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Leveraging networks to develop citizens' digital competences: a pseudo-panel analysis of outreach initiatives in Italy

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Short Bio

Francesco Olivanti is a PhD Candidate in Management Engineering and a researcher at the Digital Agenda Observatory of Politecnico di Milano. His research focuses on public policies and on innovation in the public sector, especially in education and skills. In particular, he investigates: which policies are most effective in developing skills for the digital transformation; how analytics can improve policymaking; the role of public policy networks to promote digital inclusion.

Abstract **– Social support plays a fundamental role in digital inclusion; thus, many argue that governments should adopt a multi-stakeholder approach to bridge the digital gap, collaborating with civil society and private sector. This study analyzes the presence and activism on the territory of organizations that, in parallel with pursuing their institutional goal, promote outreach activities to achieve better social outcomes. For these organizations – schools, universities, libraries, and third-sector organizations –, I coined the term outreach-oriented organizations (OOOs).**

Taking advantage of a dataset mapping all Code Week events – a European-wide initiative that introduces students and adults to the digital world – between 2013 and 2020, I assess the impact of OOOs' activism on citizens' digital competences, by means of a fixed effect pseudo-panel analysis.

Main results: first, it is essential to consider the degree of simultaneous activism and collaboration among organizations, in particular between civil society and schools; second, I confirm that digital competences are strongly linked to social inclusion: the strength of social networks is fundamental to lower digital inequalities and viceversa.

Such results are robust to multiple model specifications, but they are sensitive to the variables chosen to measure school activism.

Keywords **– digital competences; Italy; social networks; digital inequality; policy impact**

Introduction

Digital technologies are ubiquitous in modern societies, but digitalization initiatives are often undertaken without addressing the issue of those who are left behind (Mariën & Prodnik, 2014). Digital divide scholars increasingly focus on a broad spectrum of *digital inequalities* and on how the digital transformation in all its forms is reinforcing or generating new mechanisms of social inequality (Mariën et al., 2016). Digital competences are a crucial element to be considered in this scenario (van Dijk, 2020).

According to the EU's vision for the "digital decade", 80% of citizens should possess at least basic digital skills by 2030 (European Commission, 2021). Italy, currently ranked 25th among 27 Member States in the *Human capital* dimension of the *Digital Economy and Society Index* (DESI), has translated this ambition into a 70% goal to be reached by 2026, thanks to about 500M euros invested via NextGenEU funds and public-private partnerships. To tackle digital skills shortages and inequalities among the population, the Italian Government has adopted a bottom-up approach, leveraging on a wide network of public administrations (PAs) and non-profits (NPOs) – who are responsible for so-called *Digital Civilian Service* and *digital facilitation networks* – to impact on what

Park (2014) defines "non-users' social environment, including the local community, workplace, and neighborhood."

Our research addresses the validity of this policy approach by performing a pseudo-panel data analysis of the dynamics of digital competences in Italy between 2013 and 2020. I investigate whether the proactivity of public and nonprofit organizations such as schools, civil society organizations, libraries, and universities – which I define *outreach-oriented organizations* (OOOs) since they increasingly aim at having an impact on the whole community, beyond their traditional institutional target – has been associated to an increase in citizens' digital skills on the territory, also linking them with drivers of digital and social inclusion.

Research Objectives and Research Questions

This research pursues two main objectives. In terms of policy, it has been developed in close collaboration with the National Coalition for Digital Skills in order to understand how to be impactful with initiatives devoted to digital competence development. Our results are intended to be put to use when updating the National Strategy for Digital Competences.

As for the academic relevance of this work, present studies who have focused on the role of specific organizations to enhance citizens' digital competences only consist in:

- Overviews of the actives performed by an actor in a specific region and of the difficulties encountered (e.g., Wong et al., 2009);
- Suggestions about the role that an actor can play (e.g., Martinez, 2019);
- Descriptions of specific initiatives – often with a pedagogical perspective (e.g., Kumpulainen et al., 2020);
- Interviews and short surveys to representatives of such organizations (e.g., Unterfrauner et al., 2020; Yilmaz & Cevher, 2015).

Starting from the knowledge gaps illustrated in this section, this research aims at answering the following research question: *How does the activism of outreach-oriented organizations (OOOs) in a specific area impact on the digital competences of citizens?*

This RQ is decomposed into sub-RQs:

RQ1.1 Do territories with higher density of OOOs show higher levels of DC among their citizens?

RQ1.2 Which OOOs are the most effective in impacting the whole community? In particular, do civil society and school initiatives have a positive impact?

RQ1.3 How relevant is the interaction among OOOs?

RQ1.4 What role do social networks play in fostering competences, in light of the activities promoted by OOOs?

Methodology and Data

Our work is based on an extensive data collection activity, which has led to the construction of a novel dataset merging information from multiple sources at different levels of analysis. To balance statistical power, representativeness, and causal identification, I have created a synthetic unit of analysis (UoA) composed by the triplet region-municipality type-age group.

