ECONSTOR
Make Your Publications Visible.

A Service of
ZBW
Leibniz-Informationszentrum Wirtschaft
Leibniz Information Centre for Economics

Navío-Marco, Julio; Pérez-Leal, Raquel; Ruiz-Gómez, Luis Manuel

Conference Paper

Analysis of the WiFi4EU initiative as a potential instrument to correct digital divide in rural areas in the EU

30th European Conference of the International Telecommunications Society (ITS): "Towards a Connected and Automated Society", Helsinki, Finland, 16th-19th June, 2019

Provided in Cooperation with:
International Telecommunications Society (ITS)

Suggested Citation: Navío-Marco, Julio; Pérez-Leal, Raquel; Ruiz-Gómez, Luis Manuel (2019) : Analysis of the WiFi4EU initiative as a potential instrument to correct digital divide in rural areas in the EU, 30th European Conference of the International Telecommunications Society (ITS): "Towards a Connected and Automated Society", Helsinki, Finland, 16th-19th June, 2019, International Telecommunications Society (ITS), Calgary

This Version is available at:
https://hdl.handle.net/10419/205200

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

WWW.ECONSTOR.EU

Mitglied der Leibniz-Gemeinschaft

Analysis of the WiFi4EU initiative as a potential instrument to correct digital divide in rural areas in the EU

Julio Navío-Marco[1]
Dept. of Management and Business Organization, UNED

Raquel Pérez-Leal[2]
Dept. of Signal Theory and Communications, Univ. Carlos III of Madrid

Luis Manuel Ruiz-Gómez
Dept. of Management and Business Organization, UNED

ABSTRACT

With the WiFi4EU initiative, the European Commission intends to reinforce local wireless Internet connectivity free of charge and without discriminatory conditions in the EU. This paper aims to analyse if this policy measure achieves its goals: to contribute towards digital inclusion and to improve coverage in disadvantaged areas. By analysing the results of the first call, we can conclude that WiFi4EU can be a good tool for promoting the necessary connectivity in local/rural environments of the European Union, but there is room for improvement to increase the positive impact of the initiative. The article proposes useful recommendations for municipalities and policymakers, and suggests improvements for the award procedure.

Keywords: WiFi4EU; ICT regulation; Gigabit Society; Rural connectivity, digital divide

1. INTRODUCTION

In September 2016 the European Commission (EC) presented different proposals to promote Connectivity for a European Gigabit Society[3]. Among them, a WiFi4EU Regulation was launched to promote free access to Wi-Fi connectivity for citizens in public spaces, including parks, squares, public buildings, libraries, health centres and museums in municipalities throughout Europe. The WiFi4EU initiative is a novel measure promoting genuine interaction between EC authorities and municipalities for the development of a telecommunications infrastructure, which is quite unusual.

Neoliberal economics has meant that the more remote rural areas are excluded from faster broadband connections as market forces lead private companies to focus their attention on urban centres and larger clusters of dwellings in rural areas where profitability is greatest (Malecki, 2003; Townsend et al., 2013). European regulations generally restricted state intervention because

[1] Corresponding autor: Julio Navío-Marco
Facultad de CC Económicas y Empresariales, Department of Management & Business Organization (UNED). Paseo Senda del Rey 11, 28040 Madrid, Spain

[2] This work has been partly supported by Spanish National Projects TERESA-ADA (TEC2017-90093-C3-2-R) (MINECO/AEI/FEDER, UE).

[3] http://ec.europa.eu/competition/sectors/telecommunications/overview_en.html

it would distort the free market (Cambini and Jiang, 2009; Sadowski et al., 2009). Now, public support should be seen as not only responsible for the regulatory framework where market forces thrive, but as the leading force behind infrastructure deployment and a measure to boost innovation (Feijoo-Gonzalez, Gómez-Barroso & Bohlin, 2011). In this context, as free-of-charge local wireless connectivity without discriminatory conditions, WiFi4EU could make a major contribution to bridging the digital gap, especially in communities that are lagging behind in terms of digital literacy, including rural areas and remote locations. The European Commission includes these goals among the objectives of the initiative: "WiFi4EU aims to complement support from the European Structural and Investment Funds to broadband roll-out and deployment of Wi-Fi. The initiative will aim to promote citizens' interest in high capacity internet services, thus contributing to both the take-up of commercial broadband and public infrastructure development. It also aims to contribute towards digital inclusion, improve coverage in disadvantaged areas, reinforce mobility and promote digital literacy, as well as to promote the use of services offered by entities with a public mission" (European Commission, 2018).

