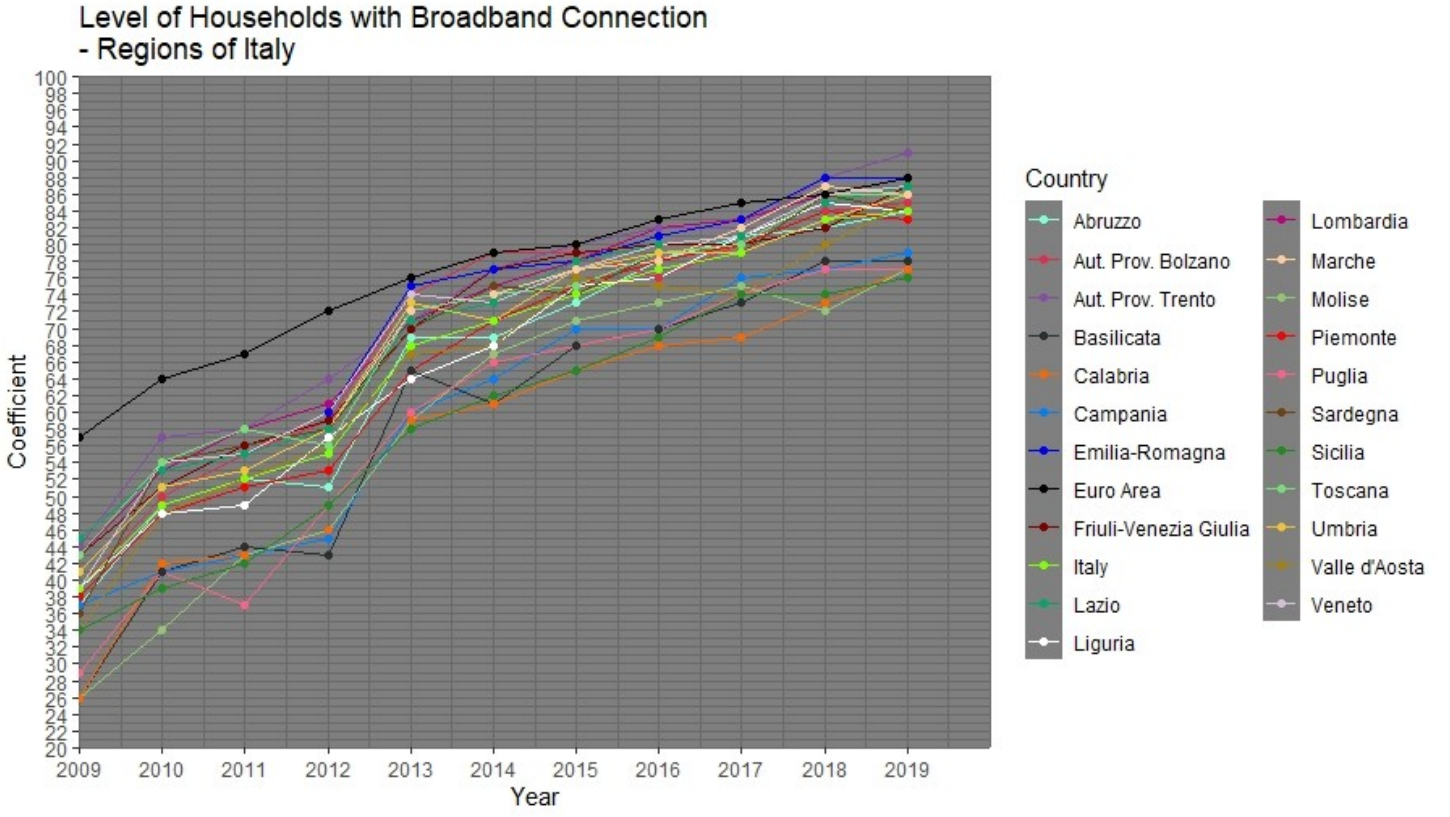

Figure 6.2

