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## **Is digital government facilitating entrepreneurship? A comparative statics analysis**

**Joana Costa | Luís Carvalho**



## Is digital government facilitating entrepreneurship?

### A comparative statics analysis<sup>1</sup>

Joana Costa<sup>2</sup>, Luís Carvalho<sup>3</sup>

#### Abstract

Promoting entrepreneurship has become a government priority worldwide. At the same time, digital technology has been embraced by governmental authorities, particularly focusing on digital infrastructure and online service provision. In this paper, we explore whether there might be a connection between both policy ambitions – notably at the local level. To do so, we empirically assess the relationship between different dimensions of government digitalization and entrepreneurial dynamics, using panel data from 278 Portuguese municipalities between 2014 and 2019, primarily drawn from the Portuguese survey on government ICT deployment (IUTIC) and analyzed through compared regression models. Results suggest an overall positive effect of digital government efforts on entrepreneurship. However, digital openness, a user-focus and transparency initiatives seem to matter more to entrepreneurship than internally-oriented digitalization measures. The results provide evidence of the positive effect of government digitalization on entrepreneurship, suggesting that the digital transition may generate relevant social returns for local economies and thus an additional mechanism for the promotion of smart and sustained growth.

**JEL Classification:** H79, L26, M13

**Keywords:** e-government, digital transition, entrepreneurship, local government.

**Note:** *This article is sole responsibility of the authors and do not necessarily reflect the positions of GEE or the Portuguese Ministry of Economy and Maritime Affairs.*

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## 1. Introduction

The role of entrepreneurship in economic growth, wealth and job creation is nowadays widely acknowledged. To this end, government authorities – ranging from the national to local level – have been active in entrepreneurship promotion policy for many years now. Beyond conventional direct support schemes and other individual and collaborative measures (Audretsch et al., 2020), policy agendas have increasingly targeted situational factors associated to the business environment and the easiness to launch new companies (World Bank, 2013).

In this respect, the deployment of digital technology in the public administration is a new guest at the entrepreneurship policy table. It is argued that a successful digital shift will enable the public sector to increase service provision efficiency; also, it shall allow improve government transparency and openness (OECD, 2020) and the delivery of better and faster public services to wider constituencies, notably to the private sector (Greenway et al., 2018, Janssen et al., 2020). According to the OECD (2014), digital government encompasses the persistent use of the digital technologies in the public administration to create public value. In a recent report, OECD claimed that an agile and flexible government requires six complementary pillars: being digital-by-design, open-by-design, user-driven, digitally proactive, data-driven oriented and to work “as a platform” (OECD, 2020).

Local authorities have been particularly active in trying to link the digital transition with entrepreneurship promotion (Manjon et al., 2021; van Winden and Carvalho, 2017). This is manifest, for example, in different sorts of smart cities and open data initiatives (e.g. Mergel et al, 2018; Kitchin, 2015; Neves et al., 2020). By using the affordances of digital technology to become more transparent and openly release government data, several municipalities have sought to encourage new firm formation and new endogenous businesses that could monetize on that information while improving government services. Digital modernization is considered to improve the relation between the public administration, citizens, and the private sector, making processes more agile and enticing a culture of innovation and responsiveness (OECD, 2020). Also, such a transition is expected to come with increasing digital awareness and re-skilling, fostering an entrepreneurial environment at the public administration and beyond. Yet, while digital modernization the deployment of different generations of e-government have been implemented over the last two decades, we still know little about whether their relation to actual entrepreneurship seem to be taking place or not.

Hence, this paper seeks to contribute to this debate and examines the effect of e-government and different types of digital modernization efforts on the dynamics of setting up new businesses at the local level. This analysis is pioneer by quantifying these relations at the local level, and also by decomposing the effect of e-government and digital transition efforts on entrepreneurship based on the Digital Government pillars proposed by the OECD (2020). Evidence suggests that initiatives focusing on digitally improving the relationship between the public administration with the outside world (e.g., data releases, digital service availability and

open-by-default measures) are positively associated with local entrepreneurial dynamics; yet, that is not the case for other sorts of measures associated with digital infrastructure, internal IT networks and broad social media presence.