In the first piece of research devoted exclusively to analysing this WiFi4EU EC regulation, Navío-Marco, Arévalo-Aguirre & Pérez-Leal (2019) make a relevant *ex ante* analysis of the initiative. These authors criticise the award procedure, which uses a "first come, first served" system. This does not appear to be the most suitable when public aid is involved, because the award should not be determined by order of application but by the objective to be achieved. This "urbi et orbe" allocation method could even distort the free market and deviate funds from using them in areas with special connectivity requirements: some of the applicants (for example, dense urban municipalities) cannot be considered subjected to market failure, while other areas (for example, rural areas) might require public intervention to guarantee the needed connectivity. These authors recommend a detailed analysis of the winners, the winners of upcoming calls, and the monitoring of the results and achievements of each winner as suggestive fields for future research, in an *ex post* exercise of the initiative that would undoubtedly continue contributing to the debate on how to provide better infrastructures and services to citizens.

In view of the initial results of the first call, announced at the end of 2018, the purpose of this research is to analyse whether WiFi4EU fulfils its objectives. Mainly, this paper aims to answer the following research question: Is the WiFi4EU initiative achieving its goals: to contribute towards digital inclusion, improve coverage in disadvantaged areas, reinforce mobility and promote digital literacy? Or, is there room to improve the use of resources, by avoiding spending resources in areas that already have the appropriate connectivity?

In this context, the objective of this article is threefold: to assess the initial results of the initiative, after the awards of the first call. Secondly, to understand if WiFi4EU is truly addressing certain market failures and decreasing potential digital gaps, which would allow for the creation of new digital inclusion initiatives. Finally, the article will offer recommendations to improve the award procedure, to provide initial guidance regarding the best possible usage of the available EC funds for the initiative.

The WiFi4EU initiative is a genuine and novel measure that suggests the EC has taken a different developmental approach to the most time-honoured regulatory tradition. It also means interaction between EC authorities and municipalities for the development of a telecommunications infrastructure, which is quite unusual.

This study comprises four sections. After the introduction, Section 2 reviews the theoretical framework, studying multilevel governance and the developmental approach in European ICT

policies. Section 3 presents the WiFi4EU case study, including methodology, analysis and findings, and provides a more in depth analysis of the results and implications for one country: Spain. Finally, Section 4 contains the conclusions of the paper and its implications for sectoral policies and strategies, as well as its limitations and future avenues of research.

2. THEORETICAL FRAMEWORK

Four motives have been identified as a justification for the intervention of national and local authorities in the deployment of ICT infrastructures: market failures related to the nature of communications services, failures related to the market structure, equity and macroeconomic arguments (Cave & Martin, 2010; Gerli & Whalley, 2018). Local and central governments have been actively supporting the supply of new telecom networks where the market failed to provide broadband access (Gómez-Barroso & Feijóo, (2010). Limbach, Kübel & Zarnekow (2014) also highlight the question of whether decisions on municipal involvement should be made on a local or national level. Controversy can be also established in private versus public terms: the leading Asian counties in broadband speed have reached their broadband targets with a large degree of public involvement (Picot and Wernick 2007), while the European Union aims to unfold market forces at different layers in an unbundled telecommunication value chain. Despite the controversy, empirical investigations on this are bizarre and usually focus on country comparisons (Troulos and Maglaris, 2011), opening new opportunities for further investigation.

The EC is in general more prone to a regulatory approach in the field of network investment and connectivity (Falch, 2007), although it is currently adopting a broader perspective, including the entire ICT ecosystem. According to Melody (2013), the regulatory instruments used have proven to be insufficient to facilitate the development of broadband infrastructures at an adequate speed, and many countries are searching for alternative policy instruments (Falch, 2007). According to Galperin, Mariscal, & Viecens (2013), a similar trend can be observed in Latin America, and there are states like South Korea that are clearly decanting towards a developmental model (Lemstra & Melody, 2014; Falch and Henten, 2018). Additionally, municipalities are playing a larger role in infrastructure deployment, especially in current broadband connectivity projects. In an analysis of approximately 60 municipal broadband projects in Western Europe, Troulos and Maglaris (2011) found that the success of local initiatives is highly dependent on the national regulatory and policy environment.

Particularly challenging is the effort to avoid inequalities between urban and rural environments, as lower densities and greater distances in rural areas discourage the market from investing in new technologies (Malecki, 2003). The EU legal framework now recognizes that in rural areas there are often no market initiatives, which then justifies public participation in telecommunications projects. It is moving towards a framework in which government initiated activities in underserved 'white areas'[4] will not be immediately forced to stop because of the prevailing interest of a free market (Sadowski et al., 2009; European Commission, 2013).

[4] The European Commission introduced a simplified approach to determine the need for a Government aid measure, distinguishing among areas where broadband infrastructure does not exist or is unlikely to be developed in the short term (white areas), areas where only one broadband network operator is present (grey areas) and areas (black areas) where at least two or more broadband network providers are present (Papadias, Chirico & Gaál, 2009).

Growing literature suggests that rural areas are increasingly found at the wrong end of the 'digital divide' (Skerratt & Farrington, 2012; Townsend et al., 2013), and a fertile research corpus looks at this problem from a political, economic and regulatory point of view (Dickes,Lamie,&Whitacre,2010; Strover,2011; Whitacre&Mills,2007). Some research has focused on highlighting persistent territorial digital divides and their consequences in various national contexts (e.g. Prieger 2013; Pant and Hamby Odame, 2017).

