Entrepreneurial quality: some evidence from Greek public policy*

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Abstract

The present paper tries to devise a rating system for evaluating the likelihood of success of publicly supported companies. In recent literature we encounter quality indexes, composed of variables like name selection, registration location, intellectual property rights etc., which predict fairly accurately startup success. Unfortunately such indexes can only be compiled for countries with open administrations facilitating access and cross-checking of company data. We argue, however, that it is countries with less open administrations that have the highest need of ex ante quality assessment in order to maximise the public return of investment of state support mechanisms. This is why we suggest that, rather than giving up research on the likelihood of company growth because of lack of systematic open data, we can test firm dynamism based on public domain information. Dynamic firms, we assume, will be more likely to grow. The Web and Social Media data, which have until now mostly been used for marketing purposes, can be a valuable source of information for our purpose.

We attempted to use the digital footprint as a proxy for the dynamism of SMEs and startups. Using State Aid schemes (i.e. public support to profit-oriented companies) in the period 2007-2013 in Greece we constructed a sample of 2000 companies and rated them individually for their presence (or not) in Facebook, LinkedIn, a site (with or without registered domain name), e-mail with domain name, references, size of the site, sales via web, search function, communication, regular update, FAQs and after sales support availability. Testing for sector, region, type of company and type of support scheme we find a statistically significant result for the more dynamic sectors, type of schemes and type of companies, while the regional level appears to be irrelevant, as companies in all regions demonstrate a fairly unified digital presence.

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JEL classifications: L22; L26; O38

Introduction

Global competitive pressures have driven both technologically advanced and middle income countries towards adopting incentives of various kinds to help create new companies and survive or scale up incumbents in an effort to maintain competitiveness, employment and wealth. However, which companies have the higher likelihood to grow and survive remains a key question for the selection process of public funding. Academic research in the US and Europe suggests that there are certain signs that can fairly adequately predict new /small businesses performance. Similarly sectoral patterns and agglomeration observations tend to suggest that high tech sectors and/or clusters are the areas where public support has the highest return on private and social investment thanks to economies of scale and scope.

The present paper makes an effort to create a rating system for supported companies in Greece and try to shed some light to the likelihood of success of supported companies. The Greek case indicates that in a country in crisis, which ranks low in all global competitiveness benchmarks, support schemes may need to undertake more innovative, tailor made approaches and selection processes. Greece, an EU Member State and a developed country by global comparison, risks reaching a middle-income country status if the recent significant and persistent GDP decline continues. Unlike other peripheral EU Member States the country has (as yet in 2017) been unable to return to growth after the 2008 crisis and could not access global financial markets despite European rescue packages coupled with structural reforms. Accumulated debt as a share to GDP and market rigidities are blamed for its failure and constitute the focus of international intervention. Hence, supporting companies that have a high likelihood of success is the recommended way out from the crisis and return to economic growth. In this spirit research suggesting ex ante signs of likelihood of company growth is particularly relevant for the future development of Greece. If/when, with hindsight, the system of suggested indicators proves reliable, then it can be used for future support schemes within and beyond the country.

The paper is structured in three main sections: In Section 2 a literature review indicated that due to lacking data new approaches of research are needed. In Section 3 we present our data and methodology, whereas in Section 4 we present our findings. A concluding Section summarises the results and suggests ideas for further research.

Literature review

Identifying success factors for company growth is crucial for countries in desperate need for economic growth. This is, however, a very challenging endeavour. As pointed out in an earlier paper (Bassiakos et al. 2016) in the papers investigating the correlation of different variables to the profitability of Greek firms, conclusions are not converging. The period examined, the sample size, the methodology and the variables used differ in each research. Since the papers investigating the growth factors of Greek companies are inconclusive, new approaches are needed.

Since the '80s academic literature indicates that small and medium sized enterprises (SMEs) have been the cornerstone of employment growth and increasing competitiveness (Acs and Audretsch, 1990). Then, in the 21st century focus shifted from all SMEs to innovative ones and in particular startups and an engine of innovation, productivity growth and hence economic development (Malchow-Moller et al., 2011). Following academic insights public policy is, since then, increasingly focusing on supporting SMEs and startups, in the hope some of them will develop into unicorns, gazelles or at least a means of viable renewal of the structural composition of the economy. Both technologically advanced and middle income countries adopt incentives of various kinds to help entry and scale up of national companies. Unfortunately most of them do not survive or grow (Audretsch, 1991; Hurst and Pugsley, 2011). As emphasised by Schoar (2010) in her synthesis of entrepreneurship on a global basis, there is a gap between the small number of transformative entrepreneurs whose ambition and capabilities are aligned with scaling a dynamic and growing business and the much more prevalent incidence of subsistence entrepreneurs whose activities are an (often inferior) substitute to low-wage employment (Guzman and Stern, 2016). We know that *innovative startups survive longer than their non-innovative counterparts* (Colombelli at al., 2016) following the process of Schumpeter's creative destruction (Aghion and Howitt, 1992), but there is little evidence a priori, which ones will be the really innovative ones. Hence, which companies will grow remains the real challenge for the design of public incentives: policy makers are trying to address this challenge with eligibility criteria reflecting priorities and likelihood of success knowing or hoping that these will create an effective selection process (i.e. they will lead to supporting likely survivors and companies to scale up).