The remainder of the article is structured as follows. Section 2 provides a brief overview of related literature and standpoints. Section 3 describes the research methods and the proxies used to econometrically infer the expected effects of e-government on entrepreneurial initiative. Section 4 presents the empirical strategy and the results, whose discussion is completed in Section 5. Section 6 concludes, synthesizes key contributions and provides policy recommendations.

## **2. E-government, digitalization and entrepreneurship at the local level**

### **2.1. From e-government to the digitalization of the public administration**

Over the last two decades, the public sector rapidly started to deploy information and telecommunication technologies (ICT) to improve service provision, increase democratic participation, decision-making processes and overall performance (e.g. Gil-Garcia and Martinez-Moyano 2007). Since then, several waves of digital transformation unfolded, introducing new demands into this on-going transformation. It is increasingly claimed that public sector digitalization is not solely about introducing digital solutions, but about transforming skills, competences and working cultures (e.g. Ubaldi, 2019; Carter and Bélanger, 2005; Kumar et al, 2007). According to the OECD (2020), digitally proactive governments not only function digital-effectively but are able to anticipate needs and demands from their constituents, adopting “pull” rather than “push” delivery modes (see also Linders et al., 2018).

Many recent studies discussed the relevance of e-government transitions, and their role in public sector performance (see table 1). In this respect, two different perspectives emerge: on the one hand, some studies focus on internal-to-the-organization outcomes, such as modernization, improvement in internal processes and improvements in infrastructure (e.g., computers, networks); on the other hand, and increasingly so, e-government and digital transformation is seen as a process of engaging others and fostering close connections between the public administrations and its constituents (see, e.g., Moon, 2002). From this perspective, e-government and digitalization offer opportunities to enhance transparency, co-innovate with external stakeholders, deliver more appropriate public services, and foster a digital-based economy (OECD, 2020).

**Table 1** – E-government: some definitions

Article	Author (year)	Definition	Context
The Evolution of E-Government among Municipalities: Rhetoric or Reality?	Moon (2002)	Defined as the production and delivery of government services through IT applications; however, it can be defined more broadly as any way IT is used to simplify and improve transactions between governments and other actors, such as constituents, businesses, and other governmental agencies.	Information technology (IT) has contributed to dramatic changes in politics. The Clinton administration attempted to advance e-government, through which government overcomes the barriers of time and distance in providing public services
Understanding the evolution of e-government: The influence of systems of rules on public sector dynamics	Gil-Garcia and Martínez-Moyano (2007)	Electronic government has been defined as the use of information and communication technologies in government settings.	First, e-government in general has evolved from its initial presence on the Internet to more transactional and integrated applications. Second, at the aggregate level and as a general trend, national governments have started adding technological and organizational sophistication and state and local governments have followed.
A public value perspective for ICT enabled public sector reforms: A theoretical reflection	Cordella and Bonina (2012)	Consists in the adoption of ICT to facilitate current administration of government and/or the production and delivery of government services to citizens through ICT	Since the late 1990s, the public sector, noting the advantages of adopting ICT by the private sector, has followed suit.
A metatheory of e-government: Creating some order in a fragmented research field	Meijer and Bekkers (2015)	Consists in the use of ICT in order to design new or redesign existing information, processing and communication practices in order to achieve a better government. The transition happens especially in the field of electronic service delivery to firms and citizens but also for managerial effectiveness, and the promotion of democratic values and mechanisms.	In recent decades, information and communication technology has changed public administration, internally and externally transforming interactions.
E-Government in the Western European Countries, Asia and in the USA	Mukhoryanova et al. (2016)	This concept arose in the Occident towards the end of the last decade of the 20th century and meant universal application of high technologies: computer and information technologies in regulatory body action for improvement and openness of their work. At the same time the considered concept led to creation of the innovative State – service oriented that means the State become organization-rendering services to citizens and society. So, the strategies and implementation programs of the "E-government" concept are created: "Indonesia National-Strategy", "e-Europe", "e-Austria" and the similar in other countries.	
E-government adoption in sub-Saharan Africa	Verkijika and De Wet (2018)	Government use of ICTs and its applications to deliver services and information to various stakeholders such as citizens and businesses.	
The public value of E-Government – A literature review	Twizeyimana and Andersson (2019)	Consists in governments' use of Information and Communication Technologies (ICTs) combined with organizational change towards improvement of the structures and operations of government.	
Assessing the Moderating Effect of Corruption on the E-Government and Trust Relationship: An Evidence of an Emerging Economy	Jameel et al. (2019)	e-government from a narrow perception by using the Internet and ICTs to advance the performance of governmental systems.	governments worldwide are progressively becoming more attentive to the significant value of the emerging digital government as an important policy tool and strategic option for governments and economic activities
Future of e-Government: An integrated conceptual framework	Malodia et al. (2021)	It is a tool to provide public services to citizens using digital media, as socially inclusive, hyper-integrated ICT platforms that are built with evolutionary systems architecture to ensure the efficient delivery of government services with transparency, reliability and accountability.	Emerged as a means of disseminating and exchanging information. Also as a tool to provide various services to its citizens, from that stage, e-government emerged as a technological function to automate non-managerial administrative tasks such as financial transactions, administrative work and administrative checks.
The Institutional Change from E-Government toward Smarter City; Comparative Analysis between Royal Borough of Greenwich, UK, and Seongdong-gu, South Korea	Kim and Kim (2021)	E-government refers to a government that uses information technology (IT) to redesign administrative functions, improve services to the public, and realize democracy. In a narrow sense, it is exemplified as a government using IT and the Internet as tools for better government implementation.	Over the past two decades, governments in the world have continued to invest and innovate in e-government for public transparency and administrative effectiveness. In particular, the coronavirus pandemic has driven the transformation of the public sector, into digitalization.

