



NATIONAL BANK OF GREECE
Economic Analysis Department

Survey of Greek SMEs: IT clusters and tech startups

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- ❑ IT enterprises have displayed resilience in the face of the crisis – spearheaded by the small and medium enterprises of the sector, which grew their sales by 6 per cent per year during 2009-2014 (versus contraction of 0.2 per cent by larger IT firms with sales between €10 million and €50 million). The positive picture presented by small and medium-sized IT enterprises is backed by the results of our survey of a sample of 1,200 firms, indicating their advantage mainly in growth dynamics, export orientation, innovation and digital technology. When taking a closer look at the structure of the IT services industry, it becomes clear that there are two distinct pillars supporting the growth of the IT sector: the dynamism of the tech startups ecosystem and firms organized in clusters.
- ❑ Corroborating the results of studies on European clusters, our study indicates that organization in IT clusters enhances sales and business development (with Greek IT SMEs that are cluster members posting average annual sales growth of 17 per cent in the period 2008-15 versus 5 per cent for other SMEs in the sector). The key strategic benefits appear to be the following:
 - ✓ strengthening of export orientation (with 42 per cent of sales directed to foreign markets versus 14 per cent of other IT SMEs), and
 - ✓ encouraging strategic partnerships (with 83 per cent of enterprises in clusters stating that there are significant benefits from strategic partnerships versus 53 per cent for other SMEs in the sector).
- ❑ Despite the relative advantages for companies that are members of tech clusters, such kinds of configurations still seem to have low penetration in Greece, as the respective cluster of Athens covers just 3 per cent of IT firms operating in the city (versus respective European averages of circa 30 per cent). The inefficient legal framework (especially in terms of intellectual property protection and enforcement of business contracts) in tandem with the weak links of academia with the business sector seems to be the main reasons for the low participation of Greek companies in clusters.
- ❑ IT startup ecosystems are cradles of rapid growth worldwide – the top performers being those of Silicon Valley, Tel Aviv, London and Berlin. The Greek ecosystem for IT startups is still in its infancy (with a total valuation of approx. €0.3 billion), though it already shows high growth potential. According to our survey, Greek startups exhibit stronger dynamism than the rest of the sector, as they achieved higher growth of sales in the period 2008-2015 (18 per cent average per year versus 5 per cent for other IT SMEs), and 54 per cent of them increased employment in the second half of 2015 (versus 24 per cent in the rest of the sector).
- ❑ The strengths that differentiate IT startups are their superior performance in terms of:
 - ✓ innovation (with 29 per cent of their turnover being invested in R&D, versus 15 per cent for other IT SMEs)
 - ✓ human resources (rated excellent by 60 per cent of the sector, versus 39 per cent for other IT SMEs), and
 - ✓ technology absorption (achieving 53 per cent of turnover through e-commerce versus 10 per cent for other IT SMEs, and ¾ of the sector having set up an integrated information system versus 41 per cent for other IT SMEs).

- ❑ When we examine the value of startup ecosystems in the EU (as approximated on an aggregate basis by the valuation attributed by investors to each startup), the Greek system appears to be among the least developed, accounting for 0.3 per cent of GDP in Athens, versus circa 3-4 per cent for medium-sized ecosystems and over 20 per cent for large-sized ecosystems (London and Berlin). On the basis of our econometric analysis, institutional deficits, in combination with the low availability of private investment capital and the weak links of the business sector with academic institutions, hold down both the number and average valuation of Greek startups.
- ❑ The domestic IT sector (SMEs and larger enterprises) contributes value added of €830 million, of which approximately ¼ concerns companies integrated in clusters and startups. According to NBG estimates (taking into account the value that private investment funds attribute to Greek startups), the value added of the IT sector may top €1.8 billion in 2020, offering circa 20,000 new jobs – the key growth vehicles being startups and cluster enterprises, which account for ¾ of the increase.
- ❑ If the business environment in Greece (institutional, infrastructure, private investment, academic support) gradually approaches the European average (excluding countries with highly developed startup ecosystems), the value added of the sector could increase to €5.8 billion, by means of:
 - ✓ tripling the number and nearly quadrupling the average valuation of startups, and
 - ✓ higher participation of companies in clusters (25 per cent from 3 per cent in 2015).The potential contribution in terms of employment would also be significant, as it is estimated that 80,000 new jobs would be created.
- ❑ Given the flexible and extrovert nature of tech startups, it is important that legislative reforms be introduced promoting digital entrepreneurship so as to enlarge the tech startups ecosystem (and to maintain in Greece as great a part as possible of the value added that it can produce), and to encourage the creation of IT clusters and participation in them. To this end, it is important that emphasis be placed on the following:
 - ✓ formulating a comprehensive and consistent legal framework for entrepreneurship (e.g. bankruptcy law, crowdfunding framework) and establishing faster and more effective procedures for defending this framework by the judicial system,
 - ✓ strengthening, on an institutional basis, of the communication channels between the academic community and enterprises,
 - ✓ targeted use of European programs (e.g. the Jeremie business financing program).

□ IT sector

□ NBG survey

- Contribution to the economy
- Financial results of IT enterprises in Greece and Europe

□ Clusters

- Characteristics of IT SMEs
- Supporting factors
- Structure of the sector

□ Startups

- Performance
- Determining factors

□ Outlook and estimates for the Greek IT sector

- Current trends
- Potential impact of startups and clusters

□ Annex

- Financing of the IT sector via European programs
- NBG indicators and models
- Mapping the SME segment in Greece
- Sample description
- Constructing the business confidence index for SMEs
- Survey ID

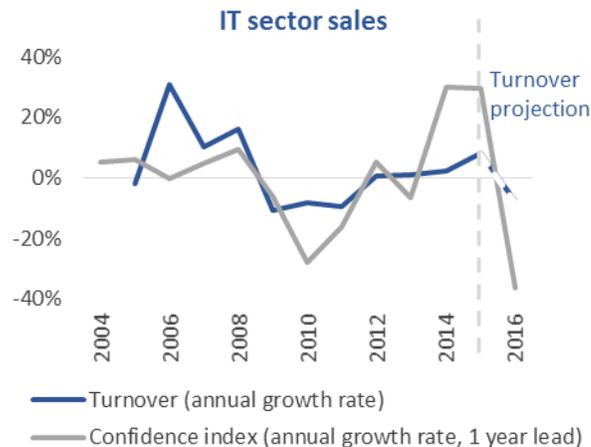
Although Greece has been investing in IT, domestic IT services remain a very small part of the business sector overall

Share of IT sector in Greek economy

	Greece	EU
% of IT sector in GDP	0,5%	2,0%
% of IT sector in employment	0,4%	1,5%
% of IT on business R&D expenses	9,4%	6,3%
% of IT in total investments	13,4%	11,1%
PE funds /GDP	0,04%	0,3%
% PE funds invested in high-tech	1,4%	9,2%
<i>Venture capital</i>	100%	45%
<i>Buyout capital</i>	-	43%
<i>Growth capital</i>	-	12%

*PE: Private Equity, reference period 2007 - 2014

Sources: Eurostat, EVCA, OECD



- ❑ In an environment of low investment activity (with the ratio of investment to GDP at 11.5 per cent in Greece versus 19.1 per cent in the EU) and against a longer-term history of generally low innovation (with the ratio of business R&D expenditure to GDP at 0.3 per cent in Greece versus 1.3 per cent in the EU), the limited development expenditure in Greece appears to be focused to a relatively high degree on IT. Specifically, the ratio of IT investments to total investments is around 13.4 per cent in Greece (versus 11.1 per cent in the EU), while at the same time the ratio of IT to business R&D expenditure is high (at 9.4 per cent versus 6.3 per cent in the EU).
- ❑ In this light, the IT sector in Greece – after a slowdown in sales of around 10 per cent per year in the period 2009-2011 – has grown at an average annual sales growth rate of 3 per cent over the last four years. Nevertheless, according to the confidence index (which shows predictive power vis-à-vis sales), turnover of IT services is expected to decline in 2016 (by circa 5-10 per cent).
- ❑ Overall, the domestic IT services sector does not seem to have built on the momentum of IT investment and remains a very small part of the economy – accounting for 0.5 per cent of GDP and 0.4 per cent of employment (versus 2 per cent of GDP and 1.5 per cent of employment in the EU).
- ❑ A constraining factor for the development of the sector appears to be the low availability of private equity funds, which correspond to just 0.04 per cent of GDP in the last seven years, versus 0.3 per cent in the EU.

IT enterprises have displayed resilience against the economic crisis – spearheaded by small and medium enterprises

- The IT sector in Greece has shown remarkable resilience, with its sales increasing by an annual average of 4 per cent in the period 2009-2014 (versus a decline of 3 per cent for the business sector overall, excluding very large corporations with sales of over €50 million). This relatively positive trend reflects the dynamism of the IT SME segment, which increased sales by 6 per cent per year over the period 2009-2014 (versus a marginal decline of 0.2 per cent for larger IT firms, i.e. with sales between €10 million and €50 million).
- The overall financial picture of the sector appears better than the rest of the Greek corporate sector in terms of profitability, asset turnover, leverage, and liquidity, though marginally weaker than the European average (the higher operating profits of Greek companies partly offset lower asset turnover and higher leverage). In particular, the SME segment of the IT sector appears to stand out positively in the period 2009-2014, with EBITDA margin at an average of 14 per cent (versus 11 per cent in the larger firms of the sector) and the debt-to-EBITDA ratio at 2.9 (versus 4.4 in the larger companies).

Basic Financial Ratios*				
	Greek IT sector		European IT sector	Greek SME's
	2004-08	2009-14	2009-13	2009-13
ROA before tax	8%	2%	6%	-2%
ROE before tax	25%	7%	16%	-4%
EBITDA margin	17%	13%	9%	7%
Profit margin	9%	3%	5%	-4%
Asset turnover	0,86	0,70	1,14	0,43
Debt/EBITDA	1,76	3,29	1,96	13,39
Debt/Equity	2,28	2,31	1,69	1,57
Interest coverage ratio	6,23	2,29	6,93	0,15
ST Liabilities/Liabilities	93%	87%	70%	58%
Cash/Assets	13%	14%	13%	15%
Intangible/Tangible Assets	132%	167%	87%	28%
Operating Cycle	71	127	86	185
<i>Days Payable Outstanding</i>	172	154	78	141
<i>Days Receivables Outstanding</i>	218	247	145	236
<i>Days Stock Outstanding</i>	25	34	18	91
% Growth in Sales	12%	4%	1%	-3%

*Exclude large firms with sales over €50 millions.