Academic research in the US and Europe suggests that it is possible to estimate *entrepreneurial quality by linking the probability of a growth outcome (e.g., achieving an IPO or a significant acquisition) as a function of start-up characteristics observable at or near the time of initial business registration e.g., the firm name or filing for a trademark/patent.* Guzman and Stern have built their Entrepreneurship Quality Index (EQI) and the Regional Entrepreneurship Cohort Potential Index (RECPI) to help precisely examine the dynamics of entrepreneurial quality over time on a near real-time basis. To build such indexes they examine start-up characteristics such as whether the founders name the firm after themselves (eponymy), whether the firm is organised in order to facilitate equity financing (e.g., registering as a corporation or in Delaware), or whether the firm acquires or develops measurable innovations (e.g., a patent or trademark) (Guzman and Stern, 2016). Recent empirical literature from various countries is trying to capture fostering and hindering factors leading to success looking at generic features (Richter et al., 2016) or more specific ones, focusing on the selection of the name (Belenzon et al., 2017), human capital (Bendickson et al, 2017), characteristics of the CEO or access to venture capital (Guerini and Quas, 2016) and others.

In countries with limited well-organised and transparent company data the identification of information suggested above is limited. These are, however, precisely the countries that need success of public intervention to lead to entrepreneurial quality most. One way to circumvent the lack of nationally collected data is to use the company digital footprint as a proxy for openness to innovation. Using digital footprints has been gaining momentum in entrepreneurship-related empirical research in recent years as the Web has become one of the most profitable tools for marketing and sales. Firms are increasingly observed changing the revenue models because of the remarkable

return on the internet and modifying and renewing the key elements of traditional marketing. Then social media have also become a turning point due to their real opportunities from the standpoint of business such as; cost effectiveness, time saving and engagement with customers. After the emergence of new technologies, customers have been looking at social media instead of Google or other search engines in order to get information about the companies (Newman, 2013). Social Media is by many authors seen as an advantage to build trust between the customers and the company in a way that has never before been seen with the traditional media (Deelmann and Loos, 2002). It is implied *that both researchers and entrepreneurs are facing new opportunities due to the emergence of online social networks* (SONG, 2015). A review of the literature indicated seven social media channels that entrepreneurs use most commonly and they are particularly useful for relationships building and new marketing models, in particular enabling entrepreneurs with limited budgets (Granger et al., 2015).

There have been numerous studies on the adoption of social media among individuals as well as organisations. It has been reported that the electronic word of mouth that takes place through Internet-based technology is a more influential and effective medium for users than traditional word of mouth as the opinion sharing and exchange of information can be immediately disseminated to reach a potentially wider audience (Litvin et al., 2008). Electronic access, the internet and Social Media have radically transformed business opportunities and hence changed business models. After the end of the 20th century, first movers, whether developers or users, have gained significant benefits and oligopolistic rents. Just a little later platform developers succeeded in reaping benefits from economies of scale. Finally, after the 2008 crisis (and only partly because of it) more and more traditional SMEs started taking advantage of the potential offered by the internet (including e-commerce) and social media. For financially less sound companies and companies located in countries with credit restrictions, the internet and social media present a unique opportunity to access the global market at a reasonable cost. A conclusion seems to be crystalising the "In addition to this, smaller companies are more suited to utilise SNM due to their greater flexibility and higher need to contain marketing communications costs" (Pentina et al., 2012). For companies, connecting through SM with the global community increases exposure, reduces marketing costs, increases customer base, and develops the brand image. Both small and large businesses realise the influence of social media influencers on public opinion (Karr, 2014). The effect of SM on businesses impresses on the fact that companies can rely on such data to conduct their consumer behaviour and marketing research studies. It comes as no surprise then that companies look for these influencers on various social media sites and send them free product samples to review (Karr, 2014). Reviewing the literature (McCann and Barlow, 2015; He et al., 2014; Durkin et al., 2013; Ahmad et al. 2017) have shown that Social Media is a useful tool that could help businesses get closer to the customers and become more competitive (Ahmad et al., 2017).