Whitacre, Gallardo & Strover (2014) suggest that high levels of broadband use in rural areas positively (and potentially causally) influenced income growth, and negatively influenced unemployment growth. These authors state, "studies related to broadband and rural economic development are limited" (Whitacre et al., 2014, p1013). Findings by Philip & Williams (2019) draw attention to the role and importance of fit-for-purpose broadband in promoting digital inclusion for individuals, households and small, home-based businesses. In a fast changing digital national and global economy remote rural home-based micro-businesses are at risk of being left behind. Briglauer, Durr, Falck, and Huschelrath (2019) conclude that an increase in broadband coverage through government aid allows workers to live in rural municipalities and prevents depopulation of rural areas,but does not attract substantial additional economic activity.

Regarding the digital divide, two research lines can be in identified in the literature on how to approach it (Salemink, Strijker, & Bosworth, 2017): 1) Digital connectivity research: Much of the policy evaluation literature discusses the imperfections or flaws in these policies. The literature on local government policy in Europe focuses mostly on public-private partnerships (PPP) and the different outcomes on various national levels (Sadowski et al., 2009; Falch and Henten, 2018; Nucciarelli et al., 2010; Troulos and Maglaris, 2011); 2) Research on digital inclusion policies, which are more subjected to a developmental approach. IT includes the study of policy initiatives and their efficacy, using macro and micro-level approaches. There is still a lot of research to be done on this topic and this paper humbly contributes to this.

3. WiFi4EU: A CASE STUDY ANALYSIS

3.1 Methodology

In order to assess the WiFi4EU, in terms of methodology, we will proceed with a five-step approach, using a case analysis. The use of different research methods enriches the case study analysis (Remenyi, 2012) and it is an intrinsic component of this methodology, as the case study is an umbrella for different research methods and has in common the decision to study a phenomenon from different approaches (Bell, 1993). The result is a qualitative analysis that theoretically explains this particular phenomenon (Eisenhardt & Graebner 2007; Yin 2014). The five steps are:

1) Briefly describe the main objectives and characteristics of the WiFi4EU initiative, detailing application rules, calendar and first call procedure

2) Make a descriptive analysis of the 2800 winners of the initiative, in terms of countries, population, area covered, relation with digital indicators etc., understanding particularities and trends.

3) Analyse in detail the impact of the initiative on rural areas suffering access inequalities within a country of study. In this case we will compare the 224 awarded Spanish municipalities with the list of areas where the market has failed in Spain ("white areas" not commercially attractive for operators to deploy connectivity).

4) To complete the overall investigation, a top level PEST analysis (Political, Economic, Social, and Technological) of the initiative was carried out focusing on the most relevant issues in these four areas. In this context, a PEST analysis is expected to support the WiFi4EU' case study by helping to identify its key impact drivers. The result is a qualitative analysis that theoretically explains this particular phenomenon (Eisenhardt & Graebner 2007; Yin 2014). Based on the above, we match the results of the analysis in the different PEST areas, in order to evaluate the overall impact of the initiative and the grant procedure. In this context, a PEST analysis is expected to support a WiFi4EU' case study by helping to identify its key impact drivers.

5) In the last step, we provide several suggestions and initial indications to improve the awarding procedure and optimize the use of public funds.

3.2 Step 1: Case description

The WiFi4EU initiative is a support scheme to provide high-quality Internet access to local residents and visitors in the centres of local public life. Such local wireless connectivity that is free of charge and without discriminatory conditions is expected to contribute to bridging the digital divide, especially in communities that lag behind in terms of digital literacy, including rural areas and remote locations.

It should further improve access to online services that increase quality of life in local communities by facilitating access to services, for example e-Health and e-Government, allow the creation of new digital inclusion offers, e.g. courses on how to use computers and the internet, and promote the development of local small and medium-sized enterprises innovating in digital products and services.

The indicative amount to be allocated based on this call for applications for the WiFi4EU initiative is €42 million. The amount of each voucher to be allocated is €15,000 in the form of a lump sum.

"Such local wireless connectivity that is free of charge and without discriminatory conditions is expected to help bridge the digital divide, especially in communities that lag behind in terms of digital literacy, including rural areas and remote locations. It should further increase access to online services that improve quality of life in local communities by making services like e-health and e-government more accessible, and promote the growth of local small and medium-sized businesses innovating in digital products and services" (COMM 2018, p.94)

The WiFi4EU initiative aims at providing support for actions which:

(1) are implemented by municipalities that must plan and supervise the installation of indoor or outdoor local wireless access points in public spaces, and which must commit to:

> a) keeping the WiFi4EU network(s) fully functional for a period of three years starting from the date of the confirmatory notification.
>
> b) reconfiguring the WiFi4EU network(s) to connect them to the secured authentication and monitoring solution in full compliance with the requirements.