Sources: ICAP, Bach, NBG Estimates

Basic Financial Ratios*				
	IT SME's (<10 εκ. €)		IT Large Companies (10-50 εκ. €)	
	2004-08	2009-14	2004-08	2009-14
ROA before tax	9%	3%	3%	2%
ROE before tax	29%	6%	13%	8%
EBITDA margin	19%	14%	9%	11%
Profit margin	10%	3%	4%	3%
Asset turnover	0,89	0,68	0,86	0,72
Debt/EBITDA	1,37	2,94	3,18	4,35
Debt/Equity	2,08	2,15	2,94	2,72
Interest coverage ratio	7,55	2,29	3,07	2,14
ST Liabilities/Liabilities	92%	83%	95%	91%
Cash/Assets	14%	15%	11%	12%
Intangible/Tangible Assets	117%	119%	118%	274%
Operating Cycle	53	122	92	130
<i>Days Payable Outstanding</i>	194	174	135	130
<i>Days Receivables Outstanding</i>	221	258	206	231
<i>Days Stock Outstanding</i>	25	38	21	29
% Growth in Sales	9%	6%	20%	-0,2%

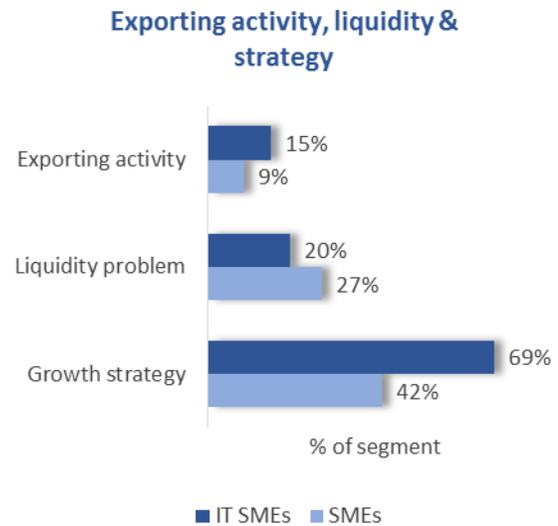
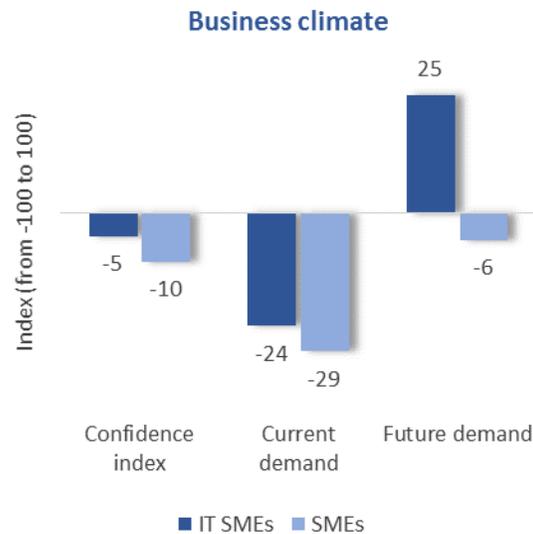
*Exclude large firms with sales over €50 millions.

Source: ICAP, NBG Estimates

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 - Characteristics of IT SMEs
 - Supporting factors
 - Structure of the sector
- Clusters
 - Performance
 - Determining factors
- Startups
 - Performance
 - Determining factors
- Outlook and estimates for the Greek IT sector
 - Current trends
 - Potential impact of startups and clusters
- Παράρτημα
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 - NBG indicators and models
 - Mapping the SME segment in Greece
 - Sample description
 - Constructing the business confidence index for SMEs
 - Survey ID

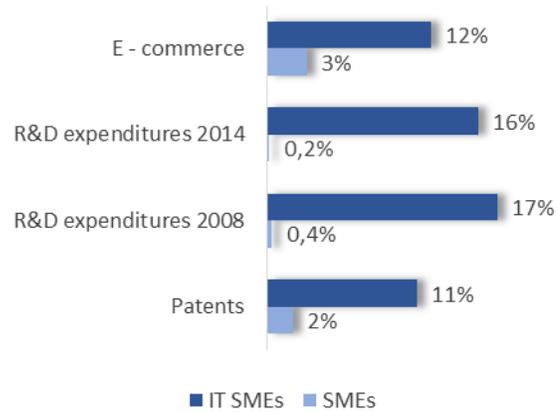
IT SMEs have the edge in terms of growth and export orientation...

- The positive picture painted by IT SMEs is corroborated by the results of our survey of a sample of 1,200 enterprises. Specifically, the confidence index for the sector in the second half of 2015 touched -5 points (5 points higher than the index for all SMEs) – the key driver being expectations of future demand, which topped 25 points (31 points higher than the index for all SMEs).
- This primacy of IT SMEs is reflected in terms of:
 - ✓ Growth – with 69 per cent of the sector stating that they follow a growth strategy, compared with 42 per cent for SMEs overall.
 - ✓ Export orientation – exports account for 15 per cent of sales in the sector (versus 9 per cent for SMEs overall) and remained strong even during the period of capital controls (exports increased by 1 per cent in the Q3.2015 versus 2 per cent in Q2.2015).



... and strong levels in terms of innovation and use of digital technology

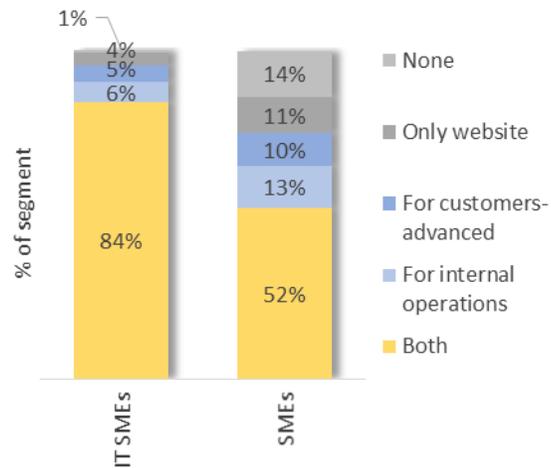
E - commerce and R&D expenditures



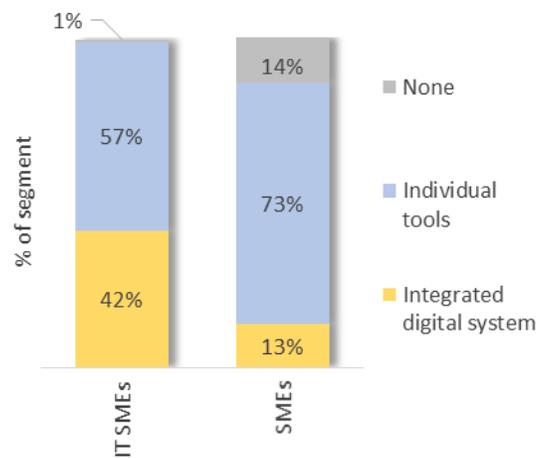
□ The IT sector is one of the most dynamic and technologically advanced segments of Greek business activity, as:

- ✓ 12 per cent of sales are made via e-commerce (compared to 3 per cent for the SME sector overall).
- ✓ R&D spending correspond to 16 per cent of sales versus just 0.2 per cent for SMEs overall, while 11 per cent of the sector holds a patent (versus 2 per cent for the SME sector overall).
- ✓ Almost all IT SMEs use some kind of digital tool (versus 86 per cent for SMEs overall), with 42 per cent of the sector possessing an integrated digital system* (versus 13 per cent for SMEs overall), while 74 per cent of the sector have invested in technology upgrades in the last five years (versus 51 per cent for SMEs overall).

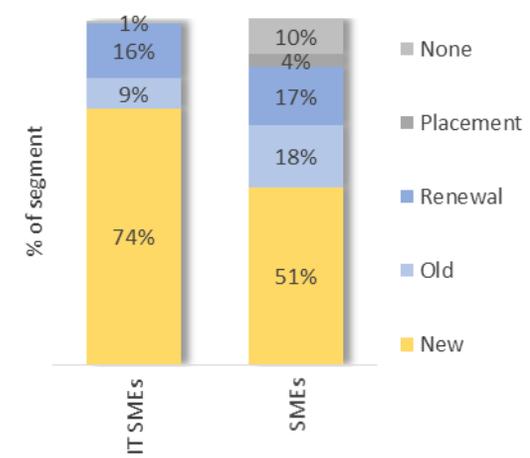
Digital tools



Use of digital tools



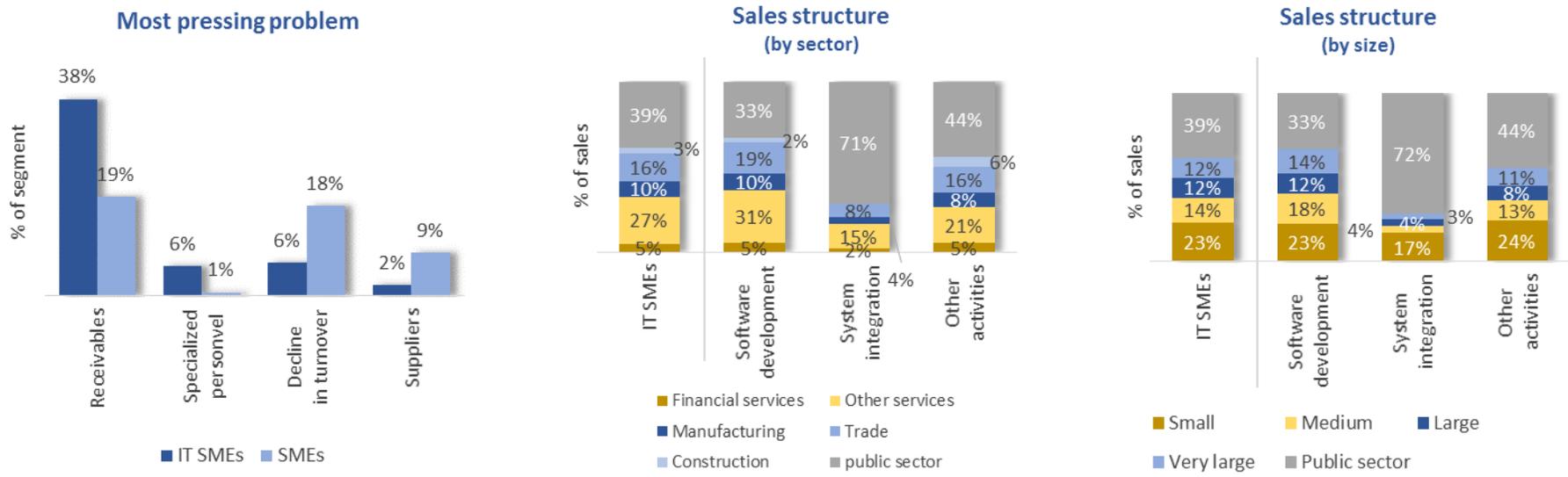
Digital profile



* We have identified systems i) of internal operations, which enable improvements in efficiencies of key operations in the business (e.g. ERP, CRM) and ii) of customers, which enhance communication channels with customers (e.g. website, e-commerce). We consider an enterprise to have an integrated digital system when it combines digital tools in such a way that its efficiency is significantly enhanced through synergies (e.g. a combination of e-commerce, online marketing and CRM comprise an integrated customer system).

