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*Original Citation:*

*Availability:*

This version is available <http://hdl.handle.net/2318/2061790> since 2025-03-07T17:59:21Z

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<https://doi.org/10.1108/978-1-83608-028-220251008>

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**Keywords:** digital literacy; financial literacy; human capital; e-government; platform society.

### **Citation**

Lo Prete, A. (2025), "Digital and Financial Literacy and the Development of e-Government Platforms", Goglio, V. and Biancalana, C. (Ed.) Mapping the Evolution of Platform Society, Emerald Publishing Limited, Leeds, pp. 133-147.

## Chapter 7

# **Digital and Financial Literacy and the Development of e-Government Platforms**

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### **Abstract**

The rapid growth of e-government platforms in the first decades of the new millennium has created both new opportunities and challenges. Digital citizenship and the digitalization of public services can represent a barrier for less competent individuals who need to connect and process information. The present contribution offers descriptive evidence on the relationship between e-government development and the average level of competences that may be arguably related to the ability of citizens to benefit from the digitalization of public services, namely digital and financial literacy.

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## 1. Introduction

The development of government initiatives that exploit digital platforms to deliver public services is an important feature of the platform society. In the early 2000s the first e-government platforms were introduced to strengthen the collaboration between citizens and governments online. Since the commitment of Barak Obama's Administration to an 'open government' model in 2009, governments around the world have increased the number and scope of internet-based platforms to facilitate the public engagement of citizens (United Nations, 2020); a process that received further stimulus during the Covid-19 pandemic, when lockdowns and restrictions on the free movement of people motivated governments to envision effective digital solutions to guarantee the provision of public services. According to the United Nations, between 2003 and 2018 e-government platforms recorded on average a 50 per cent increase around the world, and a 67 per cent increase over the slightly longer 2003-2020 horizon.

The rapid growth of e-government platforms in the first decades of the new millennium has created both new opportunities and challenges. On the one hand, civic engagement through e-government platforms can provide citizens with new means to participate in the social and political life of their community (McDonald, 2008; Khazei and Stockemer, 2013; Campante et al., 2018; Ceccarini, 2021). The United Nations defines *e-participation* as a new form of civic engagement that, in principle, should foster open and participatory governance through ICTs – Information and Communications Technologies (United Nations, 2020).

On the other hand, digital citizenship and the digitalization of public services can represent a barrier for less competent individuals who need to connect and process information, and who should engage in bottom-up policymaking and in the co-production of public services. In this regard, the digitalization of contents and services can reduce or hinder the political participation of less-educated voters, who, according to traditional theories in social sciences (Lijphart, 1997), are more likely to support redistributive policies (Fujiwara, 2015; Gavazza et al., 2019).

Thus, whether the digitalization of governments promotes social inclusion and helps address social injustice or whether it widens democratic gaps is a question to address empirically by studying data on both the supply side and the demand side of digital public services. To contribute to the discussion on this topic, the present chapter offers

descriptive evidence on the relationship between e-government development across countries and the average level of competences that may be arguably related to the ability of citizens to benefit from the digitalization of public services.

Following recent studies on the digitalization of financial services (Lo Prete, 2022), the analysis in this chapter is motivated by the idea that people need both the cognitive skills necessary for independent movement in the digital world – a known determinant of the digital divide in e-government development (see, e.g., Tomaszewicz, 2015) – and the skills necessary to understand the contents (or products) therein. Specifically, along with education at school, this chapter will consider (i) digital literacy, defined as the ability “to access, manage, understand, integrate, communicate, evaluate and create information safely and appropriately through digital technologies for employment, decent jobs and entrepreneurship” (UNESCO, 2018); and (ii) financial literacy, defined by the OECD as “a combination of awareness, knowledge, skill, attitude and behavior necessary to make sound financial decisions and ultimately achieve individual financial wellbeing” (Atkinson and Messy, 2012) and that the recent literature relates to better public decisions (Fornero and Lo Prete, 2019 and 2023).

This chapter will use graphical evidence and descriptive statistics to provide insights into the relationships of interest and to discuss the policy implications of e-government conditional on the level of competence of European Union citizens.

## **2. E-government platforms**

The term ‘e-government’ refers to the delivery of digital public services through online platforms. According to the European Commission, the provision of effective digital public services can produce benefits including increased transparency, citizens’ participation in political life, efficiency and savings for the public and the private sector, and greater cross-border mobility. It also has implementation costs that cannot be ignored but are not the focus of the present chapter.