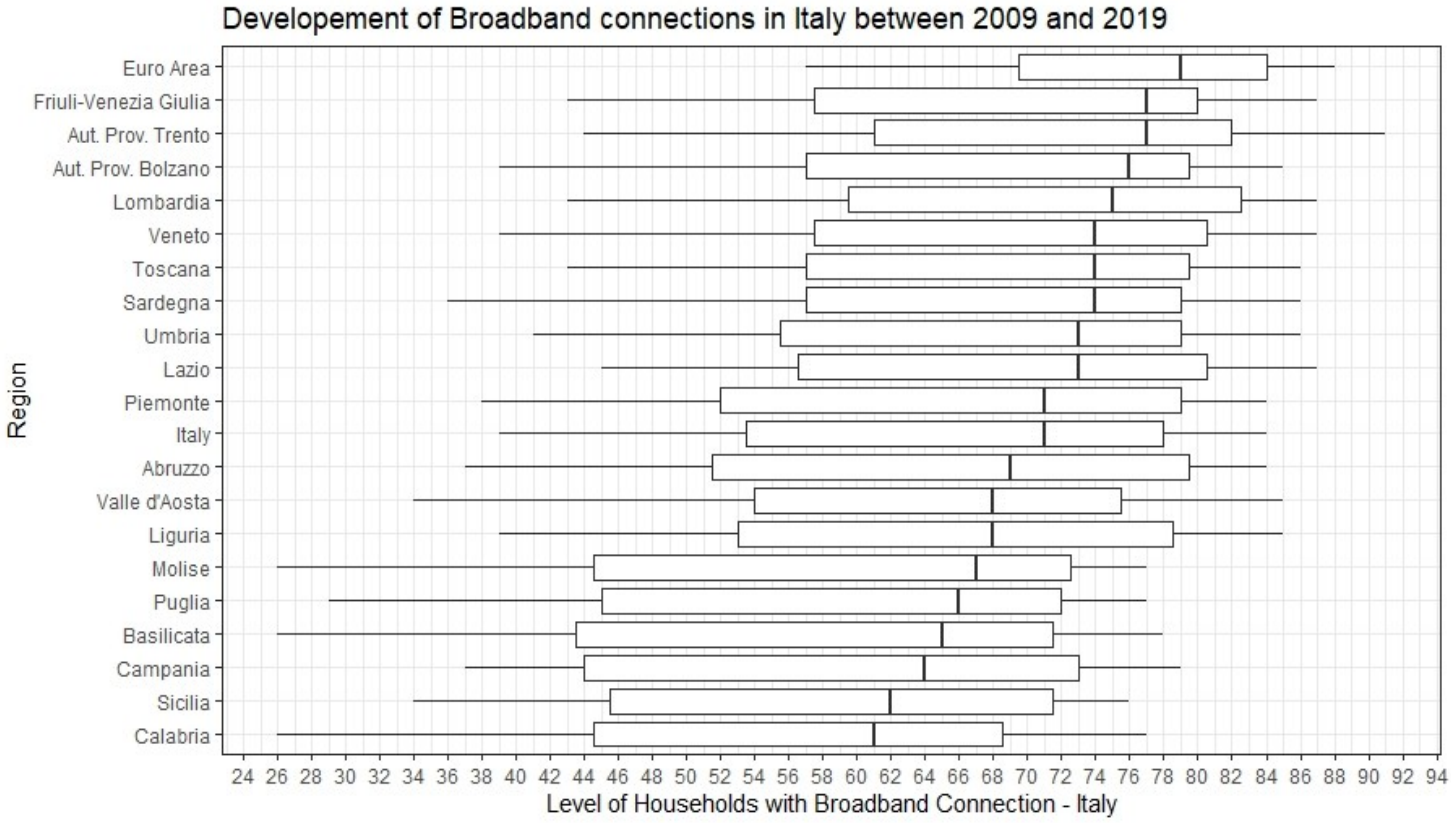

Figure 7.1.1