A basic weakness of IT SMEs is their dependence on the government sector, which is provoking a squeeze in terms of liquidity (mainly for systems integration enterprises)

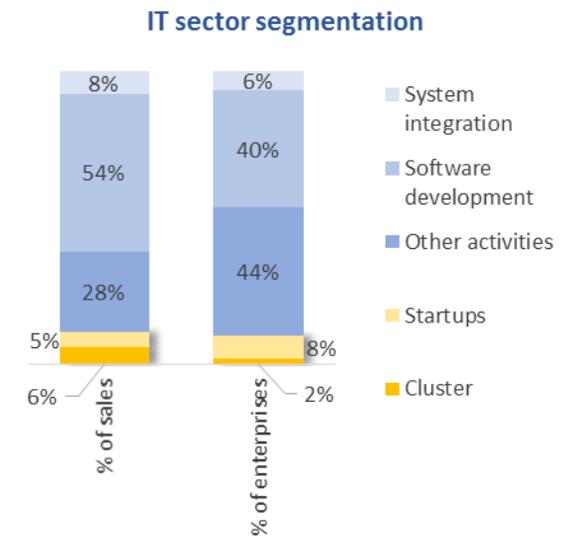
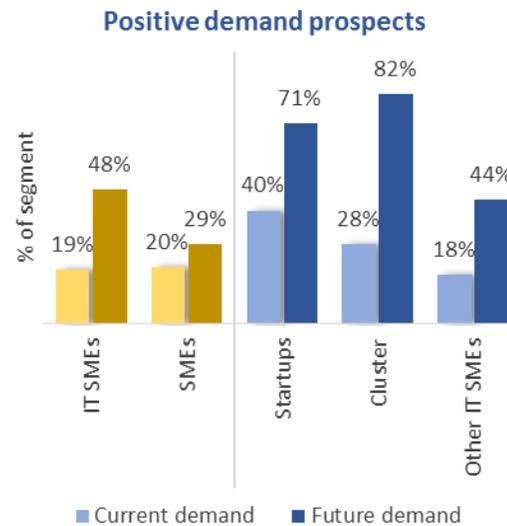
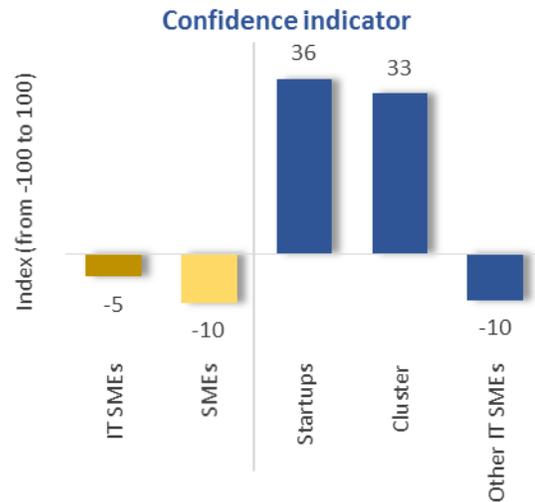
- ❑ Corroborating the relatively healthy course of demand for IT services, only a small percentage of the sector reports decline in sales as the most pressing problem (6 per cent of the sector versus 18 per cent for SMEs overall).
- ❑ However, IT services firms state that two other problems are more pressing:
 - ✓ High levels of outstanding receivables from customers are the most important problem for 38 per cent of the sector (versus 19 per cent for SMEs overall), mostly reflecting the high degree of dependence on public projects, which account for 40 per cent of total sales in the sector. The intensity of this problem is particularly evident in systems integration companies, which depend on the State to a level over 70 per cent.
 - ✓ A measurable proportion of the sector (circa 6 per cent) states that a key problem is the difficulty in finding specialized personnel – a point worth noting, as only 1 per cent of the rest of the business sector indicates a similar problem. This may point to the direction that future training programs need to take.



* We define business size in terms of annual turnover: small = €0-1 million, medium = €1-10 million, large = €10-50 million, and very large = >€50 million.

Pillars of healthy growth for the sector: the startup ecosystem and cluster organization

- When taking a closer look at the structure of the IT services sector, it appears that the primacy of the sector versus the rest of the SME sector derives from the existence of two distinct pillars: the ecosystem of technology startups and organization of firms in clusters. Indeed, if we remove the impact of these two subcategories, the rest of the IT services sector looks to be in roughly the same situation as the average SMEs (as reflected in the confidence index). It appears to be the case then, that the growth dynamic of the sector is based on the two aforesaid growth drivers – with 71 per cent of tech startups anticipating increased demand in the next six months and 82 per cent of IT companies organized in a clusters, versus 44 per cent for the rest of IT firms and 29 per cent for the rest of the SME sector.
- Given this situation, the following sections of our analysis will focus on these two pillars, which accounted for circa 11 per cent of IT SMEs in 2015, though it is estimated that they will play an ever increasing role going forward.

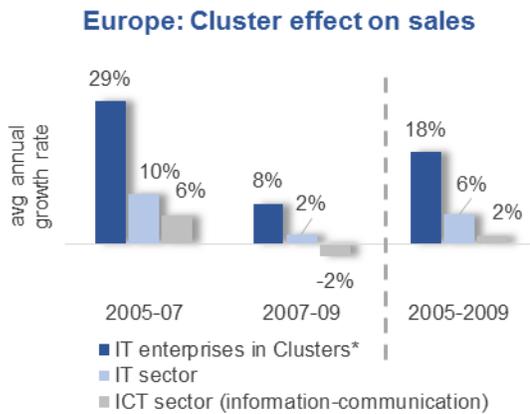


* Indices consist of the net balance of answers for increase (100), stability (0) and decrease (-100) of activity. See Annex.

- ❑ IT Sector
 - Contribution to the economy
 - Financial results of IT enterprises in Greece and Europe
- ❑ NBG survey
 - Characteristics of IT SMEs
 - Supporting factors
 - Structure of the sector
- ❑ Clusters
 - Performance
 - Determining factors
- ❑ Startups
 - Performance
 - Determining factors
- ❑ Outlook and estimates for the Greek IT sector
 - Current trends
 - Potential impact of startups and clusters
- ❑ Annex
 - Financing of the IT sector via European programs
 - NBG indicators and models
 - Mapping the SME segment in Greece
 - Sample description
 - Constructing the business confidence index for SMEs
 - Survey ID

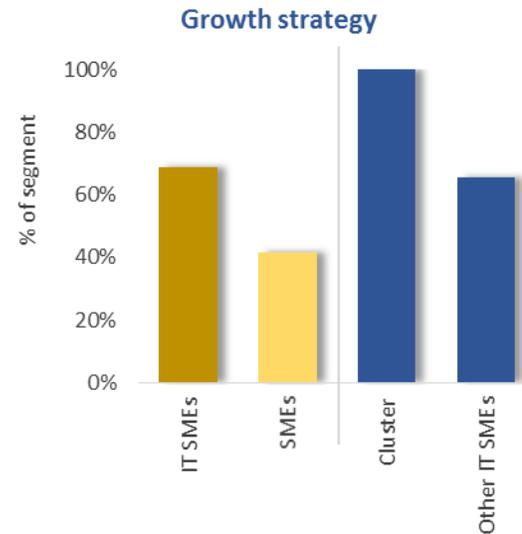
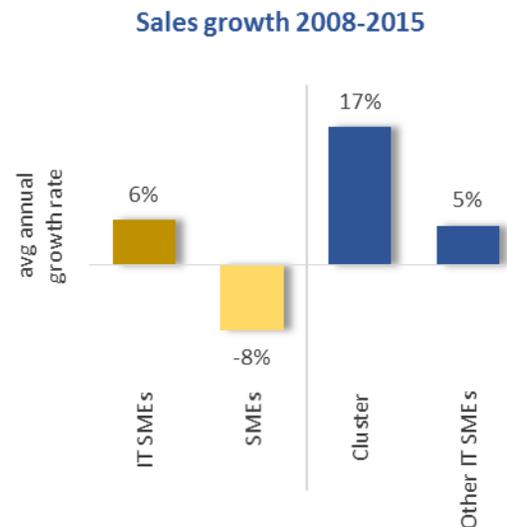
Grouping into IT clusters enhances the growth dynamics for enterprises in Greece and Europe

- Business clusters are collaborative groupings of enterprises with the strategic goal of creating integrated production ecosystems that focus on innovation, export orientation, and maximization of competitive advantages. Clusters presuppose a degree of geographical concentration among their members, while they also usually include research centers and universities. The key benefits that enterprises can enjoy by joining clusters include access to international markets, synergies, economies of scale, know-how, advisory support and easier access to financing through partnerships with investment bodies.
- Empirical studies have quantified the existence of discrete benefits in the IT sector from the creation of clusters. For example, on the basis of a sample of 18 IT clusters in 14 European countries, tech enterprises that were members of clusters tripled their sales growth versus the average of the IT sector in the period 2005-2009, with clusters dominating in both sub-periods, i.e. 2005-2007 (high growth) and 2007-2009 (low growth).
- Our study confirms such empirical results in Greece. Specifically, on the basis of NBG's survey, IT SMEs which are members of clusters recorded average annual growth of 17 per cent in sales in 2008-15 (versus 5 per cent for the rest of IT SMEs), while at the same time they all turn to long-term growth strategies (versus 67 per cent for the rest of IT SMEs).