Specific studies (Öztamur et al., 2014) have used as variables the number of likes, the frequency of update, richness and relativeness of the content, interaction of engagement, the use of language and punctuation or spelling mistakes in the Facebook and Twitter accounts of their case studies conclude that "the American companies are more prone to apply the required strategies and the factors when compared to the social media use of Turkish companies" and that dynamic industries such as "fashion-retail chains" strive more than conventional industries such as "bakery-retail chains" on social media medium and this obviously affects their amount of customer followers". The

conclusion of the paper is that SMEs, planning to use social media mediums as a competitive marketing tool should spend time to create rich contents on their social media accounts to attract their target customers' attention. Others used Social Media to assess the personality of entrepreneurs and distinguish the promising (or "superstar") entrepreneur from the average one (Obschonka et al., 2017).

The problem remains that, while 90% of companies globally recognise that the digital transformation is a crucial aspect of company strategy many entrepreneurs have not fully understood and internalised the potential of social media for their businesses. Those who use social media do not use tools optimally because they use only selected tools due to some certain limitations present from infrastructure and technical capabilities. This means that businesses in these countries have not benefited adequately from technology and specifically social media despite its wide usage by potential customers. This is a golden opportunity that could enhance entrepreneurship growth and gain a competitive edge against large companies that traditionally have resources and have been in business for a long time (Samuel and Sarprasatha, 2015).

This brief review suggests that, while it would be ideal to test entrepreneurial quality with a large number of parameters deriving from longitudinal data, when these data are not available we can attempt to use the digital footprint as a proxy for the dynamism of SMEs and startups. This seems to be more relevant for developing and middle income countries lacking data, for smaller companies lacking resources for more sophisticated models and for different uses of the internet and social media. In the following section we suggest a way to distinguish companies that are potentially open to innovation based on their current digital footprint.

Data and methodology

The raw dataset was retrieved from the Integrated Information System of the Greek Managing Authority of the Structural Funds' Support Scheme of the European Union. It included State Aid schemes (i.e. public support to profit-oriented companies) in the period 2007-2013. The total population we started with is composed of 6010 companies broken down into 402 public limited companies, 197 limited liability companies (AE), 663 General Partnerships, 196 Limited Partnerships, 16 Private Companies, 12 Social Enterprises and 4524 companies of personal liability. The traditional type of limited liability companies (AE), public limited companies and Social Enterprises have been excluded, as they have been dealt with in other studies and public domain data on their balance sheets exists. Our target group, which is the type of companies, that cannot be easily studied as there are no regular registries and publications with their data offering a wider scope for original research, is General and Limited Partnerships, Private Companies and companies of personal liability.

After isolating the companies under these types of legal form and removing any duplicates, our data was comprised of 3996 companies. We created a statistically significant sample of 2000 companies using random sampling, representing each business entity proportionately to its share in our dataset. By testing if the difference of proportions, between our expected and actual sample proportions is statistically significant by using the Chi-square test of proportions with a 0.05 confidence level, we came to the conclusion that the difference in proportions isn't statistically significant, ergo the representation of each entity is statistically sound.

Our ensuing sample of 2000 companies is comprised of, 319 General partnerships, 96 Limited Partnerships, 8 Private Companies (the new Limited Liability Form IKE[1]) and 1577 companies of personal liability.

We searched the 2000 companies of our sample using their formal company name (name on the database as declared for the financial support) and rated them individually for the following five binary variables:

- Whether the company has an official Facebook (F) page
- Whether the company has LinkedIn (L) presence (i.e. the founder)
- Whether the company has a site
- Whether the company has a site with registered domain name
- Whether the company has e-mail with domain name.

In addition we selected eight categorical variables (1:3) as follows:
References (Re): Whether there are references to the company in free web-search (e.g. awards, articles in the press or specialised events etc.)
Size: (of the site): Number of pages 1=less than 4; 2=4-6 pages; 3>6 pages
Information on the company profile: (1= Rudimentary information only; 2=Some information on the company alone; 3=Extensive background about company, policy and staff)
Sales: 1=no possibility to sell form the site; 2= Detailed information and possibly basic e-shop; 3 = e-shop and active promotion
Search function on the site: (1= NO search function at all; 2= Rudimentary search possibility; 3=Multiple Options and Good Response Rate)
FAQ: 1= no questioning ability; 2= only predefined questions; 3= Section and grouped questions with extensive answers
Communication: 1= No communication ability or simple address/tel., 2=Just mail, 3= Enhanced forms of access/communication
Update: 1=until 2012; 2=until 2014; 3=up to date
Support (after sales support): 1= Telephone only; 2= Communication Board; 3= Chat)