The state of development of e-government platforms has been monitored since 2003 by the United Nations. Every two years, the United Nations E-Government Development Database assesses e-government development comparatively, focusing on the development of government websites, and their accessibility in terms of infrastructure development and of educational levels in each country.

Specifically, e-government effectiveness in the delivery of public services is measured by the ‘E-Government Development Index’ (EGDI). This is a composite index computed as the weighted average of three components, independent of each other, that measure the role of technological constraints, general competences available at the country level, and online provision of public services. In the 2022 Survey, some changes were introduced to the methodology that this study will not consider, focusing instead on the values recorded in 2018, before the outbreak of the Covid-19 pandemic.<sup>1</sup>

An important caveat to bear in mind is that, by construction, the United Nations’ benchmarking exercise provides information on the supply side of e-government platforms at the national level. It does not include data on the use of these platforms by citizens.

As the histogram in Figure 1 shows, there are wide differences in EGDI among the European Union’s 27 member states. The index ranges between zero (less developed) and one (most developed). The higher values are recorded in the higher-income countries, with the Scandinavian countries at the top of the ranking, while the EGDI values of Romania, Latvia, Croatia, and other countries in the East of Europe and the Balkan region fall below the EU average. With respect to the rest of the world – not considered in this chapter – it is useful to point out that, over the past twenty years, Europe has recorded the highest average EGDI value, followed by the Asian region, the Americas, Oceania, and Africa (United Nations, 2022). Moreover, among the fifteen countries that are world leaders in e-government development, there are other high-income countries: South Korea, New Zealand, Iceland, Australia, the United States, the United Kingdom, Singapore, Japan.

[Figure 1 here]

The EGDI provides an overall picture on the state of e-government platform development. The discussion that follows considers its components, which enter the

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<sup>1</sup> The time window considered reduces possible measurement issues due to the limited availability of data for cross-country comparisons on digital and financial literacy. As the next section of this chapter explains, the most recent data available at the time of writing are the data on digital literacy from the OECD-PIAAC 2018 survey and the data on financial literacy from the 2014 Standard and Poor Survey.

EGDI with equal weight, in order to deepen the analysis and focus on different aspects of the digitalization of public services.

The first component of the EGDI is the ‘Telecommunications Infrastructure Index’ (TII). This includes information on the proportion of internet users and of mobile subscribers, as well as on the proportion of wireless (i.e. active mobile-broadband) and fixed broadband subscriptions. It is interesting to point out that the value of the TII has remained broadly stable since the first edition of the United Nations E-Government Survey (United Nations, 2022). This can be explained by considering that, technically speaking, the TII does not measure infrastructural features of e-government platforms, but rather the more general dimension of the reach of ICTs.

The second component of the EGDI is the ‘Human Capital Index’ (HCI). This measures the average level of human capital based on the following four components, all of which reflect information on schooling: (i) the literacy rate of adults measured by the percentage of people aged 15 years old and above that can read, write, and understand a short statement on everyday life; (ii) the combined primary, secondary and tertiary gross enrollment ratio defined as the number of students enrolled in all grades, regardless of their age, as a percentage of the school-age population; (iii) the total number of years of schooling completed by the adult population (defined as 25 years old and above) excluding the years spent repeating grades; (iv) the expected years of schooling, defined as the number of years that a child is expected to spend at school in the future, where the probability of being in school is based for each specific age on the current enrollment ratio at the national level.

The third component of the EGDI is the ‘Online Service Index’ (OSI), which measures the delivery of public services on national e-government platforms. This is what is termed ‘e-government’. The index includes information on various aspects of public service provision. Technically, it is based on five components that evaluate the level of institutional quality (10 per cent of the OSI), service provision (45 per cent), content provision (5 per cent), technology (5 per cent), and e-participation (35 per cent). Basically, it is an indicator of the ability of governments to set up national websites, policies, and the strategies needed to deliver public service online.

The three indexes capture very different aspects of e-government platforms’ development that can furnish a more informative picture of digital governments when

considered one by one: TII, the reach of technologies, i.e. the number of users of mobile phones, broadband and internet services; HCI, the level of competence that people acquire in school; OSI, the level of e-government development.

The graphical analysis of pairwise comparisons in Figure 2 makes it possible to disentangle the dimensions of interest. In each panel, a dashed straight line represents the best fit of an ordinary least squares model that minimizes the distance between the line itself and each observation. It represents the estimated linear relationship between the variables measured on the two axes and immediately provides information on whether there exists a positive, negative, or null statistical association between them.