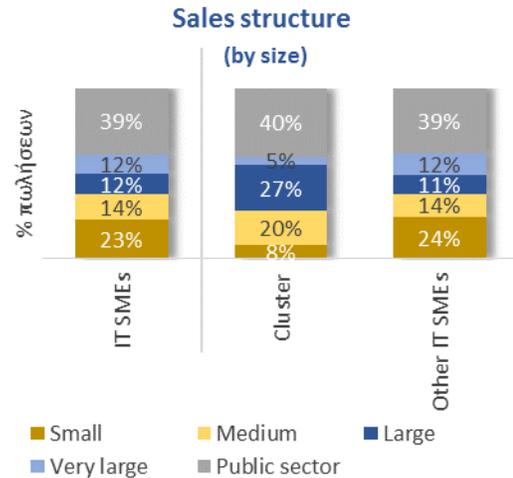


* Cluster data concern knowledge intensive sectors (KISA clusters) in 14 European countries.

Source: OECD working papers, Temuri Y. (2012), "The Cluster Scoreboard - Measuring the performance of local business clusters in the knowledge economy", NBG estimates

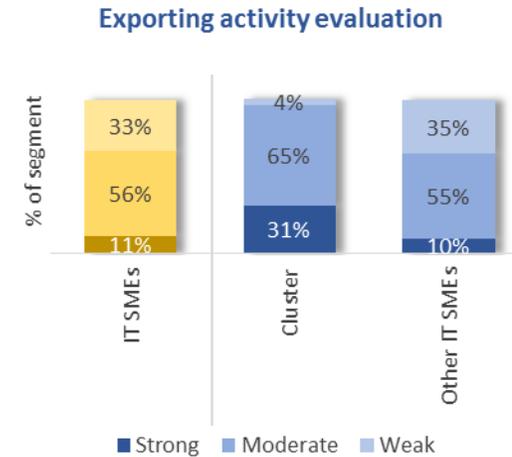
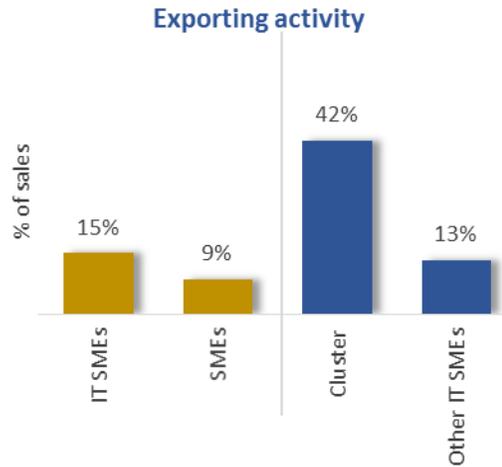
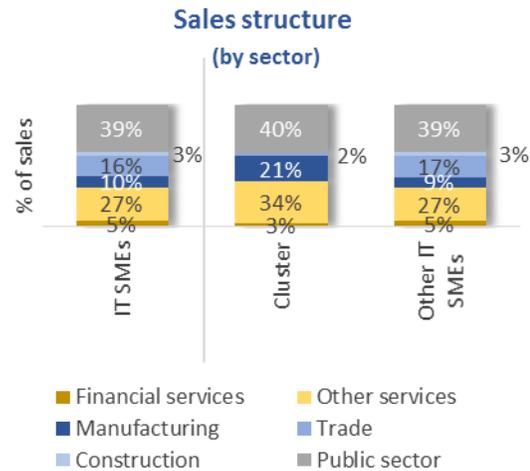


SMEs in clusters obtain access to larger-sized enterprises (as customers) as well as international markets



□ According to the findings of our survey, business clustering of IT SMEs seems to improve their competitiveness and offer easier access to demanding customers. Specifically:

- ✓ enterprises in clusters target their sales to a greater degree at large enterprises (27 per cent of sales versus 11 per cent for the rest of IT SMEs).
- ✓ enterprises in clusters achieve a high level of export orientation (with 42 per cent of sales aimed at foreign markets versus 13 per cent for the rest of IT SMEs), while at the same time only a tiny number of SMEs consider their export activity to be weak (4 per cent of enterprises in clusters versus 35 per cent for the rest of IT SMEs).



* We define business size in terms of annual turnover: small = €0-1 million, medium = €1-10 million, large = €10-50 million, and very large = >€50 million.

Apart from supporting export orientation and innovation, organization in clusters offers a significant distinct benefit through the encouragement of strategic partnerships

Cluster effect

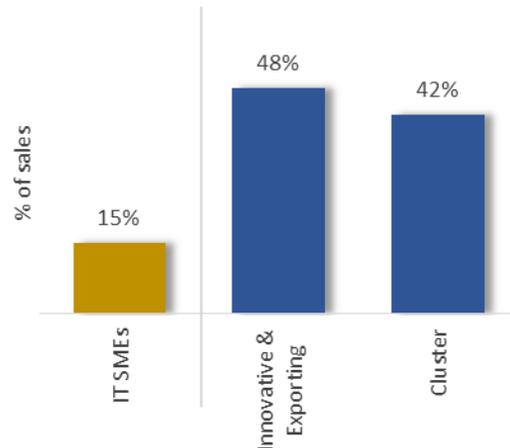


* % of segment
 ** avg annual growth rate

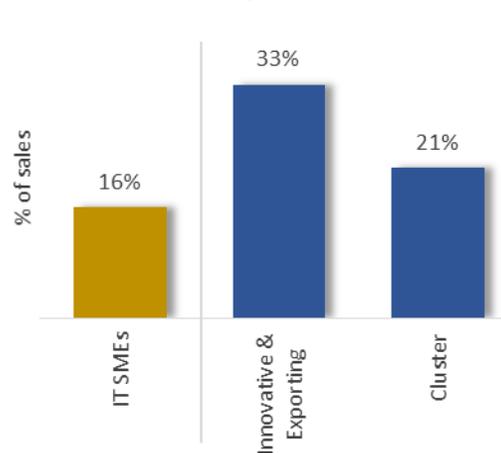
- Grouping into clusters enhances export orientation and innovation in enterprises, while at the same time offering additional distinct benefits. Specifically, the comparison of clustered enterprises with the most dynamic part of non-clustered IT enterprises (innovative and exporting non-clustered enterprises) indicates the superiority of the former, which (although reporting lower performance in export orientation and innovation versus the dynamic non-clustered enterprises) achieved:
 - ✓ higher increase in sales (an average of 17 per cent per annum over the last seven years versus 6 per cent for dynamic non-clustered IT SMEs)
 - ✓ higher confidence index (by 22 points), and
 - ✓ enhanced growth dynamics (with all enterprises in clusters aiming at growth versus 78 per cent of the non-clustered SMEs).

- The main difference offered by organization in clusters is that it enables cooperation with similar enterprises, suppliers or research bodies. Specifically, 83 per cent of enterprises in clusters report significant benefits deriving from strategic partnerships (versus 49 per cent for the dynamic non-clustered IT SMEs).

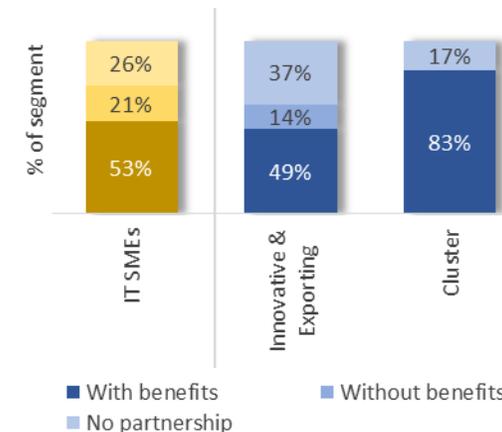
Exporting activity



R&D expenditures



Strategic partnerships

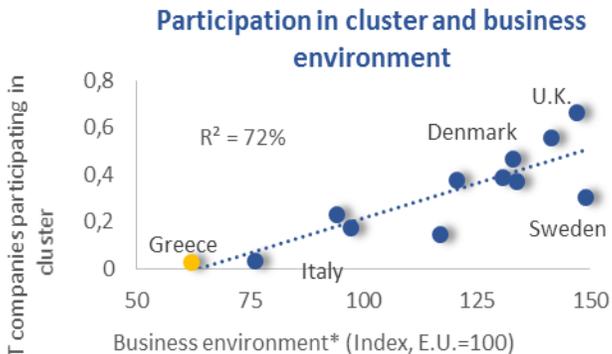


Participation of Greek IT enterprises in clusters is low



* In each country take into account the main cities with presence of IT clusters.

Source: OECD working papers, Temuri Y. (2012), "The Cluster Scoreboard - Measuring the performance of local business clusters in the knowledge economy", Eurostat, WEF:Global Competitiveness Index 2014-15, Eurostat, NBG Estimates



* Business Environment Index weighted with: i) 50% for the legal framework (e.g. business contracts, literary property rights) and ii) 50%, the level of the collaboration between universities and firms in the field of R&D.

Source: OECD working papers, Temuri Y. (2012), "The Cluster Scoreboard - Measuring the performance of local business clusters in the knowledge economy", Eurostat, WEF:Global Competitiveness Index 2014-15, NBG estimates

□ Despite the significant benefits mentioned for enterprises grouped in technology clusters, such configurations still seem to present low penetration in Greece, as only 3 per cent of IT SMEs active in the city of Athens participate in the relevant cluster in Athens. The respective rate in Europe is around 30 per cent according to an analysis of established clusters of tech and IT services in Europe (source: OECD, see chart). Top ranking are the UK highest (the main clusters being Oxfordshire R&D, the London cluster, and Silicon Glen in Scotland) and Denmark (with clusters in Aarhus and Aalborg) where over half of the companies are concentrated in clusters.

□ The factors influencing the degree of penetration of IT clusters in EU countries are to be found mainly in the business environment where the IT enterprises are active. Specifically, the following stand out as key parameters in the business environment:

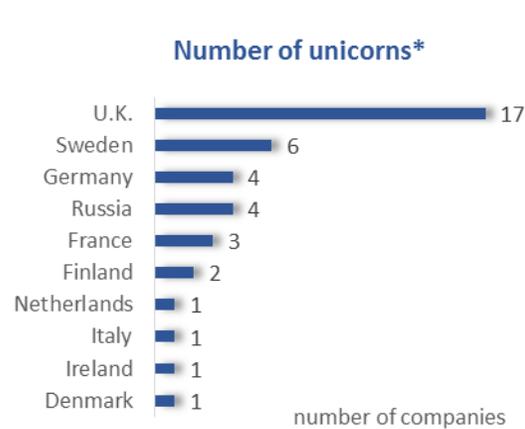
- ✓ the combination of the legal framework and the quality of safeguards provided it by the judicial system (e.g. in terms of business contracts, fast resolution of business disputes, and protection of intellectual property rights), and
- ✓ the level of cooperation between universities and the business sector on R&D activities.