Article	Author (year)	Definition	Context
Support and resistance of public officials towards current eGovernment initiatives - A case study on Ukraine and Germany	Lemke, Ehrhardt, and Popelyshyn (2021)	E-government reflects a higher level of governance. This shift aims not only at providing digitized service but also improving internal processes, structures and working practices through the application of digital technology as part of a larger institutional reform in the public sector.	The growing development and adoption of digital technologies by both individuals and companies cause external pressure on public administration to be more efficient and citizen-centric. In addition, the passage of laws and regulations aims to boost the modernization of government processes and the adoption of e-government.
The Role of E-Governance in Combating COVID-19 and Promoting Sustainable Development: A Comparative Study of China and Pakistan	Ullah et al. (2021)	The e-government may be contemplated as technology by governance that should upgrade the work of current organizations and reorganize the network of interactivity between a government and its citizens and among businesses and employees.	Information technology

Source: own elaboration

Previous approaches place significant emphasis on municipal openness, the role of data and connection to users as leitmotif around digital transitions and e-government deployment in the public administration. In fact, over the last decade, developments in ICTs (such as enhanced broadband connectivity, diffusion of smart devices, data-sharing platforms, social media, the internet-of-things and cloud computing) opened new opportunities and challenges for the provision of public services (e.g. Institute for the Future, 2012; OECD, 2020). These developments are associated with the ambition to bring places “smarter”, namely by making urban provisions more efficient (e.g. water, energy, transport) and by facilitating the involvement of entrepreneurs around social and environmental challenges (e.g. Kitchin, 2015; Carvalho and Vale, 2018).

As part and parcel of these trends, many local authorities and advocacy organizations worldwide seek to make as much government data as possible available for all to use and re-use. Instead of keeping it closed or hard to access, it is believed that widely opening public sector data can increase democratic participation, accountability and transparency, but also help to improve local service provision, spur innovation and create new business opportunities (e.g. Goldstein and Dyson, 2013; Janssen et al., 2012). The number of jurisdictions – notably municipalities – active in some sort of openness-related initiative has been on the rise over the last decade, including the development datastores, open interfaces, user engagement events, among others. In Europe, the official vision for the future of public services is now explicitly based on the principles of open data, transparency and collaboration (e.g., European Parliament, 2019).

The previous vision is shared by the OECD (2020), who enlisted six pillars for digital government, focusing on openness, embedding digitalization in each and every process, data-driven mentality, proactiveness, focus on users and the use of digital technologies to connect government authorities to innovation ecosystems. The latter notion of ecosystem is relevant, as it moves the discussion beyond early debates on one-directional, passive public information release (as in freedom-of-information regulations) towards a new perspective in which the

public administration uses digital technology to become a network articulator, proactively engaging others and releasing data on their own services and provisions. While the actual implementation of these visions is still in the infancy, their benefits are believed to be huge, cutting across multiple dimensions. Frequent anecdotes include the development of digital services, the creation of new programming and digital jobs, better coordination across city departments and efficiency, improvements of the overall quality of city data, access to new ideas and the engagement of communities of innovators with the public administration (Carvalho et al., 2017).