(2) build on high-speed broadband connectivity enabling delivery of a high-quality internet experience to users that:

a) is free of charge and without discriminatory conditions, easy to access, and uses the latest and best equipment available, capable of delivering high-speed connectivity to its users.

b) supports access to innovative digital services, such as those offered via digital service infrastructures.

c) for the purpose of accessibility, provides access to services at least in the relevant languages of the Member State concerned and, to the extent possible, in other EU official languages.

d) is provided in centres of local public life, including outdoor spaces accessible to the general public in the everyday life of local communities.

(3) commit to procure (or some similar arrangement) the necessary equipment and related installation services, where required in accordance with applicable law and to install Wi-Fi access points in areas where no similar offers of free Wi-Fi connectivity already exist.

The WiFi4EU voucher shall be used to finance any one of the following actions:

a) The installation of an entirely new public Wi-Fi network

b) The upgrade of an existing public Wi-Fi network

c) The extension of the coverage of an existing public Wi-Fi network.

In order to ensure that the WiFi4EU funded network is capable of providing a high quality user experience, municipalities should offer a service that is equivalent to the highest speed available mass-market Internet connection in the area or one offering at least 30 Mbps of download speed. The beneficiary should also ensure that this backhaul speed is at least equivalent – if any exists– to that used by the beneficiary for its internal connectivity needs.

The following criteria are used in the selection of the applications:
1. A minimum of 15 vouchers per Member State and EEA country (Iceland and Norway) will be allocated in this call for applications, provided sufficient applications are received from these countries.
2. The total number of vouchers per Member State and EEA country (Iceland and Norway) should not exceed 8% of the budget to be awarded.

A first call for applications was launched on 15 May 2018. Within seconds, over 5,000 municipalities had already applied and, within a few hours, 11,000 had done so. A few hours later, the Commission identified a flaw in the software supplied by contractors. This issue allowed some municipalities to apply in good faith before the call was opened.

On 14 June 2018, Commissioner Mariya Gabriel, in charge of the Digital Economy and Society, cancelled the first call for applications for free Wi-Fi vouchers[5]. The portal was re-opened in autumn 2018, once the IT problems were fully resolved. The first WiFi4EU call for proposals finally took place from 7-9 November 2018 with a budget of 42 million Euros. More than 13,000 municipalities from all over Europe applied. Following an evaluation of the applications, the

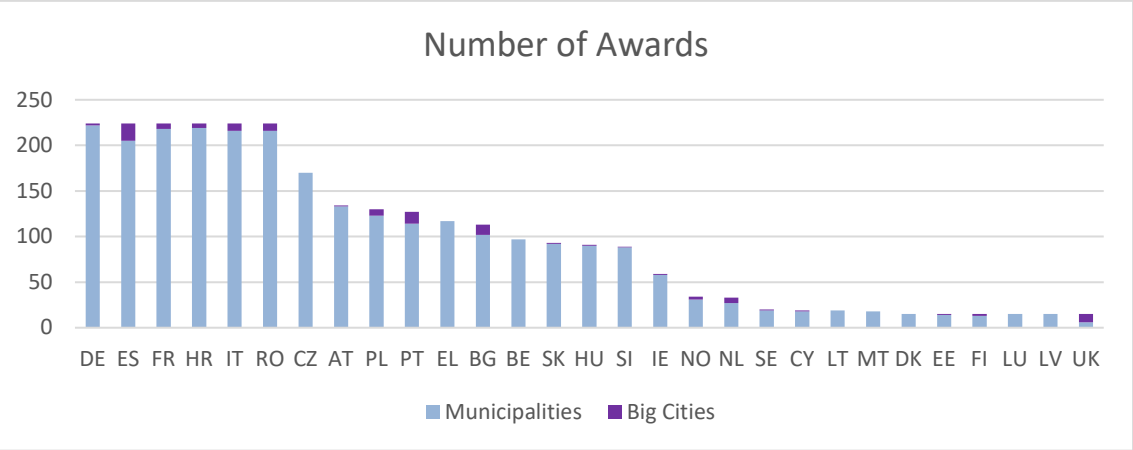
[5] EC Press Release: http://europa.eu/rapid/press-release_STATEMENT-18-4158_en.htm

Innovation and Networks Executive Agency (INEA), the Commission's executive agency in charge of implementing the WiFi4EU, published the list of winning municipalities[6] and the first 2,800 municipalities were announced. While based on a "first come, first served" principle, all participating countries were nevertheless guaranteed a minimum of 15 vouchers (provided they had sufficient numbers of applicants) and capped at a maximum of 224 vouchers (corresponding to 8% of the call budget). A second call has been launched at the beginning of 2019.

3.3. Step 2: Analysis of initial results

In a brief analysis of the 2800 vouchers awarded, we observed that the allocation by country is not as homogeneous as expected (an average of 93,3 winners per country; min: 3 winners in Iceland; max: 224 in the Czech Republic, Croatia, France, Germany, Italy, Romania and Spain). The results are presented in figure 1.