[Figure 2 here]

The top panel of Figure 2 shows the association between TII (on the vertical axis) and OSI (on the horizontal axis). The positive slope of the dashed line indicates that countries where more people use the internet and have access to wireless and fixed broadbands are also countries with more e-government development, as measured by online public services. Estonia is at the same level of the top performing Scandinavian countries, France, Germany, the Netherlands, and Luxembourg. The other ex-socialist countries occupy the bottom-left of the figure, where low levels of use and access to ICTs are associated with equally low levels of online public services' delivery, except for Poland, where large e-governments are associated with relatively low access to and use of digital technologies.

The panel in the middle of Figure 2 compares the TII (on the vertical axis) with the HCI (on the horizontal axis). These two indicators are positively associated, as the positive slope of the regression line indicates, but observations are more dispersed. There is a cloud of countries with relatively higher TII in the upper region of the scatter plot, and a group of countries including Portugal, Italy, Spain, Ireland and Belgium with average values, all associated with very different levels of human capital. However, this information is not easy to read, because HCIs are quite similar – as the close range of values on the horizontal axis shows. All the South-Eastern European countries and all the Baltic states except for Estonia are in the bottom-left region of those with lower access to and use of technologies and average or lower human capital.

Finally, the indicators of human capital and of online public services are positively associated in the bottom panel of Figure 2, but the distance between many observations and the regression line indicates that there is some heterogeneity across countries in the relationship of interest, with Ireland and Belgium standing out as countries with high levels of human capital but low levels of e-government development.

On comparing the panels of Figure 2, it is apparent that Portugal and Italy provide online public services to a population that is relatively less active on the internet and has lower human capital. Countries like Ireland and Belgium do not invest much in e-government, notwithstanding their high levels of human capital and average use of technologies. More in general, the delivery of online public services and the reach of online technologies seem to go hand in hand, while a more complex picture emerges when human capital, measured by the level of schooling, is also considered.

### **3. Digital and financial literacy**

To better understand how e-platforms have developed in relation to the competences needed to reap the benefits of digitalization, this section draws a relationship between cross-country e-government experience and less generic competences with respect to the level of attained and expected schooling in each of the countries that the HCI component of the EGDI considers. The following analysis focuses on two sets of skills: digital literacy to capture proficiency in the use of digital platforms and applications; and financial literacy, which can be a proxy for the ability to understand policy content (Fornero and Lo Prete, 2023).

#### *3.1. Digital literacy*

Digital literacy (DL) is defined by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as “the ability to access, manage, understand, integrate, communicate, evaluate and create information safely and appropriately through digital technologies for employment, decent jobs and entrepreneurship. It includes competences that are variously referred to as computer literacy, ICT literacy, information literacy and media literacy” (UNESCO, 2018).

Mapping digital competences is not an easy task. The UNESCO has developed and provides guidelines based on the examination of previous frameworks adopted by

different countries, enterprises, and institutions. The resulting synthesis constitutes its Global Framework of Reference on Digital Literacy Skills. The measure of digital skills that this chapter uses is the indicator that the OECD computes through its Survey of Adult Skills, that is conducted as part of the Programme for the International Assessment of Adult competencies.

The OECD Survey of Adult Skills (PIAAC) measures cognitive skills of working-age adults (aged between 16 and 65 years) based on evaluation of respondents' ability to read digital and traditional print-based text, master mathematical information and ideas, use technology to solve problems, and accomplish tasks (OECD, 2019). The PIAAC survey is administered every 10 years in three yearly rounds of data collection. The first cycle took place between 2011 and 2017. It covered 38 countries/economies, with data released in 2018. The second cycle is ongoing (at the time of writing), taking place in the period 2018-2024 and covering 30 countries/economies.

The PIAAC complex measurement exercise evaluates skills in the three domains of numeracy, literacy, and problem-solving in a technology-rich environment (recently renamed 'adaptive problem solving'). The following discussion will focus on the last domain.

The measure of 'problem-solving in a technology-rich environment' is computed on the proportion of the population aged 16 to 65 that was able to undertake the computer-based version of the assessment, a precondition for displaying competency in this domain. That is, the target population can vary across countries. The resulting indicator is the percentage of adults scoring at the two highest levels (out of three) in problem-solving in technology-rich environments. To provide an idea of the cognitive skills required to show a basic level of digital competence, we define as digitally literate a respondent who could use both generic and specific technology applications to perform non-trivial tasks such as using a command to sort information and use a browser to navigate across pages.