## **2.2. Digitalization and entrepreneurship at the local level**

Currently, stakes are high on the role of public sector digitalization. Beyond transparency and internal efficacy, also fostering economic development has been a relevant target. In fact, from the policy side (OECD, 2020), public sector digitalization is often seen as a lever for the creation of new markets for example, though the use of public procurement to foster entrepreneurship (e.g. van Winden and Carvalho, 2019). Moreover, digitalization efforts are expected to make the public administration increasingly more capable and responsive to societal needs, expanding citizen participation, becoming user-centric and harnessing ideas from external constituencies. While these claims are often implicitly discussed at the national (or even supra-national) level, local governments are increasingly involved in these transitions too, with some debates revolving around the territorial dimension of the digital transition of public services.

While not always explicitly explored, policy documents and previous studies suggest the existence of a link between e-government, digital transition and the facilitation of entrepreneurship, at the local level. Three main mechanisms can be discerned. First, public administration digitalization is said to make government authorities more agile, hence saving on startup costs for companies by removing bureaucratic hurdles and unnecessary processual delays (e.g., Branstetter et al., 2014). It is claimed that the development of related e-services means shorter times to start a firm, to obtain permits, to hire employees. While not all the relevant services are provided at the local level, this improvement can be a powerful facilitator for enterprise creation and maintenance, which in turn may improve the rate of business creation. The underlying idea is that service optimization and improvement on the level of e-government also improves the business atmosphere overall, hinders corruption (Almeida and Zoauin, 2014), and may increase the ability of local governments to respond to the challenges put by entrepreneurs, resulting in the creation and maintenance of new business.

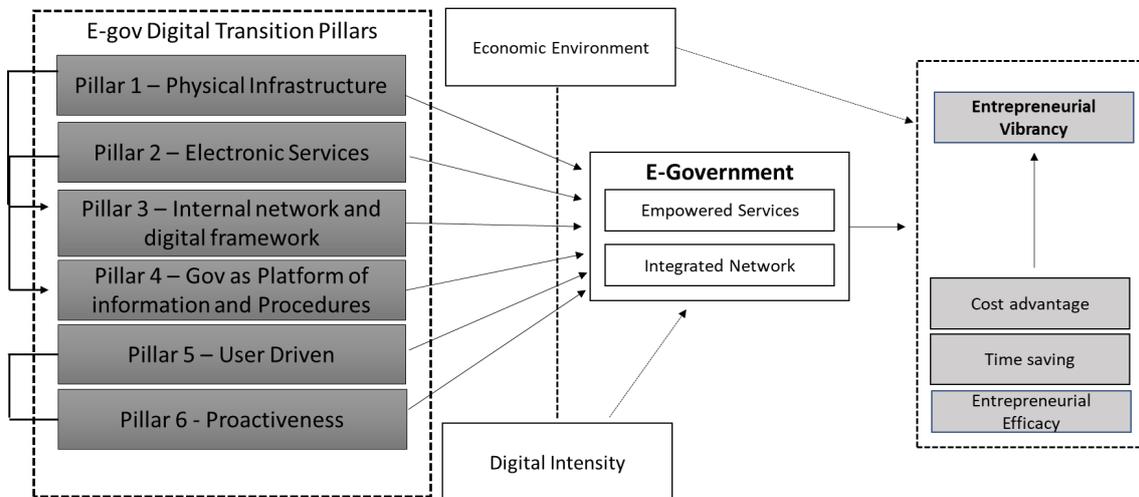
Second, public sector digitalization is linked to transparency and efficiency, thus increasing the overall economic conditions and hence the attractiveness to start a business. This can take the form of trust in the government, the improvement of policy making processes, the offer of suitable information to entrepreneurs through multiple online and digital channels, optimized access to public provisions, availability of information for investors and companies (Janssen et