Fig. 1 – Vouchers awarded by country



Different associations have studied the alarming situation of connectivity in certain European geographic areas. In particular, the study titled Scarcely Populated Areas in Southern Europe (SESPAs) was presented[7] in October 2018. It covers countries including Greece, Romania, Portugal, France, Italy, Croatia, etc. where connectivity defects were noted, more specifically the poor situation in Spain. Surprisingly, countries with higher WiFi4EU allotments seem to coincide with those indicated in the study.

In this preliminary analysis we have also compared the list of successful applicants with the list of cities and large cities according to Eurostat. We noted that only 107 of the 2800 are among the European "cities", according to the harmonized OECD-EC definition of a city and its commuting zone developed in 2011, which considers that a city should have an urban centre of at least 50,000 inhabitants. With this definition, the European Commission has identified cities in the EU, Switzerland, Iceland and Norway. Only 3 countries present more than 10 awards to populations considered cities under this definition: Spain (19 of 224 winners), Portugal (13 of 127 winners) and Bulgaria (11 of 113 winners). This is also depicted in figure 1. Given that the results indicate

[6] https://ec.europa.eu/digital-single-market/en/news/winners-wifi4eu-call-announced
[7] http://www.agroinformacion.com/dan-a-conocer-el-mapa-de-la-despoblacion-de-espana-en-el-53-del-territorio-solo-vive-el-5-de-la-poblacion/

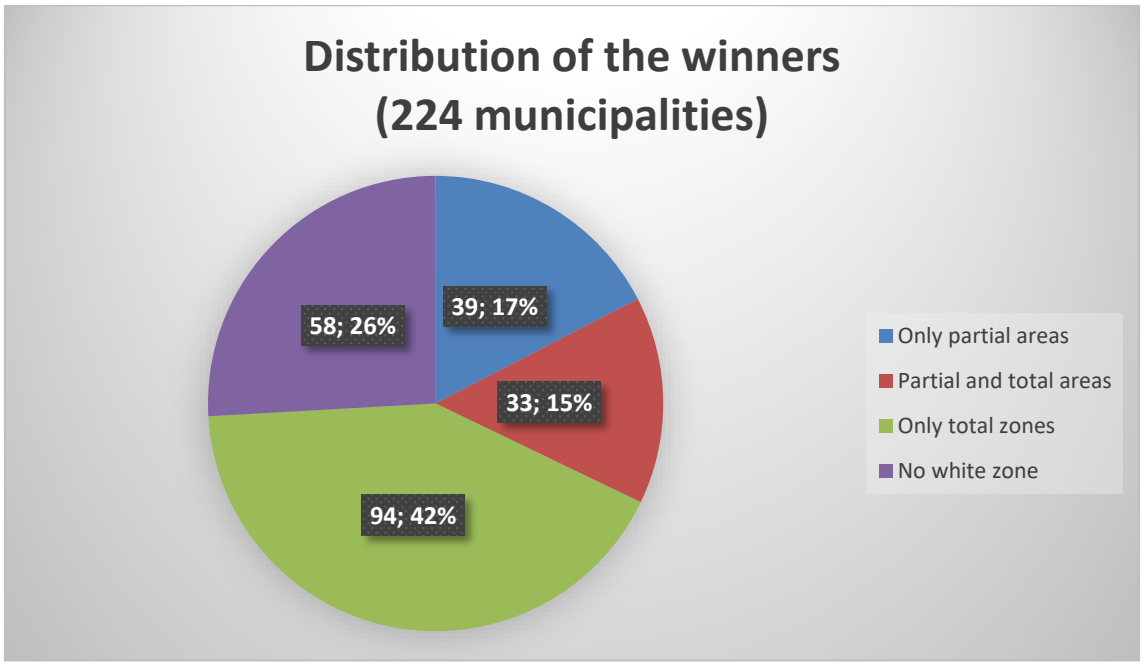
that the number of large cities is less than 5%, and small populations make up the majority, we can expect that the initiative will contribute to the development of connectivity and digital skills in areas requiring special attention, moving away from the US model of large initiatives in large cities (Navío-Marco, Arévalo-Aguirre & Pérez-Leal, 2019).

3.4. Step 3: detailed analysis for a country

In this section, we will compare the results of the first call (municipalities that were awarded vouchers) with the populations with white areas in a country of study: Spain, as is one of the countries with largest connectivity inequalities.

As shown in Figure 2, the distribution of the 224 awarded municipalities with total or partial white areas resulted in a very positive balance for the initiative, since 166 (74%) of the successful populations show some type of connectivity deficiency, while only 58 (26% of the total) were granted to municipalities without problems.

Fig. 2 - Municipalities without any white areas vs some white areas (partial or total)



Source: Compiled by the authors

However, we must put this result into context by comparing it with the reality of connectivity in Spain. Based on public information supplied by the Commission, table 1 includes regional distribution in municipalities with total white areas and those obtaining support from the European Commission, as well as the accumulated populations of those municipalities.