	1=	2=	3=
References	Almost no references	Low Profile	High Profile
Size	Small	Medium	huge
Information	Low	Medium	Extensive
Sales	Non existent	Information (enhanced)/e-shop (basic)	e-shop (enhanced) and newsletter
Search	Non existent	Mediocre	Multiple Options
FAQ	General Questions	In Depth Questions	Section/Section Size
Communication	no thumbnail, no mail	just mail	availability of question form, map and membership
Update	Old	Until 2014	Up-to-date
Support	telephone only	Communication board	Chat

[1] Law 4113/8.6.2012 created a new form of Limited Liability Company where founders are allowed to contribute in kind rather that liquid resources; this was a decision to stimulate economic growth by giving opportunities to entrepreneurial people who lack the resources to create a traditional Ltd (AE).

Using these variables 1319 companies were rated, whereas 681 had no digital footprint. One may argue that some companies have changed name between the time of the grant and the time of search. In order to minimise this source of misinformation we searched the web also with the name of the founder and could not get additional access. Hence, one can reasonably assume that about one third of the companies supported are not modernizing/adopting sales and communications techniques.

For the 1319 companies for which information was found we calculated an individual rating per company using a two-step model as follows:

1. For companies, which have a site, one component of their rating was a "Site variable" (SV), calculated as the average rating of the "site" characteristics, namely: Size; Information; Sales; Search; FAQ; Communication; Support; Site Domain; E-mail Domain and Update. SV takes a value of 0 for companies with no site presence and 1<SV<2.6 (Max = (2*1 + 8*3)/10).
2. The actual rating was then calculated as R= Sum of the values of the variables that were not related to the existence or not of a site, namely References; Facebook and LinkedIn presence plus the SV

$$R = F + L + Re + SV$$

The relevance of the digital footprint undoubtedly differs from sector to sector, hence some sort of filtering should be applied, after the unified calculation of the initial R leading to R* and R**. We assume that in low concentration, hence higher competition sectors, the digital presence of a company is more important than in oligopolistic sectors. As a proxy we used sectoral concentration, i.e. number of companies active in the sector. Using data from the Research Institute of the General Confederation of Labour[2] we concluded that for the following two sectors, that cover approximately 45% of the total number of companies the digital footprint is more relevant:

- Wholesale and Retail Trade, repair of motor vehicles and motorcycles
- Accommodation and Catering Services Activities

For these two sectors with low concentration, we adapted our initial rating, by customizing the Site Variable (SV) into SV* and keeping the most important observed variables for these sectors. The formula R= F + L + Re + SV changes into R*= F + L + Re + SV*::

The Site Variable (SV*) of the new rating R*, is calculated as the average rating of Size; Sales; Search; FAQ; Communication; Support; Site Domain and E-mail Domain. Subsequently, we scaled R* to the same upper limits as R so as to be comparable with both the original and R** that follows. As a result,

$$R^* = (F + L + Re + SV^*) * 7.7/7.5$$

The rest of the sectors, that cover the other 55%, are considered high concentration, hence lower competition, sectors where company information, associations and cooperation are more important than a commercial digital footprint. Ergo, we customised our rating R into R** for the following low concentration sectors:

- Other service activities
- Real Estate Management
- Administrative and Supporting Activities
- Activities related to Human Health and Social Care
- Education
- Information and Communication
- Professional, Scientific and Technical Activities

[2] http://www.inegsee.gr/wp-content/uploads/2017/03/ETHSIA_EKTHESH_2017.pdf

- Constructions
- Manufacturing
- Transport and Storage
- Mines and Quarries
- Electricity, Natural Gas, Steam and Air-Conditioning Supply
- Water Supply, Wastewater Treatment, Waste Management and Cleaning Activities
- Arts, Entertainment and Recreation
- Financial and Insurance Activities

For these sectors with high concentration, we adapted our initial rating, by customizing the Site Variable (SV) into SV** and keeping the most important observed variables for these sectors. The formula R= F + L + Re + SV changes into R**= Re + SV**:
The Site Variable (SV**) of the new rating R**, is calculated as the average rating of Information; Sales; Communication; Site Domain; and E-mail Domain. Subsequently, we scaled R** to the same upper limits as R so as to be comparable with both the original and R* that preceded. As a result,

$$R^{**} = (Re + SV^{**}) * 7.7/5.2$$

The differences of both R* and R** from the original R are statistically significant, as shown by their respective paired t-tests. And the differences of means between R* and R** are statistically significant, as shown by the use of the Kruskal Wallis test.