al., 2012). Beyond the release of ad-hoc information, it is argued that public-sector information should become easily accessible and open by default. According to the OCED (2020), open by default means “shifts from top-down, centralised and closed decision-making processes, based on policy black boxes – and driven by organisational efficiency – towards a more proactive approach (...) centered around openness, collaboration, collective intelligence and innovation. [It involves] communicating, informing, consulting, and engaging with external and internal actors to co-create public value (...)” (p.25). As an example of the previous, some municipalities now release, in machine-readable formats, linked and geo-located information on every public decision made by the Council. These data releases are systematic, with no prior checks and permissions. Apart from transparency and increases in efficiency – everybody knows what is being done and decided, and by whom –, this has encouraged the development of data visualization services and the formation of new companies and private services that create new intelligence based on that data, selling it to multiple industries (Carvalho et al., 2017).

Third, and related to the previous, digitalization is expected to enable government involvement in digital procurement, e-commerce and in open data releases on government provisions (e.g. transport, waste collection, the built environment, etc.), fueling new business opportunities, service co-creation and entrepreneurial ecosystems. A number of studies have been exploring this link, focusing on fleshing out new business models associated to open data and the formation of entrepreneurial ecosystems (e.g. Kitsius et al, 2017; Corrales-Garay et al., 2020). Qualitative studies identify a link between open data platforms at the local level and entrepreneurial dynamism, with municipal open data contributing to stimulate innovation and to develop better public services by using the wisdom of the crowds (Cohen et al., 2016; Carvalho and Vale, 2018; Kitsius et al. 2021).

All in all, the aforementioned studies and policy statements suggest that there is a link between public sector digitalization and entrepreneurship at the local level, leading through improvements in the business atmosphere (Almeida and Zoauin, 2014) and running through the improvement of services and the formation of new relations between public and private constituencies. Moreover, they also suggest that the link is likely to be related more with digitalization as an instrument to foster openness and data-driven philosophies than to technological affordances and infrastructure per se. This suggests that not all the six pillars proposed by the OECD (2020) when describing e-government digital transitions are equally relevant for the creation of new firms at the local level – albeit some are related to one another – and the strength of these links should be further scrutinized. Figure 1 proposes a synthetic conceptual model, consolidating the previous ideas in a nutshell, to be tested in the subsequent sections.

**Figure 1** – Conceptual Model of e-government effect on entrepreneurial vibrancy



Source: own elaboration

### 3. Research setting and methodology

#### 3.1. Data sources and measurement

According to Statistics Portugal (*Instituto Nacional de Estatística - INE*), in 2014 there were more than 176 thousand newly born firms in Portugal, while the total number of firms in operation exceeded 1.128 thousand firms. In 2019, more than 194 thousand new firms were established (1.318 thousand in operation)<sup>4</sup>. Also, in 2019, almost all municipalities offered at least some type of digital or electronic service; 45% of the municipalities offered mobile services and open-source shared solutions were developed in 23% of the municipalities<sup>5</sup>.

For this study, we address the relation between the extent of e-government deployment and entrepreneurship, using data from the 278 Portuguese mainland municipalities between 2014 and 2019. To do so, we combined multiple public-access datasets and performed comparative static analyses through regression models to assess the impact of the digital transformation of public services and its impact in the business environment. The most extensive survey covering the digital strategies of municipalities is the survey on Information Society in Public Administration in Portugal (IUTIC), conducted on a yearly basis and covering all Portuguese municipalities. Digital Transformation indicators encompass government services, technological solutions to integrate and disseminate interoperability between systems, raising information availability as well as its systematic use, fostering transparency and resource sharing among public organizations.

The presence of statistical heterogeneity among municipalities called for the inclusion of a variable proxying for the economic dimension of municipalities; the Datalabor database<sup>6</sup>

<sup>4</sup> [https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine\\_indicadores&indOcorrCod=0009819&contexto=bd&selTab=tab2](https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&indOcorrCod=0009819&contexto=bd&selTab=tab2)

<sup>5</sup> <https://www.dgeec.mec.pt/np4/12.html>

<sup>6</sup> <https://datalabor.pt/data/rendimento-bruto-declarado>

provided the gross income per municipality, which captures the ability to generate income returned to households. Entrepreneurial dynamism in each municipality was proxied by new firm births, as provided by INE. The same data was collected for two points in time (2004 and 2009), and the combination of datasets assures exact comparability between the estimations. Likewise, the time gap allows understanding eventual shifts on the e-government drivers of entrepreneurial dynamics. The digital government pillars were addressed using the OECD framework, and proxied by variables collected from the IUTIC survey (Table 2). Also, a variable to assess the overall soft (digital) infrastructure in the municipality was added (digital mindset), here proxied by the percentage of municipal workers engaged with digital technologies.