Table 1 – Connectivity in Spain: White areas vs vouchers awarded by regions

Community	Municipalities with total white areas that have obtained WiFi4EU support	Populations with total white areas that have obtained WiFi4EU support	Total number of municipalities with total white areas	Total Population of Municipalities with Total White Areas
Andalucía	14	15268	327	217.011
Aragón	10	2058	493	132.848
Asturias, Principado de	9	26903	78	189.491
Balears, Illes	1	52	37	56.692
Canarias	4	6715	65	112.555
Cantabria			9	1.223
Castilla y León	29	11015	2096	560.121
Castilla-La Mancha	4	1669	768	301.148
Cataluña	21	16743	692	378.307
Comunitat Valenciana	4	15653	167	147.537
Extremadura	6	5843	321	274.362
Galicia	5	12415	305	745.836
Madrid, Comunidad de	4	326	145	35.590
Murcia, Región de	6	2808	38	58.014
Navarra, Comunidad Foral	3	871	94	19.730
País Vasco	4	822	80	18.318
Rioja, La	3	1005	91	14.627
Total	**127**	**120.166**	**5806**	**3,263,410**

Only 127 municipalities with total white areas have requested support, although there are 5806 with total white areas. This amounts to 6412 municipalities with some type of white area in Spain and only 166 have requested the subsidy. It confirms the fact that, although the objective to improve the connectivity of these populations has been met, improvement in the promotion of the initiative is needed to ensure that more municipalities with poor connectivity opt for it.

3.5. Step 4: Top level PEST

A summary of the PEST analysis is shown below. It includes the fundamental political, economic, social and technological considerations of the initiative to provide a balanced overview of the implications.

Table 2 – PEST Analysis

POLITICAL	**ECONOMIC**
- New interaction between EC authorities and municipalities, without national intervention - EC avoids the regulatory tradition of no intervention in infrastructure deployments. Any city can apply including commercially attractive ones. - To a certain extent, the measure can help to address the digital divide, but it is not properly articulated for this objective - A minimum of 15 vouchers and a maximum of 8% of the funds per applicant country deployments: Only 3 countries present more than 10 awards	- EC funded infrastructure and municipal maintenance. No private deployment of operators - It is estimated that the EC will be responsible for 30-50% of the final cost of the project, depending on the deployment scenario. - For citizens: free of charge local wireless connectivity without discriminatory conditions - The Wi-Fi model can seed a more complex array of potential business models, but its impact is not clear - The awards in "white areas" do not distort competition but in the cities they might
SOCIAL	**TECHNOLOGICAL**
- Possibility to correct digital divide and market failures - Benefits for rural areas deployments: number of large cities with less than 5% (cities with an urban centre of at least 50,000 - Awarding schema is not sensitive to social needs: “first come, first served” - City squares, parks and municipal building as show cases	- Wi-Fi active network equipment is relatively cheap (especially with regard to access points), especially when compared to the cost of installing and configuring the equipment. - Networks with few nodes are considered morecostly than deployments with a greater number of nodes - Town councils will be provided with state-of-the-art technology. This will allow citizens access to updated technology and advanced services as long as they commit to maintaining the facilities for 3 years.

3.6. Step 5: Indications to improve the awarding procedure

In the previous sections, we have seen that, at a global level, "the results indicate that the number of large cities is less than 5%, and small populations make up the majority". In the detailed analysis of the country, just over 25% of the vouchers have been granted to municipalities without

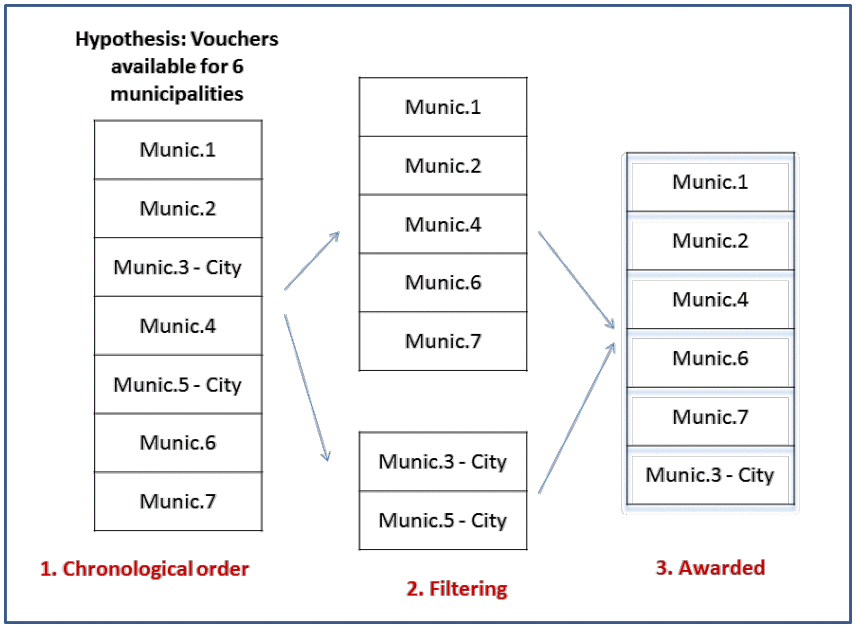
any white areas although there are many more municipalities with total white areas existing in the country than those that were awarded a voucher or applied for one.