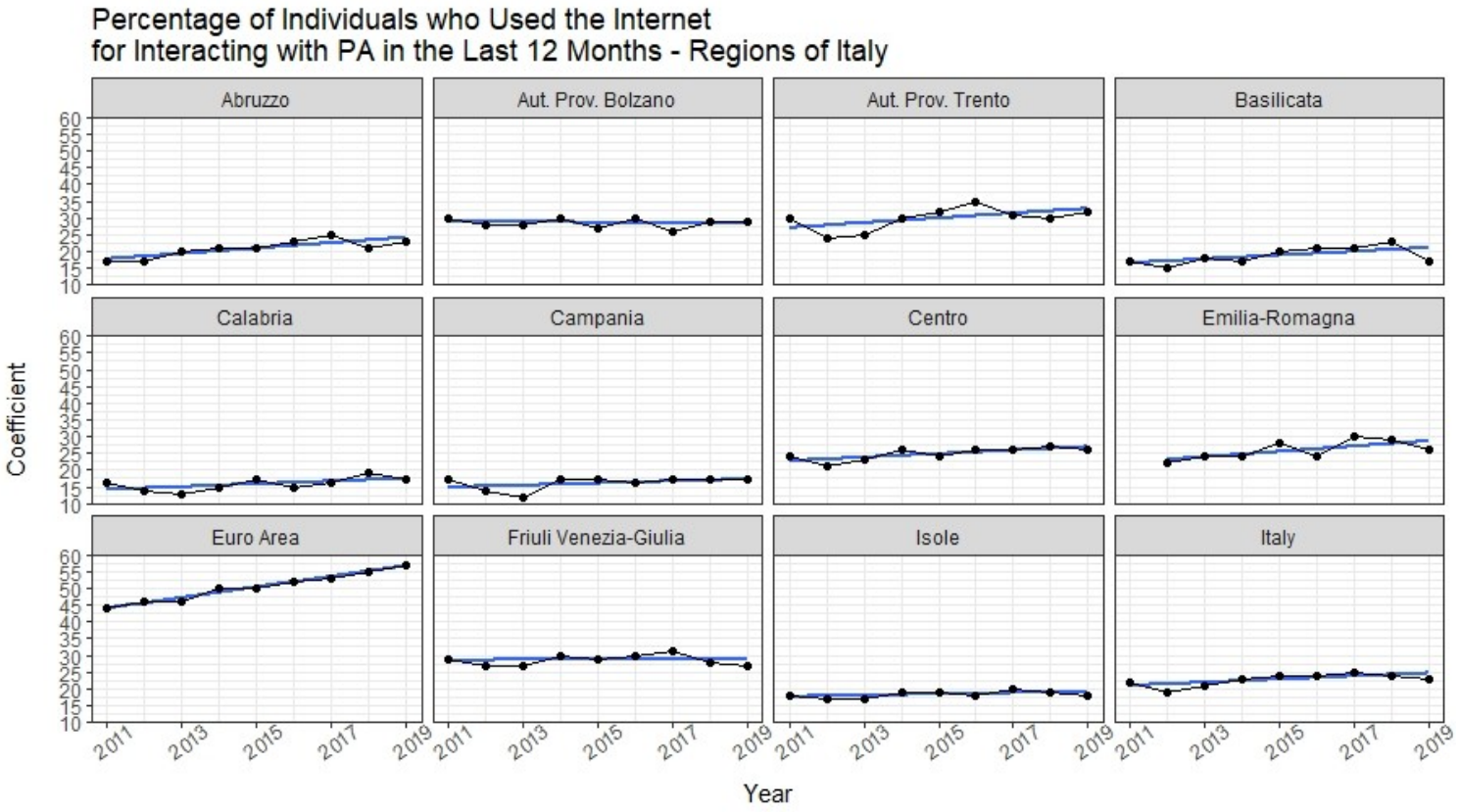

Figure 7.1.2