□ Looked at from this perspective, the low participation by Greek IT enterprises in clusters reflects the relatively adverse business environment (as Greece lags by 40 per cent versus the European average in respect of both parameters).

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 - Determining factors
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 - Performance
 - Determining factors
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 - Current trends
 - Potential impact of startups and clusters
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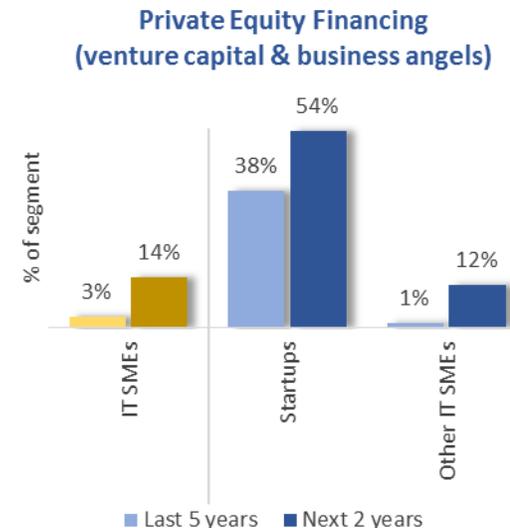
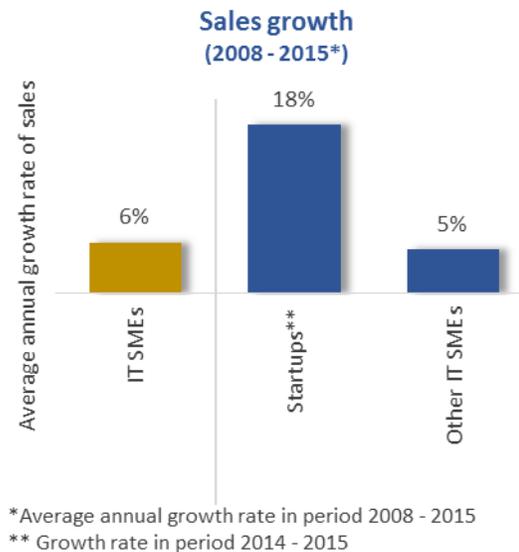
On a global basis, the ecosystems of tech startups constitute sources of rapid growth

- ❑ The largest ecosystem of tech startups at a global level is that of Silicon Valley in the USA, their total value amounting to €250 billion and numbering around 15,000 startups (source: Startup Compass). The EU, although at an earlier stage of development, is fostering similar ecosystems (e.g., that of London with a total valuation of €40 billion, and that of Berlin with a total valuation of €25 billion) and already numbers some 36 startups that are already valued at over €1 billion (deriving mainly from the UK, Sweden and Germany).
- ❑ The Greek ecosystem of tech startups is still in its infancy (with a total valuation of circa €0.3 billion) though it already shows signs of high growth potential. Specifically, according to the NBG survey, Greek startups have recorded higher growth rates than the rest of IT SMEs, as:
 - ✓ They achieved higher sales in 2008-2015 (an average of 18 per cent annually versus 5 per cent for the rest of IT SMEs).
 - ✓ 54 per cent of startups increased employment in the second half of 2015 (versus 24 per cent for the rest of the sector) and 38 per cent estimate that this will continue in 2016 (versus 31 per cent for the rest of the sector).
 - ✓ 38 per cent of startups were backed by venture capital and business angels (versus just 1 per cent for the rest of IT SMEs), while 54 per cent plans to get similar financing in the future (versus 12 per cent for the rest).



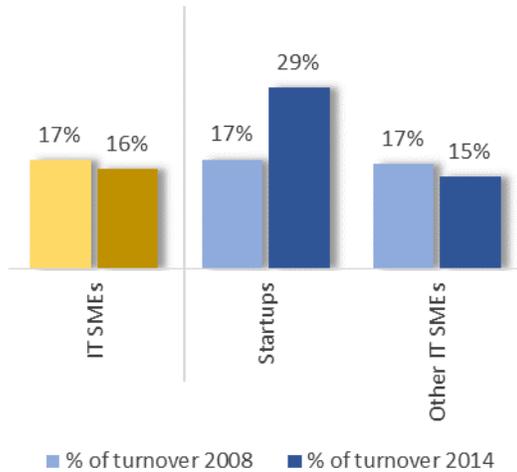
*The term "unicorns" refers to startups with valuation over €1 billion

Source: G.P. Bullhound



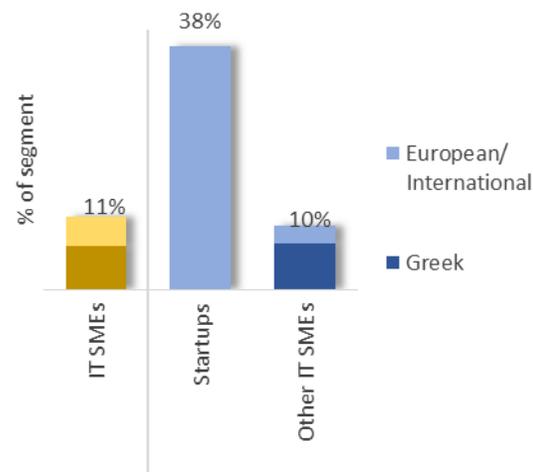
The strong points that differentiate tech startups are their supremacy in terms of (i) innovation, (ii) calibre of human resources, and ...

R&D expenditures

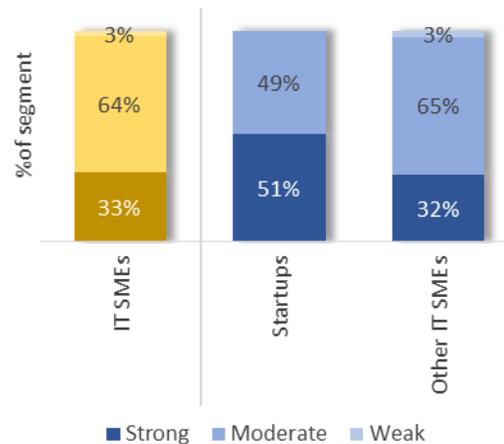


- A significant factor supporting the IT sector is investment in R&D with the aim of promoting innovative products and services. Over the crisis, startups have increased R&D activity, which absorbs 29 per cent of their turnover (from 17 per cent in 2008) while the rest of IT SMEs remain close to 15 per cent (and SMEs overall at just 0.3 per cent).
- The said investments are reflected in patents filed by 38 per cent of startups (versus 10 per cent for the rest of IT SMEs), which in total have been filed at the European or international level.
- As a result, startups rate positively their level of innovation (51 per cent is fully satisfied, versus 32 per cent for the rest of IT SMEs), while they acknowledge the strong contribution of their employees (rated as strong by 60 per cent of the sector, versus 39 per cent for the rest of IT SMEs).