In the upper panel of Figure 3, the PIAAC indicator of digital skills, measured on the vertical axis, is low on average. Considering the 16 countries/economies of the European Union that participated in the survey, only three persons out of ten can be defined digitally literate, and even in the top performing Scandinavian countries the percentage is well below 50 per cent – that is, less than one person out of two can operate in a digital environment at a decent level. The dispersion of the observations in the top panel of

Figure 3, which plots the (positive) bivariate association between digital literacy and human capital (on the horizontal axis), indicates that countries may have a high level of schooling, because education is compulsory and people spend time studying, but the time spent at school may not be a good proxy for the skills needed to comprehend digital contents and to navigate on the internet being able at least to solve easy tasks.

[Figure 3 here]

### 3.2. *Financial literacy*

Financial literacy (FL) is the set of competences in economics and finance that help people take basic personal finance decisions (Lusardi and Mitchell, 2011). Research has extensively analyzed how the lack of basic economic and financial competence relates to saving and investing behavior in individual and aggregate data (see, e.g., van Rooij et al., 2011, Lo Prete, 2018, Lusardi and Mitchell, 2023). More recently, the same indicator has served as a proxy for citizens' understanding of the content of public policies, an element needed to inform public decisions (Lo Prete and Fornero, 2019) and that is also associated with higher electoral participation (Lo Prete, 2021). The idea is that those same people that have basic knowledge about economics and finance also have a better understanding of the trade-offs that lie behind private and public intertemporal choices. They can evaluate the content of a policy proposal at a lower information cost, and, in the context of this chapter, they can make better use of e-government, as regards both the use of online public services and open participation in bottom-up policymaking.

The largest worldwide collection of data on basic economic and financial competences is the 2014 Standard & Poor's Ratings Services Global Financial Literacy Survey commissioned by the Global Financial Literacy Excellence Center (GFLEC). The survey covered a sample of over 140 countries and, unfortunately, has not been administered again since 2014. Hence, the data considered in this chapter refer to that year, on the hypothesis that the relative position of countries and the level of financial literacy did not change much after that until 2019.<sup>2</sup>

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<sup>2</sup> The hypothesis that the level of financial literacy was quite stable over time is reasonable over the period considered, when specific financial education programs were missing at the school level and in training programs for adults (see the discussion in Lo Prete, 2018).

The set of questions included in the Survey were based on Lusardi and Mitchell (2011)'s classification and definition of financial literacy. They covered four topics: numeracy, compound interest rate, inflation, and risk diversification. The survey was administered to 1000 individuals in each country, and the indicator of financial literacy measured the percentage of respondents who correctly answered at least three questions out of four.

Around the world, only one adult out of three understands the basic notions of (simple and compound) interest, inflation, and risk diversification (Klapper and Lusardi, 2022). Narrowing the analysis to the European Union, 49 per cent of people are financially literate, with wide differences between the lowest values recorded in Romania and Portugal, both below 30 per cent, and the highest 71 per cent of Sweden and Denmark.

In the medium panel of Figure 3, financial literacy, measured on the vertical axis, shows more cross-country heterogeneity with respect to the indicators of digital literacy and human capital. It is positively associated with human capital, measured on the horizontal axis, for the two groups of countries above and below the dashed line. Among the higher-income countries, Italy and Portugal record the lowest levels of financial literacy.

Finally, the bottom panel of Figure 3 shows that digital and financial literacy are closely correlated across countries. As discussed in Lo Prete (2022), individuals who master financial literacy are also more digitally literate; and poor digital literacy is associated with poor financial literacy. Missing information on digital literacy for Italy and Portugal prevents determination of the relative positions of these countries.

#### **4. Competence and e-government platforms**

Recent analyses on personal finance indicate that people need both digital literacy and financial literacy to share the benefits of the digitalization of banking and financial services (Lo Prete, 2022). This chapter explores whether the same competences are determinants of the use of digital public services in general.

The previous section showed that low-skilled respondents who could use only basic applications and take a few steps on digital platforms (e.g. sorting email in pre-existing folders) formed a significant fraction of the population. And that financial literacy used

as a proxy for the skills that help assess the content of public policies and services is low on average, with wide differences among the 27 member states of the European Union.

Figure 4 plots the two indicators of digital and financial literacy on the horizontal axis of the top-left and the bottom-left panel respectively, and the level of e-government measured by the OSI on the vertical axis. The positive slope of the dashed line in both panels indicate that e-government is most widespread in countries with higher digital and financial literacy. Recalling that the level of digital literacy is quite low on average, online public services are provided to citizens that are often digitally illiterate, and who may find it difficult to navigate on e-government platforms. In the top panel of Figure 4, this is especially true in the case of Poland but also of Greece, Estonia, Ireland. In the bottom panel, the provision of public online services is associated with very low levels of financial literacy in Portugal, Italy, and Poland. While other countries in the bottom-right area do not deliver many online public services but have higher levels of financial literacy.