Results and interpretations

Searching the internet for the 2000 companies of our sample we found a sub-set of 1319 companies with digital footprint. The 681 companies with no presence at all may have ceased operations or they are operating without any use of either the internet or social media. The breakdown per variable is presented on Table 1:

Through the results per binary variable for the 2000 companies researched and the sub-set of 1319 with digital footprint we can observe that 43% of companies that were found to have a digital footprint lacked even a Facebook page. The worrying picture continues when looking at the LinkedIn presence of rated companies, with only 9% of them appearing through either the profile of board members (or directors) or a company profile on LinkedIn.

Table 1: Shares of companies by positive /negative position in binary variables in the total sample and in the population of companies with digital footprint

	Total Sample		**Companies with digital footprint**	
	0	1	0	1
Exists	0.34	0.66	-	-
Facebook	0.71	0.29	0.57	0.43
Site	0.80	0.20	0.70	0.30
LinkedIn	0.94	0.06	0.91	0.09
Site Domain	0.81	0.19	0.71	0.29
E-Mail Domain	0.85	0.15	0.77	0.23*

* It was highly surprising that some companies with site domain were using public domain e-mails
0 = Lack of variable; 1= Presence for the particular variable

The results per categorical variable for the 2000 companies researched and the sub-set of 1319 with digital footprint respectively suggest that References are very limited with only 1% of the companies observed being top rated, whereas over 33% had no references at all. By and large only in Communications a reasonably high share received top scoring. The only variable where companies achieve higher scores is update, indicating at least that more companies than not, when they invest in digital means, they do it regularly.

Table 2: Shares of companies by positive/negative position in categorical variables in the total sample and in the population of companies with digital footprint

	Total Sample				**Companies with digital footprint**			
Rating / **Variable**	0	1	2	3	0	1	2	3
References	0.34	0.59	0.06	0.01	-	0.90	0.08	0.02
Size	0.80	0.07	0.07	0.06	0.70	0.11	0.11	0.08
Information	0.80	0.04	0.08	0.08	0.70	0.06	0.12	0.12
Update	0.80	0.03	0.08	0.09	0.70	0.04	0.12	0.13
Sales	0.80	0.09	0.06	0.05	0.70	0.13	0.09	0.08
Search	0.80	0.12	0.02	0.05	0.70	0.19	0.04	0.07
FAQ	0.80	0.06	0.10	0.03	0.70	0.10	0.15	0.05
Communication	0.80	0.02	0.04	0.13	0.70	0.03	0.07	0.20
Support	0.80	0.08	0.12	0.01	0.70	0.11	0.18	0.01

0 = No digital footprint; 1-3: As described above

The Ratings calculated were aggregated using four classifications: Sector of activity; Region; Type of intervention and type of company. In all four cases we checked for statistical significance of the difference of means initially testing the equality of variances by Fligner test and then testing the equality of means by the use of the Kruskal Wallis test[3]. The results are presented below in summarised tables, while the full statistical description is presented on the Appendix for all four groups calculated.

Rating per sector

The following table gives an overview of the rating per sector. For the three sectors with the lowest concentration both the initial rating R and the recalculated R* are presented. Our tests indicated that the results of the sectoral rating are statistically significant.

In particular, as presented on Table 3 the highest average ratings Median) are received in companies with Administrative and Supporting Activities, followed by real Estate Development (with only four companies) and Tourism. While Real Estate is only represented by four companies, the other sectors are covered with a sufficient number of entities to indicate a reliable performance. Conversely Energy Companies, the Financial Sector and Commerce

[3] This was chosen over ANOVA because the data lacked normality and equality in variances.

are rated below 2[4]. In particular for Commerce, where e-commerce is rapidly eroding the market of physical commerce[5], this calls for policy intervention to link support to e-commerce. It's interesting to note that just three sectors covered more than half of the companies we rated (55.7% to be exact), namely; Wholesale and retail Trade, Repair of Motor Vehicles and Motorcycles covered 30.1% percent of our rated companies, Manufacturing covered 13.9% and Accommodation and Catering Services Activities 11.8%. We can also observe that the percentages of companies without a site for each sector are incredibly high, with an average of 68.6% chance for a company not to have a site across the board. The only sector where more than half of the companies rated had a site, is Administrative and Supporting Activities. Something that is reflected on the average rating. As expected we can see that there's a high linear correlation, between the Average Rating and the percentage of rated companies without a site (with a value of -0.93 in the Pearson statistic).

Observing the sectoral ratings, we can see that Construction entered the group of highly rated sectors, while Wholesale and retail Trade, Repair of Motor Vehicles and Motorcycles remained in the lower ranks.