Our outcome variable is represented by the digital competence level of Italian citizens, constructed following different alternative configurations. The data source is *Aspetti della Vita Quotidiana (AVQ)*, a repeated cross-sectional survey managed by the national statistical office (Istat). Cross-sectional information at the individual level has been grouped at the UoA level using a stratification scheme, in order to produce our pseudo-panel dataset.

Independent variables regarding OOOs are measured by collecting data on the exposure to joint initiatives promoted by schools and NPOs (Code Week), on schools' activism (digital-related and general activism on the territory), on the density of social facilities and community centres, on participation into volunteering activities, and on the presence of universities and libraries.

To avoid omitted variables bias, I have included a vast set of control variables measuring the constructs identified in the literature by Scheerder et al. (2017) as determinants of Internet skills, use, and outcomes of the digital divide.

Pseudo-panel methods are one way of making up for the lack of proper panel data (Guillerm, 2017) by including independent repeated cross-sections, i.e., different samples. I apply this approach, after performing standard checks on the appropriateness of panel data models.

Furthermore, I verify that, as expected given the data generating process, the dataset is characterized by heteroskedasticity and serial correlation, hence requires the use of clustered standard errors.

Lastly, I opt for a fixed effect model, to account for time-invariant unobserved individual effects and for year fixed effects.

Importantly, however, only two dependent variables – together with all the control variables – are time-varying. Thus, I have to resort to the properties of Within estimators to include time-invariant variables by means of interactions (Wooldridge, 2010). Following such configuration,

I estimate the impact of schools, libraries, and universities as *moderators* of the impact of joint schools-NPOs initiatives.

We complete the quantitative analysis by performing multiple robustness checks.

Expected Contribution

From a theoretical point of view, I underline three key messages. First, network ties among organizations matter. When evaluating the impact of OOOs on digital competences, it is essential to consider the degree of simultaneous activism and collaboration among organizations – i.e., an ecosystem approach should be adopted. Focusing on single actors separately does not provide relevant feedback both in terms of research and in terms of policy.

Second, network ties among individuals matter. Digital competences are inextricably linked to full inclusion in society. Participation in social life, extent of the personal network, level of education are always relevant constructs.

Third, the choice of the measurement approach is not neutral. Assessing a specific level of proficiency for every competence area opens a broader range of scenarios for analysis, in terms of variables choice, scale, thresholds.

Our study is also addressed to policymakers and managers and operators of OOOs.

The major implication for OOOs' practitioners is the importance of searching for (scalable and effective) partnerships on the territory rather than focusing exclusively on solitary initiatives. This implies being equipped for collaboration, for enhancing each other's capacity, but also understanding that project success is strongly dependent on contextual factors and interconnections among local stakeholders.

As for policymakers, our research points to the need to incentivize collaboration among entities, for example by increasing the importance network involvement as an evaluation criteria used to select projects and evaluate their results. Furthermore, policymakers must carefully allocate funds in a balanced way among different actors within the network. This does not imply adopting a fragmented approach, spreading funds among small-sized actors who promote very heterogeneous initiatives. Rather, it implies adopting an integrated approach that leverages on different typologies of actors and initiatives dedicated to an audience as heterogenous as that of "citizens", though still preserving the adequate scale to yearn for impact and also to produce robust impact evaluations.

Key Findings

If taken individually, joint schools-NPOs initiatives are not significant, but they becomes so – with a negative sign – when considering the moderation of OOOs (Error! Reference source not found.). This means that bottom-up initiatives are not able to sustain the improvement in citizens' digital skills by themselves.

However, when joint schools-NGOs initiatives are carried on in OOOs-rich territories, the overall effect of activism for citizens' digital skills is positive. In particular, UoA characterized by schools more active in the digital field and by a higher density of universities, witness an overall improvement in citizens' digital competences.

These results are robust to different model specifications, including Leading Indicators or ARDL models; however, they strongly depend on the variable used to proxy school activism.

Citizens' digital competences are also impacted by the extent of personal social networks (+), by connectivity (+), economic and subjective wellbeing (+), human capital (+), and religiosity (–).

Table 1. Fixed-effects model with extensive controls (using Within estimator and interactions)

Variables	Coeff. (SE)
Code Week initiatives	**-0.188*** (0.0536)**
Code Week # Community centers	**-0.589 (0.706)**
Code Week # ICT teacher training	**0.271*** (0.0735)**
Code Week # Library density	**-0.0160 (0.0169)**
Code Week # University density	**2.128* (1.270)**
Broadband take-up	0.00178* (0.000996)
Participation in society	0.0996*** (0.0201)
Religious practice	-0.0474*** (0.0163)
Employment rate	0.368*** (0.0453)
Lower secondary graduates	-0.297*** (0.0168)
One-person households	-0.133* (0.0777)
Life satisfaction index	0.0334* (0.0195)
Constant	0.0775 (0.461)
Year FE	Yes
Observations	2,632
Number of id (clusters)	329
R-squared	0.642
Adjusted R-squared	0.639

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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