Considering the above and the fact that the award procedure used by the Commission in the first phase was efficient in terms of the speed of concession and its "quasi" automatic nature, we propose a modification of the procedure, while maintaining the "first come, first served" award philosophy proposed by the Commission. Thus, after applying the filter for a maximum number of vouchers per country, a multi-filtering procedure based on successive approximations is proposed. The proposed procedure is based on a multi-step process, the first being chronological, as at present, followed by subsequent filters (Fig. 3):

1. It should continue to be based on order of arrival
2. Filtering requests chronologically, but prioritizing connectivity in rural areas, without private investment, white areas, etc. For example, a simplified case could be to filter out cities (> 50,000 inhabitants), which can also be applied almost automatically.
3. Dividing the original list into several lists, keeping the relative chronological order in each of them. For the previous example, eliminate the larger cities from the initial list (Fig. 3).
4. Grant awards to the list of municipalities with the worst connectivity. In the case of the example above, the award would go to the "Non cities" that meet the conditions imposed by the Commission.
5. If there is still money in the budget, start by granting awards to the municipalities on the 2nd list, while still applying the maximum number by country rules, etc., then to the third list and so on.

The procedure could be improved successively, making chronological lists of municipalities "totally in white areas" and others "partially in white areas", categorised in proportion to the percentage of white areas, cities, and their areas with adverse economic conditions, etc.

Fig 3. Example of a chronological and filtered approach



5. CONCLUSIONS

The WIFI4EU initiative intends to reinforce local wireless Internet connectivity free of charge and without discriminatory conditions. It aims to improve access to high-speed broadband, promote take-up of broadband and facilitate access to digital services. This, in turn, aims to help reduce the digital divide, increase quality of life and promote the development of local small and medium-sized enterprises in many municipalities across the EU (European Commission, 2018).

In this study we have seen how the initiative does serve to improve connectivity in rural areas at risk of suffering from the digital divide, but there is room for improvement so that the initiative has a greater impact on the connectivity of rural areas. The way in which the awards are granted does not seem to help in this sense either and possible problems of diffusion or implementation of the initiative can be observed. It is obvious that many municipalities that could have requested help to improve their defective communication systems have not chosen to do so. However, the majority of successful applicants are municipalities with poor connectivity, so the desired objective has been achieved, or at least partially.

Additionally, this novel EC approach helps to promote the discussion about how to improve coordination between the EU/National/Regional/Local authorities and has a major impact both on the national regulatory strategies to promote connectivity and on the strategies of the municipalities involved to guarantee network infrastructures and digital services for citizens (Picot & Wernick, 2007; Troulos & Maglaris, 2011; Rajabiun & Middleton, 2015). The deployment of next generation infrastructures in telecommunications requires an integrated policy approach (Gomez-Barroso & Feijoo, 2009).

Despite the beneficial results that can be derived from the initiative in the field of digital divide and rural connectivity, the instrument must refine its allocation mechanism to achieve a more efficient result in infrastructure provision in rural areas.

Our analysis undoubtedly has its limitations, one of the major ones being the exploratory nature of the study. While we can already analyse the initial results, we cannot determine the real impact on citizens, how it will be used specifically, and how citizens will respond to its implementation. We are also unable to determine the indirect effects that the measure may have on the local economy in relation to economic impact, employment or business implications. Nevertheless, this study is the first ex post analysis of this policy initiative. These first results give us a glimpse of the positive benefits of this first round and we urge the EC to continue to open similar future calls. Monitoring the economic aspect of the initiative and encouraging the deployment of infrastructures, as regards its originality and innovativeness in the field of regulation in the telecommunications sector, constitutes an interesting new research area that we intend to tackle in future work.

REFERENCES

Bell, J. (1993) *Doing Your Research Project: A Guide for First-time Researchers in Education and Social Science*. Open University Press.

Briglauer, W., Dürr, N. S., Falck, O., & Hüschelrath, K. (2019). Does state aid for broadband deployment in rural areas close the digital and economic divide?. *Information Economics and Policy*, 46, 68-85

Cave, M., & Martin, I. (2010). Motives and means for public investment in nationwide next generation networks. *Telecommunications Policy, 34*(9), 505-512.

Dickes, L. A., Lamie, R. D., & Whitacre, B. E. (2010). The struggle for broadband in rural America. *Choices*, 25(4), 23-34.

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of management journal, 50*(1), 25-32.

European Commission (2018) On the adoption of the work programme for 2018 and on the financing of Connecting Europe Facility (CEF) - Telecommunications Sector. COM/2018/0568 final.