[Figure 4 here]

The close correlation between the two indicators of digital and financial literacy makes it difficult to evaluate if one dimension is more relevant to e-government than the other. To obtain insights in this regard, it is possible to focus on the relationship between one indicator of skills only and e-government, controlling for the role of the other skill indicator. By partialling out financial literacy, in the top-right panel of Figure 4, it is no longer possible to detect an association between digital literacy and the provision of online public services. The same exercise conducted controlling for the level of digital literacy, in the bottom-right panel of Figure 4, shows that a positive association between financial literacy and e-government still exists – at conventional significance levels if the Czech Republic is treated as an outlier and dropped from the statistical analysis. These statistics indicate that, in the small sample of European countries and economies under analysis, controlling for the level of digital literacy, the supply of e-government services is higher in countries where citizens have a better understanding of the trade-offs behind personal and public finance. E-government may not be widespread in countries where citizens are digitally literate per se, raising the issue of understanding whether they can use digital platforms in the first place.

## **5. Discussion and policy implications**

Whether citizens possess the skills necessary to access e-government platforms and use online public services – the dimension most relevant to evaluating the degree of e-democracy and e-participation – is an issue that the indicators of digital and financial literacy imperfectly capture. As the previous sections have shown, e-government is not always associated with the level of cognitive skills that enable individuals to navigate online independently and understand policy trade-offs. This can represent a severe barrier to the development of inclusive and critically independent e-citizenship through online platforms.

At present, the supply of e-participation tools seems to offer new channels of civic engagement to those citizens who are concerned about the collective costs of climate change and global warming; and in turn it seems to have an impact on the level of government spending on redistributive functions such as welfare (Lo Prete and Sacchi, 2023). Similarly, evidence on the use of digital technologies and e-platforms by the government in China indicates that governments pay greater attention to social welfare policies, even in the absence of electoral accountability, and improve the quality of governance when citizens engage more online (Jiang et al., 2019).

However, the use of ICTs can also represent a barrier for voters who are exposed to huge amounts of information on online platforms. Gavazza et al. (2019) find that the internet can increase information costs, and drain political participation, with perverse effects on government policies in terms of a decrease of public expenditures addressed to less-educated voters. Moreover, new forms of civic engagement can modify the level and composition of government spending, not necessarily increasing spending on functions that are particularly beneficial to the poor (Fujiwara, 2015).

Cognitive skills are a precondition for civic participation. The basic competences needed to use e-platforms, i.e. ‘digital literacy’, and the basic competences needed to understand the policy contents therein, proxied by indicators of ‘financial literacy’, should be strengthened by educational and training programs in order to share the benefits of the digitalization of public services and civic engagement without incurring the dangers that digital technologies imply. This is especially necessary if the delivery of public services online substitutes, instead of complementing, the traditional in-person interaction between public servants and citizens.

To be transparent and inclusive, open government and participation should integrate all groups of citizens, without leaving the most vulnerable segments of society behind, and they should protect all citizens/users against any manipulation. Provided that traditional electoral participation does not necessarily increase the quality of policies and of politicians (Lo Prete and Revelli, 2021), it is crucial to understand how its online counterpart, e-participation, works. For instance, digital forms of e-democracy require platforms that function through algorithms that choose who sees what posts and define the salience of different topics and discussions. The legislator, at the national and European level, should also establish the rules regulating the online community, especially if public money and resources are invested in e-government platforms that may change the way in which citizens engage with and participate in political and civil life.

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*Figure 1. E-government development across the EU.*