Table 3: Rating per sector

Activity Codes	**Average Rating**	**% with no site**	**Coverage Rate by Group**
Other service activities	2.09/2.21**	73.3%	4.5%
Real Estate Management	2.65/2.67**	50%	0.3%
Administrative and Supporting Activities	3.02/3.2**	49%	3.7%
Activities related to Human Health and Social Care	2.09/2.14**	77.6%	5.1%
Accommodation and Catering Services Activities	2.61/2.63*	61.9%	11.8%
Education	2.40/2.45**	62.9%	2.7%
Information and Communication	2.40/2.61**	62.7%	4.5%
Professional, Scientific and Technical Activities	2.37/2.43**	64.4%	7.7%
Constructions	2.32/2.68**	57.9%	1.4%
Manufacturing	2.16/2.4**	67.8%	13.9%
Transport and Storage	2.30/2.52**	65.8%	5.8%
Mines and Quarries	1.00/1.48**	100%	0.1%
Electricity, Natural Gas, Steam and Air-Conditioning Supply	1.40/1.86**	85.7%	4.8%
Water Supply, Wastewater Treatment, Waste Management and Cleaning Activities	1.78/2.15**	75%	0.3%
Arts, Entertainment and Recreation	2.44/2.49**	66.7%	2.7%
Wholesale and retail Trade, Repair of Motor Vehicles and Motorcycles	1.90/1.93*	77.6%	30.1%

[4] We do not consider the results for mining and water treatment as representative because of the very small number of companies rated

[5] Eurocommerce, UNI Europa, (2017), Analysis of the Labour Market in Retail and Wholesale, Brussels: IDEA Consult

Financial and Insurance Activities	1.59/1.75**	80%	0.8%

Rating per region

Ratings per region are not only much closer to each other but they are the only group that proved to be not statistically significant after our tests. Hence, the top regions, namely Attica and Continental Greece, which unsurprisingly rate at the top, may not call for policy refinements. Addressing regional coverage, most of our rated companies originated in Crete (16.1%) followed by Thessaly and Eastern Macedonia & Thrace (12%), the commercial centers of Greece, namely; Attica and Central Macedonia, covered 10.5% and 9.7% respectively. The percentage of companies without a site is extremely high for all regions, with more than 80% of the companies originating Western Macedonia, Thessaly and South Aegean having no working site.

Table 4: Rating per region

Region	Average Rating	No Site % per treatment	Coverage Rate by Group
Eastern Macedonia & Thrace	1.38	77.8%	12.0%
Attica	1.61	60.4%	10.5%
North Aegean	1.53	69.7%	5.0%
Western Greece	1.51	69.6%	9.5%
Western Macedonia	1.07	82.1%	2.1%
Epirus	1.45	69.5%	6.2%
Thessaly	1.08	80.4%	12.0%
Ionian Islands	1.09	74.4%	3.0%
Central Macedonia	1.59	67.2%	9.7%
Crete	1.48	67%	16.1%
South Aegean	1.25	81.3%	1.2%
Peloponnesus	1.55	65%	9.3%
Continental Greece	1.91	62.2%	3.4%

Rating per type of intervention

The results broken down per programme are statistically significant. Territorial Cooperation and Youth Entrepreneurship rate top[6] while Female Entrepreneurship, Large Family support and Entrepreneurship Support for the Roma bottom. The Development Law supporting the highest number of manufacturing and value added services rates in the middle. This indicates that the European Social Fund is supporting companies that have a lower likelihood of growth than the European Regional Development Fund. However, it is a matter for further research to weight our ratings with the amounts of support, as the low rated interventions are those that offer typically the smaller grants. As stated earlier, the rated companies funded by Female

[6] Three companies were classified under non-identifiable support programmes

Entrepreneurship programs cover 46% of our data set, which is more than the three top scoring interventions combined (excluding the non-statistically significant unknown interventions), namely; Territorial Cooperation (11.4%), Youth Entrepreneurship (16.4%)and the development Law 3299/2004 (15.4%). It's important to notice that there's a high percentage of companies with no working site under every program, with only 15.3% of the companies under Large Family Support programs and only 12.1% of the companies under Entrepreneurship support for Roma programs having a site. As expected we can see that there's a high linear correlation, between the Average Rating and the percentage of rated companies without a site (with a value of -0.99 in the Pearson statistic).