European Commission (2016) Connectivity for a Competitive Digital Single Market - Towards a European Gigabit Society. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions COM/2016/0587 final.

European Commission (2013), European Commission, Communication from the Commission. EU Guidelines for the Application of State Aid Rules in Relation to the Rapid Deployment of Broadband Networks.

Falch, M. (2007). Penetration of broadband services–the role of policies. *Telematics and Informatics, 24*(4), 246-258.

Falch, M., & Henten, A. (2018). Dimensions of broadband policies and developments. *Telecommunications Policy, 42*(9), 715-725.

Feijoo Gonzalez, C. A., Gómez Barroso, J. L., & Bohlin, E. (2011). Public support for the deployment of next generation access networks-Common themes, methodological caveats and further research. *Telecommunications Policy, 35*(9-10), 791-793.

Galperin, H., Mariscal, J., & Fernanda Viecens, M. (2013). One goal, different strategies: an analysis of national broadband plans in Latin America. *info, 15*(3), 25-38.

Gerli, P., & Whalley, J. (2018). *How does public intervention perform in broadband markets? A systematic literature review*. 29th European Regional Conference of the International Telecommunications Society (ITS). Trento, Italy. August, 2018.

Gomez-Barroso, J. L., & Feijoo, C. (2009). Policy tools for public involvement in the deployment of next generation communications. *info, 11*(6), 3-13.

Gómez-Barroso, J. L., & Feijóo, C. (2010). A conceptual framework for public-private interplay in the telecommunications sector. *Telecommunications Policy, 34*(9), 487-495.
Lemstra, W., & Melody, W. H. (Eds.). (2014). *The Dynamics of Broadband Markets in Europe: realizing the 2020 digital agenda*. Cambridge University Press.

Limbach, F., Kübel, H., & Zarnekow, R. (2014). *An Empirical Contingency Perspective on Cooperative Municipal Broadband Adoption*. Twentieth Americas Conference on Information Systems, Savannah.

Malecki, E. J. (2003). Digital development in rural areas: potentials and pitfalls. *Journal of Rural Studies, 19*(2), 201-214.

Navío-Marco, J., Arévalo-Aguirre, A., & Pérez-Leal, R. (2019). WiFi4EU: Techno-economic analysis of a key European Commission initiative for public connectivity. *Telecommunications Policy, 43* (6), 520-530.

Nucciarelli, A., Sadowski, B. M., & Achard, P. O. (2010). Emerging models of public–private interplay for European broadband access: Evidence from the Netherlands and Italy. *Telecommunications Policy*, 34(9), 513-527.

Philip, L., & Williams, F. (2019). Remote rural home based businesses and digital inequalities: Understanding needs and expectations in a digitally underserved community. *Journal of Rural Studies, 68*, 306-318.

Picot, A., & Wernick, C. (2007). The role of government in broadband access. *Telecommunications Policy, 31*(10-11), 660-674.

Prieger, J. E. (2013). The broadband digital divide and the economic benefits of mobile broadband for rural areas. *Telecommunications Policy, 37*(6-7), 483-502.

Rajabiun, R., & Middleton, C. (2015). Regulation, investment and efficiency in the transition to next generation broadband networks: Evidence from the European Union. *Telematics and Informatics, 32*(2), 230-244.

Remenyi, D. (2012). *Case study research.* Academic Publishing International.

Sadowski, B., Nucciarelli, A., De Rooij, M. (2009). Providing incentives for private investment in municipal broadband networks. *Telecommunications Policy*, 33 (10-11), 582-595.

Salemink, K., Strijker, D., & Bosworth, G. (2017). Rural development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas. *Journal of Rural Studies, 54*, 360-371.

Skerratt, S., & Farrington, J. (2012). Next generation broadband in rural Scotland: Mobilising, meeting and anticipating demand. In: Rural Scotland in Focus 2012. Rural Policy Centre, Scottish Agricultural College, Edinburgh, 70-85

Strover, S. (2011). Scholars' Roundtable: The effects of expanding broadband to rural areas. Center for Rural Strategies, USA. http://www. Rural strategies. org/sites/all/files/Broadband_Investment.pdf.

Townsend, L., Sathiaseelan, A., Fairhurst, G., & Wallace, C. (2013). Enhanced broadband access as a solution to the social and economic problems of the rural digital divide. *Local Economy, 28*(6), 580-595.

Troulos, C., & Maglaris, V. (2011). Factors determining municipal broadband strategies across Europe. *Telecommunications Policy, 35*(9-10), 842-856.

Whitacre, B. E., & Mills, B. F. (2007). Infrastructure and the rural—urban divide in high-speed residential Internet access. *International Regional Science Review*, 30(3), 249-273.

Whitacre, B., Gallardo, R., & Strover, S. (2014). Broadband′ s contribution to economic growth in rural areas: Moving towards a causal relationship. *Telecommunications Policy*, *38*(11), 1011-1023.

Yin, R. K. (2014). *Case study research: design and methods* (5th ed). Thousand Oaks.