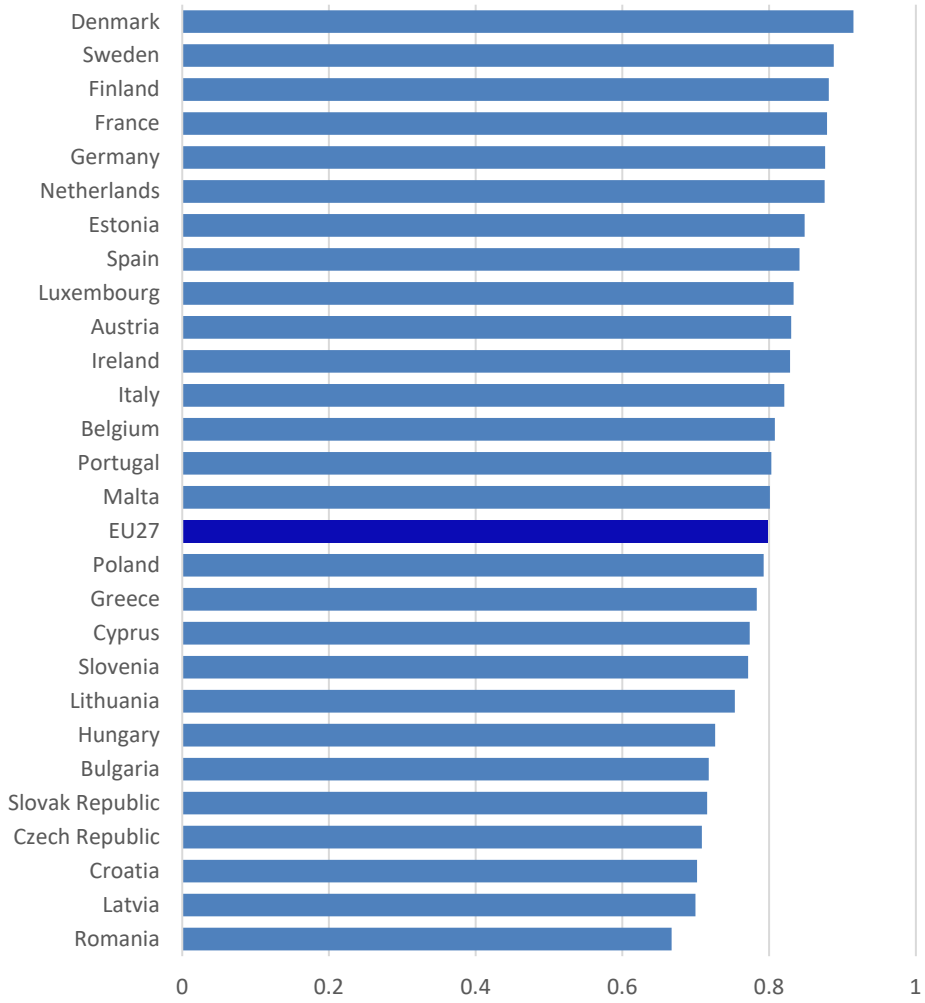


Figure 2. Disentangling the EGDI's three dimensions.