Table 5: Rating per intervention

Intervention	**Average Rating**	**No Site % per treatment**	**Coverage Rate by Group**
Development Law 3299 2004	2.15	68.5%	15.4%
Territorial Cooperation	2.48	61.6%	11.4%
OTHER	3.37	33.3%	0.2%
Female Entrepreneurship	2.12	72.8%	46.6%
Youth Entrepreneurship	2.42	61.1%	16.4%
Large family support	1.68	84.7%	7.4%
POM 2007	1.46	87.9%	2.5%

Ratings per type of company

Results per type of company are absolutely conforming to intuitive thinking and are statistically significant: Limited liability companies have the highest rating. It is of interest to note that the ratings of the new form of Ltd, IKE, while only 7 in number and hence with limited power of interpretation, seems to justify the decision to create this new legal framework and companies registering as IKE have a higher openness to digital presence. At the same time the very low rating of companies identical to the individual founder is not surprising, since these companies do not necessarily have the means to activity pursue new ventures. It's immediately apparent that the amount of Individual Entrepreneurs rated greatly outweighs any other legal entity covering 72% of our rated companies, with General Partnerships covering 20.7% of the remaining companies. It's worthy to note that 73.7% of the Individual Entrepreneurships operated with no working site. On the other hand only 28.6% of the Private Capital companies rated had no site, a difference also observed in the difference between the average ratings of the two legal entities. As expected we can see that there's a high linear correlation, between the Average Rating and the percentage of rated companies without a site (with a value of -0.99 in the Pearson statistic).

Table 6: Rating per type of company

Type of Company	**Average Rating**	**No Site % per treatment**	**Coverage Rate by Group**
Partially Limited company (EE)	2.43	62.9%	6.7%

General Partnership (OE)	2.38	61.2%	20.7%
Private Capital Company (IKE)	3.84	28.6%	0.5%
Individual entrepreneurs (ATOMIKES)	2.07	73.7%	72.0%

Conclusion

The Ratings calculated were aggregated using four classifications: Sector of activity; Region; Type of intervention and type of company. The sectoral pattern (refined to test the need for digital presence using concentration as a proxy for competitive pressure) shows which sectors have been more dynamic towards investing in their digital presence (Administrative and Supporting Activities, followed by real Estate Development and Tourism. Conversely Energy Companies, the Financial Sector and commerce are rated low. In the case of regional comparison, there seems to be a unified pattern in the country with no statistically significant differences observed. But the type of instruments and type of companies supported offer some interesting insights on expected future performance, assuming that the digital footprint investments will pay off.

We interpret these results as a new way to assess potential dynamism and growth of publicly-supported companies in Greece. We see them as paving the way for further research in three ways:

- Use similar digital footprint variables in other countries with limited open access datasets
- Get access to additional data on the profitability of companies at a later stage and correlate profitability with digital presence and
- Last but not least find, for a limited number of cases the quality index variables reported in the US literature and test their compatibility with our results.

In academic terms it is not until after such additional research that we will be able to confirm our hypothesis that the digital footprint correlates with economic success. However, in terms of development policy, incorporating digital footprint enquiries into the selection criteria of public incentives may be an issue worth considering already now.

Appendices

Appendix 1: Rating per sector

Activity Codes	Variance Rating	Standard Deviation Rating	Average Rating	Median Rating	Max Rating	Number of Firms Rating	Coverage Rate by Group
Other service activities	1.4561	1.2067	2.09	1.0	5	60	4.5%
Real Estate Management	4.1700	2.0421	2.65	2.2	5.2	4	0.3%
Administrative and Supporting Activities	4.1086	2.0270	3.02	2.8	7.4	49	3.7%
Activities related to Human Health and Social Care	2.0464	1.4305	2.09	2.0	6.4	67	5.1%
Accommodation and Catering Services Activities	3.3620	1.8336	2.61	2.0	7.3	155	11.8%
Education	1.7512	1.3233	2.40	2.0	6.1	35	2.7%
Information and Communication	2.9629	1.7213	2.40	1.0	7.2	59	4.5%
Professional, Scientific and Technical Activities	2.5653	1.6017	2.37	2.0	6.9	101	7.7%
Constructions	3.1870	1.7852	2.32	1.0	6.2	19	1.4%
Manufacturing	2.1057	1.4511	2.16	2.0	7.3	183	13.9%
Transport and Storage	3.1629	1.7785	2.30	1.0	7.6	76	5.8%
Mines and Quarries	0.0000	0.0000	1.00	1.0	1	1	0.1%
Electricity, Natural Gas, Steam and Air-Conditioning Supply	1.2282	1.1083	1.40	1.0	7.5	63	4.8%
Water Supply, Wastewater Treatment, Waste Management and Cleaning Activities	2.4025	1.5500	1.78	1.0	4.1	4	0.3%
Arts, Entertainment and Recreation	2.1716	1.4736	2.44	2.0	6	36	2.7%
Wholesale and retail Trade, Repair of Motor Vehicles and Motorcycles	1.8794	1.3709	1.90	1.0	6.4	397	30.1%
Financial and Insurance Activities	0.4810	0.6935	1.59	1.5	3	10	0.8%