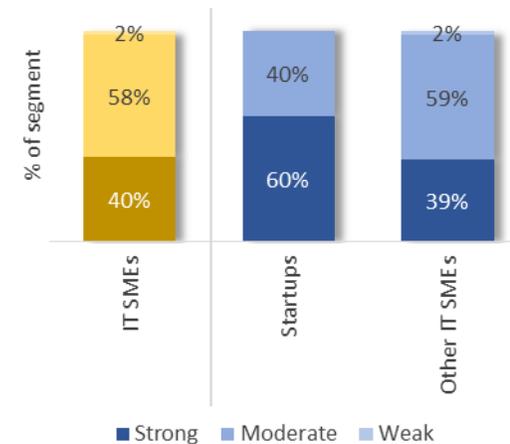
Patents



Innovative products evaluation

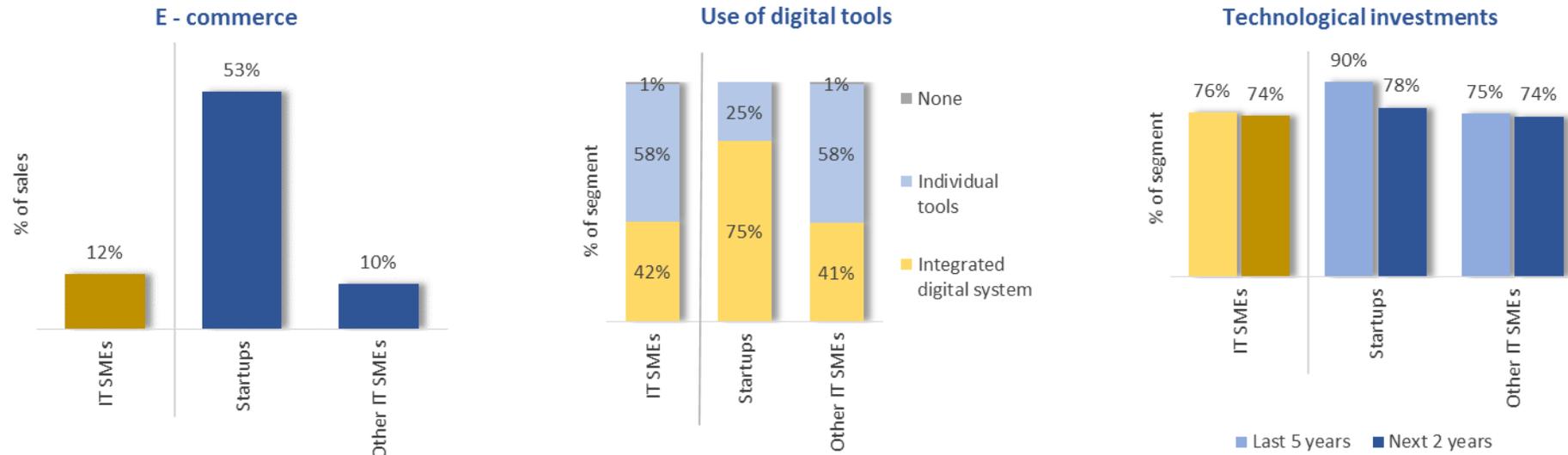


Human resources evaluation



... (iii) digital technology

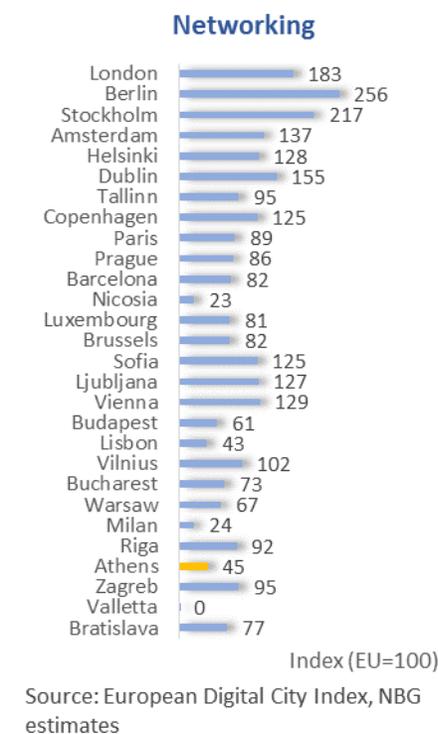
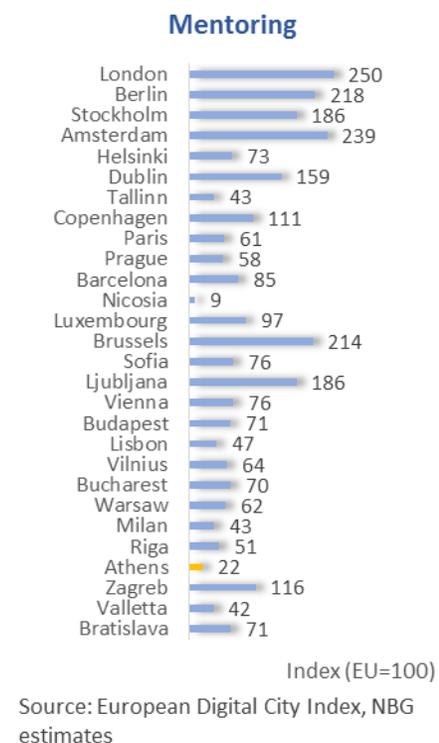
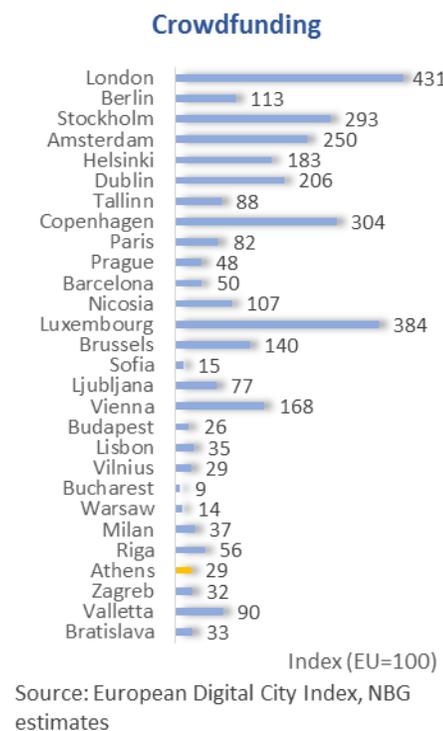
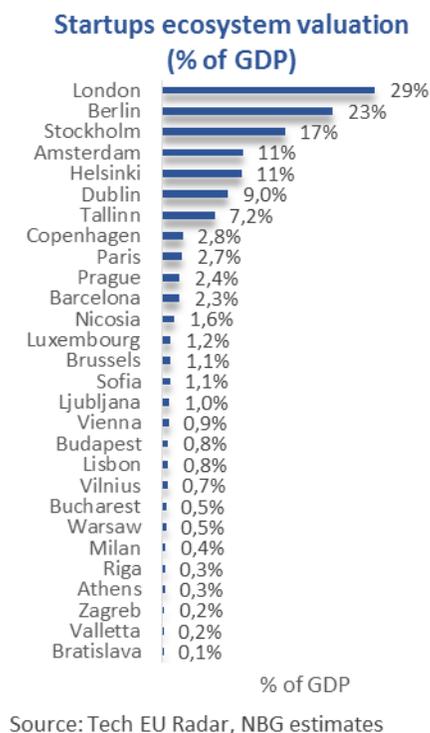
- Apart from the emphasis on innovation, through investments in R&D, IT startups demonstrate a remarkable effort to penetrate online distribution channels, generating 53 per cent of their turnover via e-commerce (versus 10 per cent for the rest of IT SMEs and just 3 per cent for total SMEs).
- The role of technology in the operation of this kind of business is reflected also in the fact that 90 per cent of IT startups invested in the acquisition or upgrade of digital tools over the last five years (versus 75 per cent for the rest of IT SMEs). Significantly, almost $\frac{3}{4}$ of IT startups have installed an integrated digital system (with an extensive combination of digital tools for internal operations and customers), versus 41 per cent in the case of the rest of IT SMEs, and just 13 per cent of total SMEs.
- This leading edge at a digital level is expected to be sustained as startups are planning further relevant investments over the next two years, by 78 per cent versus 74 per cent in the case of the rest of IT SMEs.



* We have identified systems i) of internal operations, which enable improvements in efficiencies of key operations in the business (e.g. ERP, CRM) and ii) of customers, which enhance communication channels with customers (e.g. website, e-commerce). We consider that an enterprise has an integrated digital system when it combines different digital tools in a way that significantly increases their efficiency through synergies (e.g. a combination of e-commerce, digital marketing and CRM is an integrated customer system).

The startup ecosystem in Greece is one of the smallest in Europe

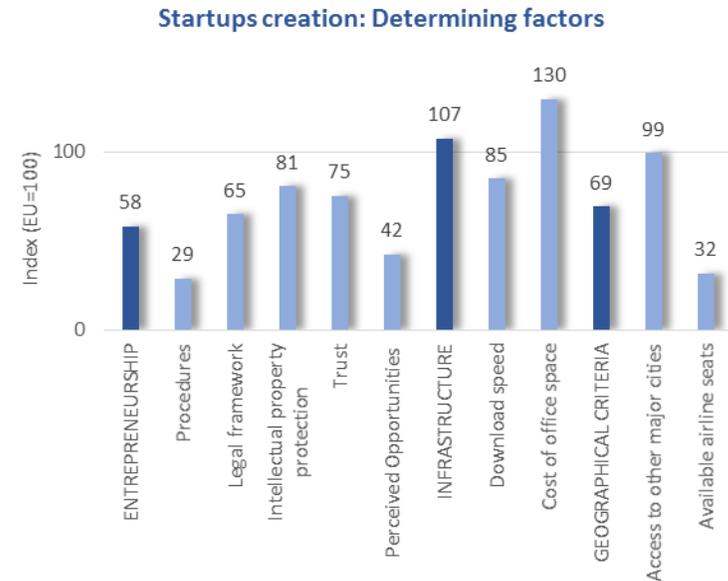
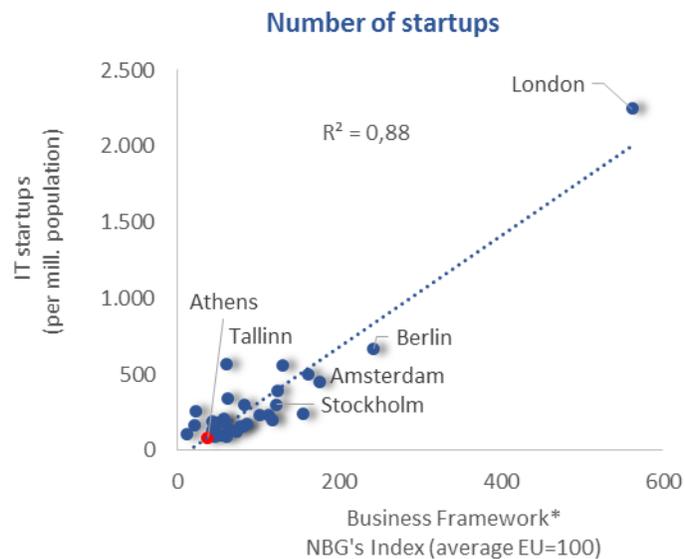
- On examining the total value of startup ecosystems in the EU (as can be approximated in aggregate by the valuation given to individual enterprises by investors), the Greek system appears to be one of the least developed - covering 0.3 per cent of Athens GDP, versus an average of 3-4 per cent for medium-size ecosystems, and over 20 per cent for largesize ecosystems (London and Berlin).
- The ranking of European startup ecosystems on the basis of their total estimated value is compatible to additional relevant maturity indicators (such as potential for crowdfunding, access to mentoring, and networking intensity).
- For the purposes of investigating factors supporting the startup ecosystem, we focus on the two parameters that determine the ecosystem: (i) the number of startups, and (ii) the average estimated value of each country's startups.



* The estimated value of startup ecosystems is derived from data of recent financing of the participating companies.

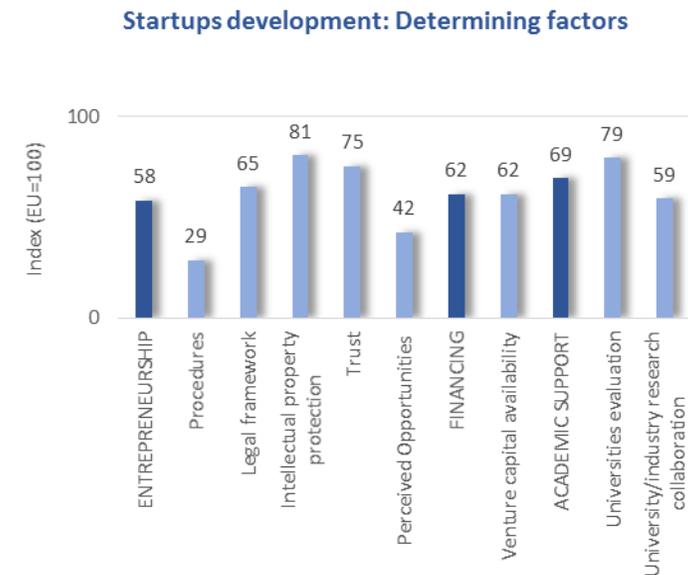
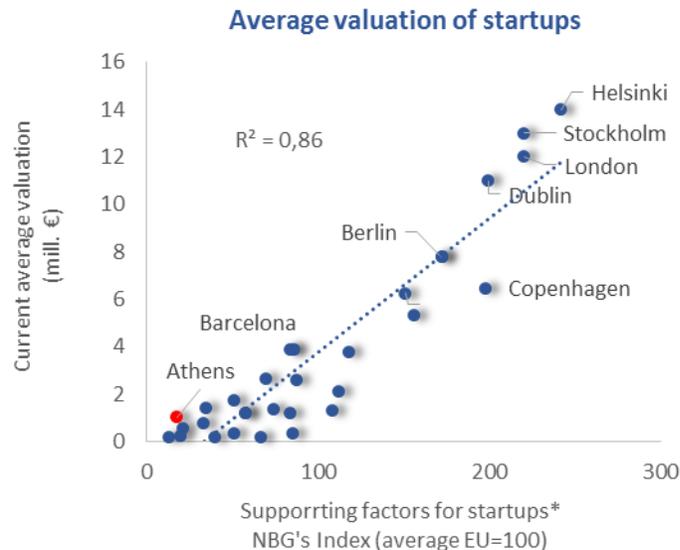
Institutional weaknesses keep the number of tech startups low in Greece