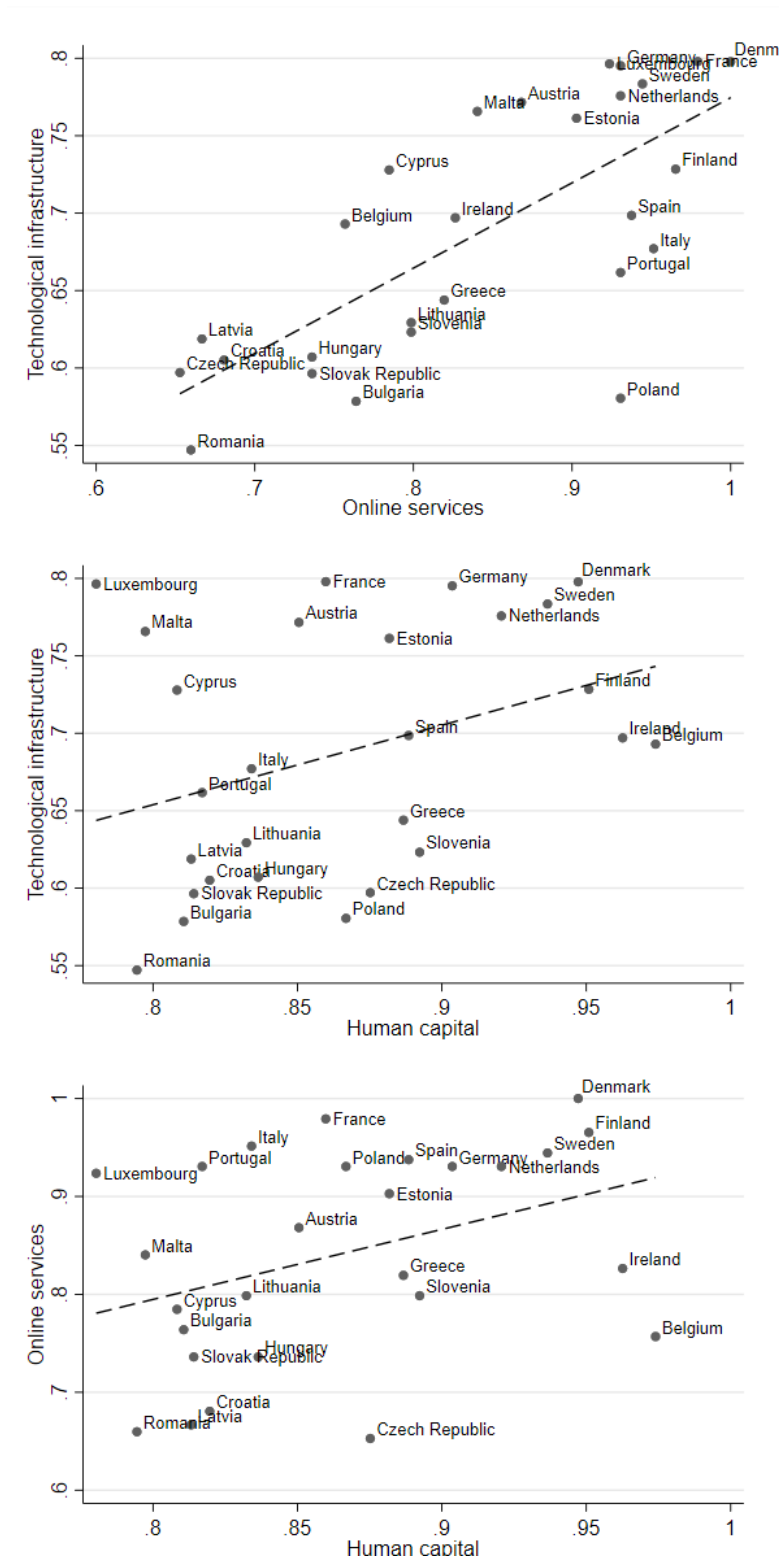


Figure 3. Indicators of competence.