Overall, the set of variables in use can be broken down into three vectors: entrepreneurial dynamism, which is the dependent variable; municipal economic and infrastructural conditions, as control variables; and e-government pillars as independent variables, to infer in a detailed way the relevance of different types of pillars/transitions in relation to entrepreneurial dynamism.

More concretely, we will look for evidence to test the following hypotheses:

**Hypothesis 1:** The availability of online open government services and information facilitates new firm creation (external dimension).

**Hypothesis 2:** Improvements in the soft (digital) infrastructure and ICT affordances facilitate new firm creation (internal dimension).

**Table 2** – Variable description

Theoretical Proxy	Operational Measure	Unit of Account	Data Source
Entrepreneurial dynamism	Firm Birth	units	INE
Income	Gross Income (all income sources)	millions of euros	DATALABOR/INE
Digital <i>mindset</i> (NET_PC)	Digitalization Intensity	percentage	IUTIC
PILLAR 1 - Digital by Design	Availability of physical infrastructure	multinomial	IUTIC
PILLAR 2 - Data Driven	Availability of on-line services	multinomial	IUTIC
PILLAR 3 - Open Nature	Network administration and orientation	multinomial	IUTIC
PILLAR 4 - Government as a platform	Information and online procedures	multinomial	IUTIC
PILLAR 5 - User Driven	Data availability	multinomial	IUTIC
PILLAR 6 - Proactiveness	Presence in platforms and social network	multinomial	IUTIC

### 3.2. Descriptive Statistics

Tables 3 and 4 provide the descriptive statistics and correlations for entrepreneurial dynamism, e-government pillars, and contextual controls (income and soft digital infrastructure), for both periods of analysis.

**Table 3** – Descriptive statistics and correlations, 2014

	Min	Max	Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ibirth (1)	3.30	9.58	5.709	1.112	1							
REND2 (2)	8.22	7968.10	270.541	621.545	.651**	1						
NET_PC (3)	0.157	1.000	0.917	0.127	-.168**	-0.101	1					
P1_INFRAST (4)	2	5	3.227	0.738	-0.023	0.084	-0.028	1				
P2_DATA_DRIVEN (5)	0	21	8.982	4.048	.490**	.345**	-0.116	0.064	1			
P3_OPEN_NATURE (6)	0	1	0.745	0.437	-.122*	-0.009	0.113	-0.021	-0.045	1		
P4_OPEN_2 (7)	0	10	4.554	3.367	.289**	.186**	-0.019	.144*	.476**	-0.043	1	
P5_USER_DRIVEN (8)	6	18	15.647	2.012	.147*	.147*	-0.053	.161**	.488**	-0.008	.357**	1
P6_PRESENCE (9)	1	2	1.906	0.292	.195**	0.086	-0.005	-0.002	.194**	-0.103	0.057	0.104

\*\* Correlation is significant at the 0.01 level (2-tailed)

\* Correlation is significant at the 0.05 level (2-tailed).

**Table 4** – Descriptive statistics and correlations, 2019

	Min	Max	Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ibirth (1)	3.00	9.89	5.534	1.272	1							
REND2 (2)	10.67	10436.76	346.312	808.586	.668**	1						
NET_PC (3)	0.364	1.000	0.980	0.077	0.005	0.017	1					
P1_INFRAST (4)	2	4	3.022	0.360	.129*	0.088	0.037	1				
P2_DATA_DRIVEN (5)	1	21	10.673	4.097	.428**	.321**	-.143*	.176**	1			
P3_OPEN_NATURE (6)	0	1	0.237	0.426	.259**	.135*	0.008	0.108	.146*	1		
P4_OPEN_2 (7)	0	16	7.133	5.028	.319**	.187**	-0.012	0.078	.456**	.120*	1	
P5_USER_DRIVEN (8)	9	18	16.223	1.785	.119*	0.078	-.122*	0.054	.465**	0.096	.273**	1
P6_PRESENCE (9)	0	1	0.986	0.119	-0.044	-0.024	-0.010	0.007	-0.039	-0.004	-0.003	-0.002

\*\* Correlation is significant at the 0.01 level (2-tailed)

\* Correlation is significant at the 0.05 level (2-tailed).