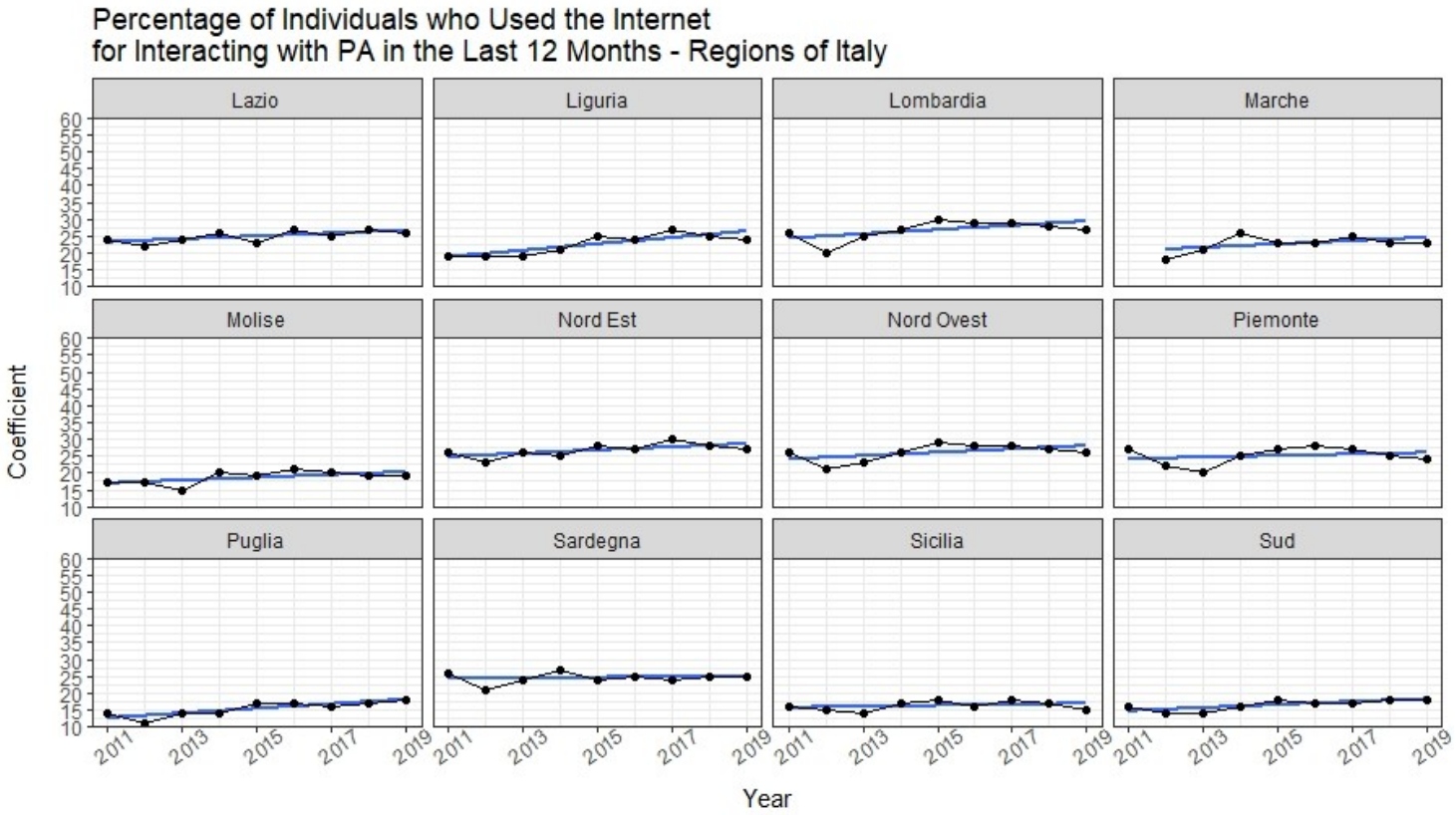

Figure 7.1.3