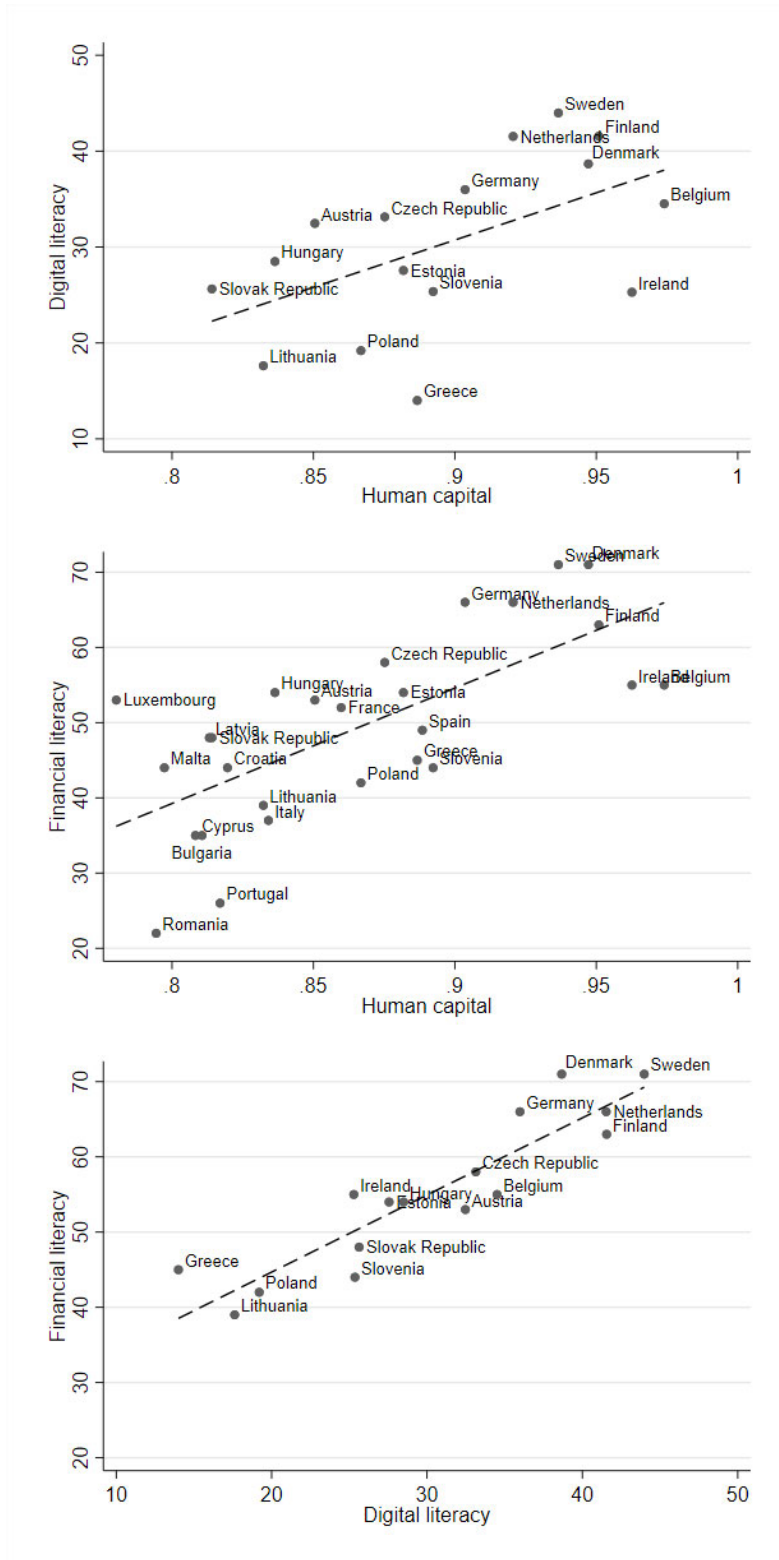
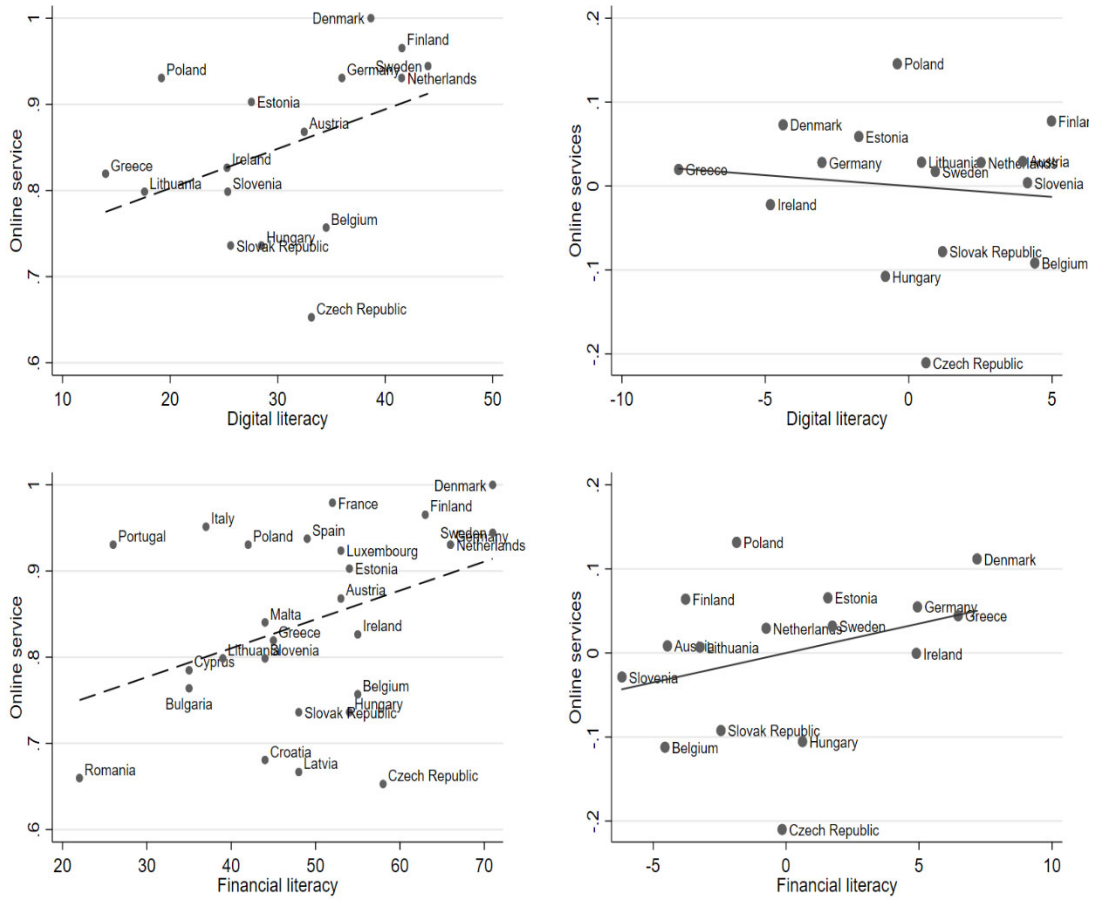


Figure 4. Digital and financial literacy and e-government.



Note: bivariate correlations in the left panels; partial correlations in the right panels.