In relation to new firm birth rates, municipalities are very heterogeneous; still, the pattern remains unchanged between the two periods of analysis. The income variable has strong variance, as expected, depicting differences between large and small municipalities by the seaside and the countryside, respectively. The soft (digital) infrastructure in the municipality, here proxied by the percentage of workers engaged with digital technologies, shown a positive evolution, as the minimum penetration was 15,7% in 2014 compared to the 36,4% in 2019. This illustrates the strong and consistent effort made by local governments to embrace the digital transformation and provide digital services. The digital diffusion is profound and widespread; proxies for all the digital pillars increased overtime.

Looking at variable correlation, results evidence an association between some of the pillars and, hence, the independence in relation to others. These results suggest that there is no single nor sequential path in the digital transition in the public sector. Also, correlations show low to moderate values, allowing to rule out multicollinearity as well as other issues potentially biasing the validity of econometric estimations.

#### 4. Empirical Results

As said, in order to understand the determinants of entrepreneurial dynamics arising from government digitalization, the same set of variables was considered for 278 municipalities, in two time periods. Thus, a comparison will be possible addressing the time gap and eventual changes in the explanatory power of different pillars. Table 5 presents the results of the econometric estimation for both periods.

**Table 5** – Econometric estimations for 2014 and 2019

	2014 (model 1)			2019 (model 2)		
	coefficient	S.E.	p-value	coefficient	S.E.	p-value
Constant	6.053	0.600	0.000	4.731	1.069	0.000
INCOME (MUN)	0.001	0.000	0.000	0.001	0.000	0.000
NET_PC	-0.665	0.365	0.070	0.259	0.702	0.712
P1_DBD	-0.130	0.063	0.041	0.078	0.150	0.606
P2_DD	0.079	0.015	0.000	0.061	0.017	0.000
P3_O_by_Nature	-0.217	0.106	0.042	0.427	0.127	0.001
P4_O_by_Default	0.030	0.016	0.058	0.031	0.012	0.010
P5_UD	-0.058	0.027	0.030	-0.045	0.034	0.182
P6_Proactiveness	0.342	0.161	0.034	-0.236	0.445	0.596

MAINLAND MUNICIPALITIES (N=278)

Dependent Variable: lbirth

Model 1, with data from 2014, suggests that the rate of entrepreneurial effort was positively affected by the availability of online services, information disclosure and online procedures in the municipality. Also, the presence of the local government in platforms and other social media did relate to new firm creation in the territory. Conversely, internal network administration improvements and data availability comes with a negative effect in the rate of new firm creation. Also, while the effect is small, municipality income levels is positively related to new firm formation. These results corroborate the importance of embracing the digital transition from the local level; moreover, as predicted, they highlight the role of exogenous dimensions in the e-government pillar vis-à-vis the internal dimensions.

Model 2 (with data from 2019) shows some changes in terms of the determinants of entrepreneurial initiative. The external components of the digital transition still play a major role towards the acceleration of these rates. Availability of online services as well as relevant information are boosters of new firm creation. However, the internal dimensions still failed to be statistically significant, and the same goes now for the presence in social media and other platforms. This result is perhaps due to over-presence or multi-channeled communication around social media; it is possible that this communication tool became too generalist or massified. This points to the need to readjust the goals underpinning each of the pillars, and

their perceived relevance for external constituencies as the diffusion and the use made of different technological interfaces evolve.

In what relates to the internal dimension, the empirical evidence associated to pillars 1 and 3 confirms that the benefit for citizens, in general, and entrepreneurs, in particular, is not strong or even relevant. This is in line with the literature as these dimensions were meant to provide efficient managerial tools to the municipality to collect, treat and archive relevant information for the purpose of their internal services. While having and storing digital information may contribute to raise transparency, accountability, such a process is not automatic: considerable work must be done at the level of disclose and open release of information (e.g. Malodia et al., 2021), as qualitative evidence on the Portuguese case suggested (Carvalho and Vale, 2018).