- The first factor that keeps the value of the overall tech startup ecosystem low in Greece is the low number of startup enterprises per capita, which reflects a low penetration of tech companies in the business sector, as well as a low share of startups in the technology sector. Specifically, it is estimated that startups in Greece amount to 500 enterprises, with approx. 2/3 of them in Athens - corresponding to less than 100 startups per million of the population, versus an average of 250 in Europe (with London standing out markedly with 7,400 startups or 2,200 per million of the population).
- Based on an econometric model by NBG Research, the number of startups per capita is fundamentally linked (at a rate of 88 per cent) to a combination of business environment factors (see annex for an accurate description of the model). In particular, we focus on 3 key categories of factors: i) the support framework for entrepreneurship, ii) infrastructures, and iii) geographical criteria. In these respects, Greece:
 - ✓ lags behind in terms of entrepreneurship, mainly because of the lack of an effective legal framework and proper judicial safeguards for business (e.g. the protection of business contracts and intellectual property rights), and secondarily in terms of geographical criteria (mainly because of limited air transport connections), and
 - ✓ holds a relatively good position regarding infrastructures (with a lag in the speed of networks and an advantage in the cost of business offices).



Institutional weaknesses, combined with the low availability of venture capital and the poor links with academia, keep the valuation of Greek startups low

- Apart from the low number of startups per capita, the estimated value of the Greek startup ecosystem is also limited due to the low average valuation per company, estimated at less than €1 million (versus an average of €3.5 million in Europe).
- It is notable that the domestic startups sector is not uniform, as a certain percentage of companies (estimated at 12 per cent) is more dynamic, participates in events and competitions, and attracts private investment capital, reaching an average valuation of €6 million. On the other hand, over half of enterprises classed as startups are valued at less than €0.1 million, while a considerable number are not likely to survive.
- According to an econometric model by NBG Research, the average value of European startups is determined to a large extent by the combination of three key factors: i) the support framework for entrepreneurship, ii) the availability of financing from business angels and venture capital, and iii) support from academia (evaluation of universities and the degree to which they cooperate with the business sector). Greece lags behind in respect of all three factors - circa 40 per cent below the European average in terms of entrepreneurship and financing indices, and 30 per cent below the academic support index (mainly due to the weak linkup of universities and enterprises).



- ❑ IT Sector

- Contribution to the economy
- Financial results of IT enterprises in Greece and Europe

- ❑ NBG survey

- Characteristics of IT SMEs
- Supporting factors
- Structure of the sector

- ❑ Clusters

- Performance
- Determining factors

- ❑ Startups

- Performance
- Determining factors

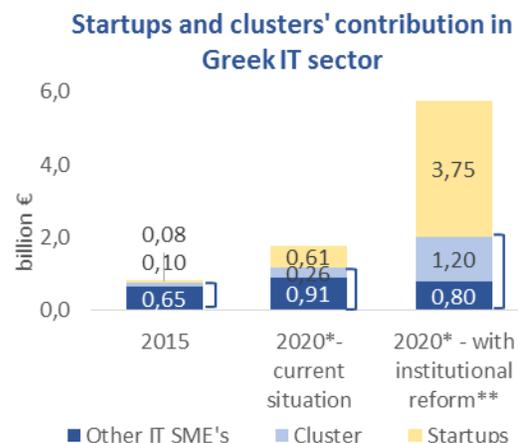
- ❑ Outlook and estimates for the Greek IT sector

- Current trends
- Potential impact of startups and clusters

- ❑ Annex

- Financing of the IT sector via European programs
- NBG indicators and models
- Mapping the SME segment in Greece
- Sample description
- Constructing the business confidence index for SMEs
- Survey ID

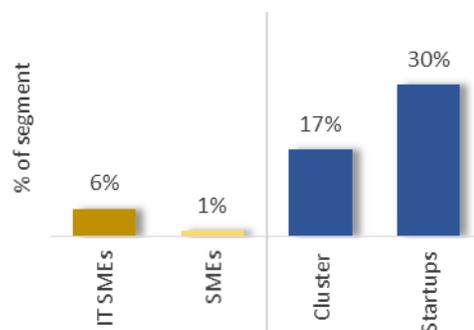
Greek tech startups and IT clusters are able to generate high value added and new jobs – It is important however that a substantial part of this benefit remains Greece



* The projections of the future startups' contribution has been estimated on the basis of the expected net flows, as they have been reflected on the investors' current valuation of the firm.
 **in the scenario that the Greek business environment gradually approaching the European average level (excluding countries with highly developed startup ecosystems).

Source: El.Stat., IMF, NBS Estimates

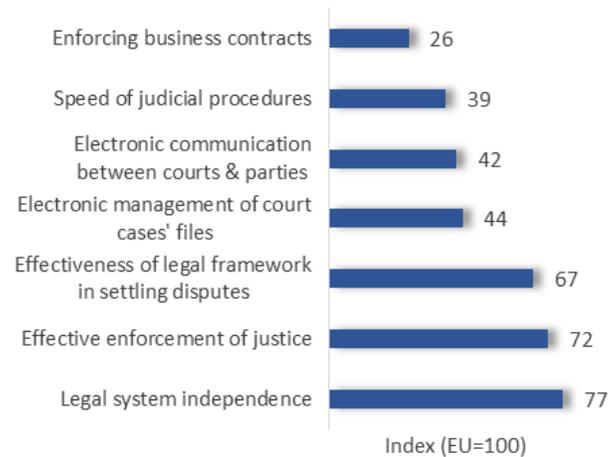
Headquarters' relocation abroad (during 6-m period after the imposition of capital controls)



- The domestic IT sector (SMEs and larger companies) generate a value added of €830 million (and approximately 16,000 jobs), of which almost ¼ concerns companies participating in clusters and startups.
- Given the dynamic of the IT sector, we estimate that value added could amount to €1.8 billion in 2020 (providing circa 20,000 new jobs), with startups and clusters being the key drivers of growth (generating ¾ of the increase). Specifically:
 - ✓ companies in clusters are expected to continue to post threefold growth in turnover versus the rest of the sector, accounting for 14 per cent in 2020 versus 12 per cent in 2015, while
 - ✓ startups (based on their current valuation that incorporates market estimates on their future growth) are expected over the next five years to increase eightfold the value added they generate.
- If the business environment in Greece (legislative, infrastructures, private financing, academic support) gradually approaches the European average (excluding those countries with highly developed startup ecosystems), the sector's value added could reach €5.8 billion in 2020,
 - ✓ by increasing threefold the number of startups and almost fourfold their average valuation (with the value added of the system amounting to €3.7 billion from €80 million in 2015), and
 - ✓ higher participation of enterprises in clusters (25 per cent from 3 per cent in 2015).
 Also significant is the potential contribution in terms of employment, as it is estimated that 80,000 new jobs could be generated.
- Startups contribute 56 per cent of growth to the sector under the baseline scenario (€530 million additional value added and 10,000 new jobs) and 75 per cent under the institutional reform scenario (up to €3.7 billion value added and 65,000 new jobs). However, their flexible and outward-looking nature should not be ignored: during the first six months of capital controls, 30 per cent of IT startups had already moved their registered offices abroad. Accordingly, it is important to adopt institutional reforms that favour digital entrepreneurship, with a view to retaining in Greece as much value added of Greek startups as possible.

The growth of tech startups and cluster ecosystems requires (i) the drafting of a comprehensive and consistent legal framework for entrepreneurship and the establishment of faster and more efficient judicial procedures to safeguard it ...

Greek judicial system performance indicators



Sources: WEF/Global Competitiveness Index, World Bank/ Doing Business Report, EC/Justice Scoreboard, NBG Estimates

Evaluation of judicial procedures

	Greece	Europe
Time needed for settling business disputes (in years)	4,4	1,6
Time needed for the arrangement of legal cases* (in months)	23	8
Number of pending legal cases (per 1,000 residents)	87	26
<i>Comercial & Civil law</i>	56	22
<i>Administrative law</i>	31	4

* Excluding criminal law cases

Sources: World Bank/ Doing Business Report, EC/Justice Scoreboard, NBG Estimates

- ❑ Countries with developed startup ecosystems have adopted a number of policies to attract such firms and boost their growth – from tax incentives (e.g. Dublin) to the issue of business visas (e.g. London).
- ❑ Given the limited ability to provide incentives entailing fiscal cost and on the basis of empirical analysis, we see four crucial parameters that enable the development of IT startups and clusters, regarding which Greece lags far behind:
 - ✓ *Upgrading the legal framework for entrepreneurship and the judicial procedures that safeguard it:* Our empirical research highlighted the importance of effective support from the legal and judicial system, so that the business sector can feel that it operates under the rule of law and that its cases are promptly processed. This parameter seems to restrict the creation and development of IT startups in Greece, and to hinder the establishment of IT clusters. For example, the settlement of business contract litigations requires 4.5 years in Greece (3 times the average time in the EU). Against this backdrop and on the basis of international ratings, the domestic judicial system in terms of procedural efficiency and process speed lags behind the European average by 25 per cent. In addition, bureaucracy is intensified due to poor digital infrastructures in respect of management of court case files and the linkup of courts with the public (60 per cent lag versus Europe). In this light, it is important to focus on: (i) drafting a comprehensive and consistent legal framework for entrepreneurship (e.g. new bankruptcy code, framework for crowdfunding), and (ii) upgrading and speeding-up judicial services to the business sector (e.g. digital upgrade, establishment of special courts).