Appendix 2: Rating per region

Region	Variance Rating	Standard Deviation Rating	Average Rating	Median Rating	Max Rating	Number of Firms rated	Coverage Rate by Group
Eastern Macedonia & Thrace	2.0609	1.4356	1.38	1.0	7.4	158	12.0%
Attica	2.7794	1.6672	1.61	2.0	7.1	139	10.5%
North Aegean	2.9188	1.7085	1.53	1.0	7.1	66	5.0%
Western Greece	2.6782	1.6365	1.51	2.0	7.6	125	9.5%
Western Macedonia	1.4780	1.2157	1.07	1.0	5.2	28	2.1%
Epirus	2.4939	1.5792	1.45	2.0	7.3	82	6.2%
Thessaly	1.5249	1.2349	1.08	1.0	6	158	12.0%
Ionian Islands	2.8402	1.6853	1.09	1.0	6.1	39	3.0%
Central Macedonia	2.4070	1.5515	1.59	1.0	7.2	128	9.7%
Crete	2.3961	1.5479	1.48	1.0	7.2	212	16.1%
South Aegean	1.7876	1.3370	1.25	1.0	5.4	16	1.2%
Peloponnesus	2.9087	1.7055	1.55	2.0	7.3	123	9.3%
Continental Greece	2.4326	1.5597	1.91	1.8	6.2	45	3.4%

Appendix 3: Rating per intervention

Type of Intervention	Variance Rating	Standard Deviation Rating	Average Rating	Median Rating	Max Rating	Number of Firms rated	Coverage Rate by Group
Development Law 3299 2004	2.7537	1.6594	2.15	1.0	7.5	203	15.4%
Territorial Development	3.0457	1.7452	2.48	2.0	7.6	151	11.4%
OTHER	6.6033	2.5697	3.37	3.0	6.1	3	0.2%
Female Entrepreneurship	2.1619	1.4703	2.12	1.0	7.4	615	46.6%
Youth Entrepreneurship	2.6232	1.6196	2.42	2.0	7.3	216	16.4%
Large family support	1.4319	1.1966	1.68	1.0	6.9	98	7.4%
Roma	1.3275	1.1522	1.46	1.0	6.1	33	2.5%

Appendix 4: Rating per type of company

Type of Company	Variance Rating	Standard Deviation Rating	Average Rating	Median Rating	Max Rating	Variance Rating	Coverage Rate by Group
Partially Limited company (EE)	2.1550	1.4680	2.43	1.0	7.3	89	6.7%
General Partnership (OE)	3.6147	1.9012	2.38	2.0	7.6	273	20.7%
Private Capital Company (IKE)	4.6062	2.1462	3.84	3.5	7.4	7	0.5%
Individual entrepreneurs (ATOMIKES)	2.7074	1.6454	2.07	1.0	7.5	950	72.0%

The sample is statistically sound, tested by the use of Chi-square hypothesis test, with a significance level of a=0.05.
Correlation scores were calculated through the Pearson statistic.

Tests per Sector

The difference of means of both sectoral ratings with our initial rating is statistically significant, tested by the use of a two-tailed paired t-test, with a significance level of a=0.05
The difference of means between R* and R** is statistically significant, tested by the use of a two-tailed t-test for unequal variances, with a significance level of a=0.05
The average R* and R** are statistically significant, tested by the use of the Kruskal Wallis test, with a significance level of a=0.05
The difference of Variance per company sector is statistically significant, as tested by the Fligner test of equality of Variance with a significance level of a=0.05, leading us to using the non-parametric Kruskal Wallis hypothesis test, for the difference of means.
The average ratings per Company Sector are statistically significant, tested by the use of the Kruskal Wallis test, with a significance level of a=0.05.

Tests per Region

The difference of Variance per Region is statistically significant, as tested by the Fligner test of equality of Variance with a significance level of a=0.05, leading us to using the non-parametric Kruskal Wallis hypothesis test, for the difference of means.
The average ratings per Region are not statistically significant, tested by the use of the Kruskal Wallis test, with a significance level of a=0.05.

Tests per Type of Intervention

The difference of Variance per Type of Intervetion is statistically significant, as tested by the Fligner test of equality of Variance with a significance level of a=0.05, leading us to using the non-parametric Kruskal Wallis hypothesis test, for the difference of means.
The average ratings per Type of Intervention are statistically significant, tested by the use of the Kruskal Wallis test, with a significance level of a=0.05

Tests per Type of Company

The difference of Variance per Type of Company is statistically significant, as tested by the Fligner test of equality of Variance with a significance level of a=0.05, leading us to using the non-parametric Kruskal Wallis hypothesis test, for the difference of means.
The average ratings per Type of Company are statistically significant, tested by the use of the Kruskal Wallis test, with a significance level of a=0.05

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