## 5. Discussion

All in all, revisiting this study's hypotheses, there is evidence that availability of digital information and services provided by the municipality does enhance entrepreneurial dynamism at the local level. In a nutshell, the external dimension in hypothesis 1 of e-governance is positively related to entrepreneurship. In what concerns the internal dimension (hypothesis 2), both the soft infrastructure and the internal organization, the effects on entrepreneurship are of little if any relevance.

However, an important discussion is whether these dimensions are two sides of the same coin. If that is the case, and apparently so, and policy makers cannot disregard the organizational and internal changes required towards a fully digital governance. Perhaps the non-significance of this dimension is tied to the maturity of the transition, as external stakeholders demand for immediate utility in the linkage. However, several barriers lie ahead, including the lack of financial resources, technical and infrastructural competences, personnel capacities, legal issues and autonomy constraints (Moon, 2002). The transition to a fully digital local governance is fruitful, but the evolution of municipal e-government is complex, deserving the attention of both local and/or central policy makers.

The role of the external dimension in government digitalization may also suggest that digital tools promoted by the municipalities can facilitate and accelerate match-making process between data producers and data users, but also between other sorts of actors that make up for local and regional innovation ecosystems. This may facilitate the identification of knowledge assets and the entrepreneurial potential (Dosso and Lebert (2019), which is nowadays the cornerstone of modern innovation and entrepreneurship policy. Yet, the link between regional innovation policies and local government digitalization has not been sufficiently explored yet. This study opens up interesting possibilities in that respect. This is more so in a time at which the European Union as a whole and Portugal in particular are re-thinking growth and cohesion policies, notably around so-called smart specialization (e.g. Laranja et al., 2020; Kopczynska and Ferreira, 2020). It seems evident that the digitalization of government cannot be left

behind, as the effectiveness of such a policy package depends on two aspects: its local and its digital dimension.

## 6. Conclusion

Information technology has become the cornerstone of the economic organization in the 21<sup>st</sup> century. Hyper-connectivity revolutions caused important changes on how citizens and local constituencies interact with the government at different levels, accelerating and raising their mutual expectation. Despite the persistent efforts to shift towards e-governance and digital government modes, the right framework, the multiple dimensions – internal and external – and its implementation at the local level remains quite overlooked.

This research aimed to shed light on the effects of the multiple dimensions of this transition (OECD, 2020) as an enhancer of entrepreneurial endeavors at the local level. This research effort has a two-fold ambition: first, to understand the dynamics of e-government from different angles and their impact on the improvement of governments' efficiency, effectiveness and transparency; secondly, to better understand how such efforts are connected to the nurturing of a smart, reliable and effective environment to support entrepreneurial engagement. The empirical evidence identified the importance of the provision of services and information to leverage the entrepreneurial dynamism, which should be considered by policy makers as a recommendation to persistently invest time and means to support this transition. Yet, the study also suggests that not every digital transition pillar matters equally from the perspective of entrepreneurial dynamism, and their relevance seems also to change over time. This heightens the bar for policy makers willing to link digitalization and entrepreneurship at the local level.

To be sure, this study would need a follow up in order to better understand other dimensions of the policy strategy as well as the identification of ex-ante conditions which may leverage or hinder the process. The datasets used cover two time periods with a large enough time gap to peek into the dynamic of e-government transitions; yet, covering the entire period without discontinuity could provide more detailed information about the on-going transitions and their effects. In the future, we hope to extend the analyses with other indicators and look into entrepreneurial dynamics across economic specialization domains. Also, sub-sampling the territory and run cluster analyses could draw a clearer picture of the state-of-the-art and its variegated spatial nuances in this transition.

So far, this study has highlighted the importance of public sector digitalization towards improving the business environment, notably by considering the different domains in which the presence of digital governance may provide external resources for entrepreneurs and collective (territorial) efficiency gains. Digitalization has put enormous challenges to all players involved in place-based entrepreneurial ecosystems. It remains to be observed the extent to which this revolution, rather than favoring economic and political elites, will democratize

opportunities and open decision-making process. In any case, it is a promising seed towards a more inclusive local economic policy framework.

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