... (ii) institutional strengthening of the communication channels between the academia and enterprises, and (iii) targeted use of European programs

Crucial areas for the development of IT clusters and tech startups

	Greece	EU (28)	UK	Germany	Sweden	Netherlands
Academic support						
University-industry collaboration (Index: EU=100)	59	100	156	130	156	149
Knowledge transfer between universities and enterprises (Index: EU=100)	62	110	126	140	138	128
Private financing of universities for the development of R&D (% of financing)	6	9	19	14	14	15
Researchers employed in the private sector (% of researchers)	14	46	36	56	69	61
Average evaluation of three best universities (0-100)	31	40	99	80	77	74
Intellectual property						
Intellectual property protection (Index: EU=100)	81	100	146	130	131	139
Patents (applications per million population)	9	81	88	223	313	207
Financing						
Venture Capital Financing (Index: EU=100)	62	100	133	126	157	130
Investments VC 2014 (€/resident)	0,02	9	16	10	35	12

Source: WEF, World Bank (Doing Business Report), OECD, Global Innovation index, NBG estimates

- ✓ *Enhancing cooperation between universities and the business sector:* Greece lags far behind in terms of researchers working for enterprises (14 per cent versus. 46 per cent on average in the EU) and private funding to universities (6 per cent versus. 9 per cent on average in the EU). As a result, the university-business cooperation index and the university-to-enterprises knowledge transfer index are 40 per cent below the European average. A common characteristic in countries where universities are closely linked with enterprises is the existence of funding programs (mostly European) to support the commercial use of academic research. Such programs are often coordinated by a non-government organization (e.g. the Technology Strategy Board in the UK). In addition, meetings are held regularly between formally established boards comprised of heads of universities and management of large corporations or business associations (e.g. the Business Higher Education Forum in the USA or the Council for Industry and Higher Education in the UK), which strengthen the relations between the two sides and often lead to bilateral cooperation agreements or business incubators.
- ✓ *Enhancing the legal framework for protecting intellectual property:* According to the relevant WEF index, Greece is rated 20 per cent below the European average, while the number of patents is extremely low (only 9 applications per million people against 81 on average in the EU).
- ✓ *Using available European programs to support VC financing flows (see Annex):* For example, Jeremie, the European program that generated the investment fund on which business angel financing in Greece is based.

- ❑ IT Sector
- ❑ NBG survey
- ❑ Clusters
- ❑ Startups
- ❑ Outlook and estimates for the Greek IT sector

- ❑ Annex

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Financing of the IT sector via European programs

- ❑ The high dependence of Greek IT enterprises on European funds, and the expectation for further strengthening of this type of financing in the future arise partly from the significance that the state attributes to the inclusion of such programs in the successive Community Support Frameworks (CSF). So, besides the general infrastructure projects in the sectors of telecommunications and IT during the 1990s (IMP-Informatics €59 million and OP Cleisthenes €294 million), in 2000-2013 projects linked more closely to the IT sector were included in the CSFs, such as the Information Society and the Digital Convergence programs whose budgets amounted to €2.9 billion and €1.7 billion respectively. Relevant funds are also included in the new 2014-2020 NSRF, with the financed projects run by ICT firms reaching €1 billion.
- ❑ Funding through the Jeremie programs is also significant. More specifically, the 2010 agreement between the European Investment Fund and Greece led to the establishment of an investment fund targeted at IT SMEs, with available funds amounting to €430 million, enabling enterprises to seek bank funding on favourable terms and startups to obtain financing through Risk Capital.
- ❑ Another alternative source of funding is the EU Horizon 2020 project. This project includes ICT actions of €9 billion; however, Greek SMEs must step up their efforts in order to approach the performance of their European peers, as during the previous program (7th framework project) only 14 per cent of Greek proposals were selected for funding, raising €173 million (or 12.5 per cent of the funds requested), while the corresponding figure for European firms stood at 20 per cent.
- ❑ Last, the Digital Single Market – one of the EU's priorities – holds out significant prospects: it is expected to have a beneficial impact, both directly, through infrastructure investments totalling €21.4 billion, and indirectly, as according to estimates the Digital Single Market should contribute €415 billion per year to the European economy.

- To understand the determining factors behind the startup ecosystem and the future prospects of startups, we evaluated models that determine i) the number of startups (per capita in the main cities), and ii) their average valuation, with the following features:

1. Number of startups

$$no_i = 1.50 \text{ entre}_i + 3.98 \text{ geo}_i + 3.23 \text{ infra}_i - 599.6$$

(2.32)
(5.25)
(2.26)
(-2.86)

$R^2 = 0.88, DW = 2.08$

Where:

no_i = number of startups per million people in the city under review

$entre_i$ = Business Index

$infra_i$ = Infrastructure Index

geo_i = Geographical Criteria Index

2. Average valuation

$$val_i = 0.02 \text{ entre}_i + 0.05 \text{ fin}_i + 0.04 \text{ acad}_i - 5.92$$

(2.83)
(2.43)
(2.81)
(-4.80)

$R^2 = 0.86, DW = 2.19$

Where:

val_i = average valuation of startups in €/company

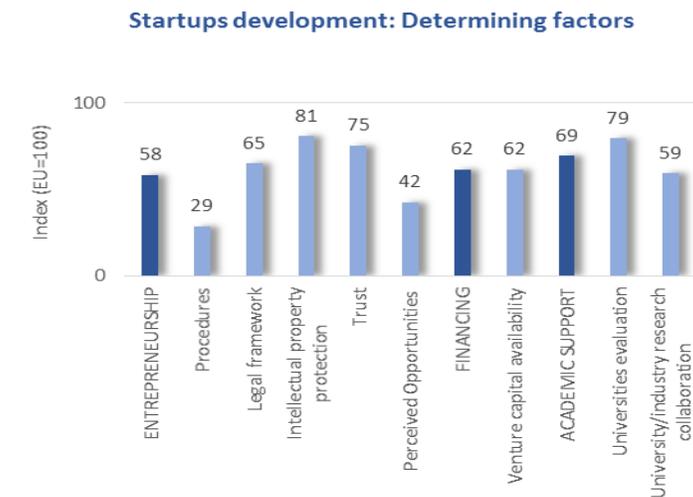
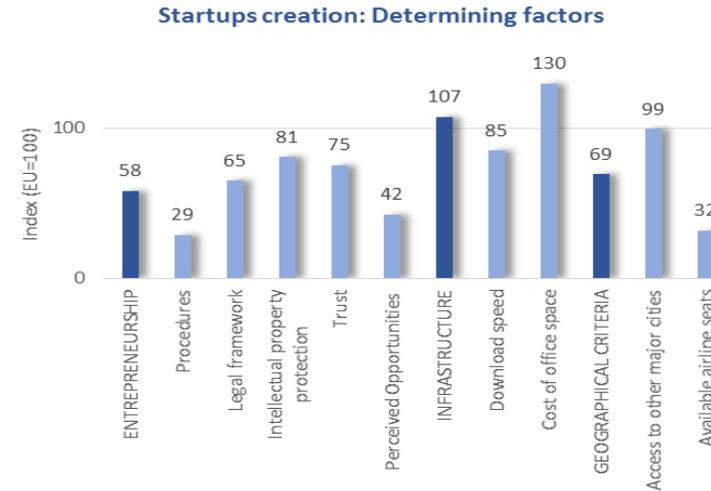
$entre_i$ = Business Index

fin_i = Financing Index

$acad_i$ = Academic Support Index

Sample i for both models are the following cities:

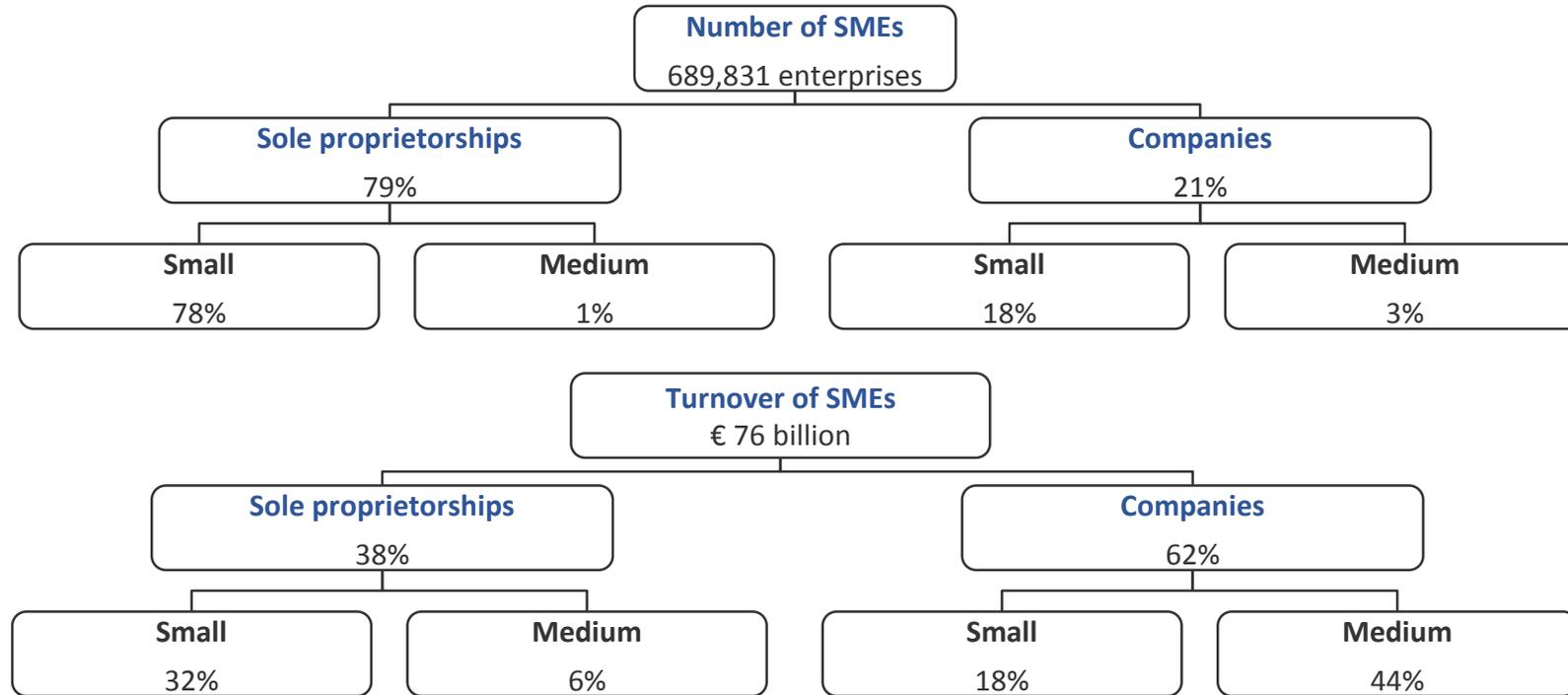
Athens, Amsterdam, Valletta, Barcelona, Warsaw, Berlin, Vienna, Vilnius, Budapest, Bucharest, Brussels, Dublin, Helsinki, Zagreb, Copenhagen, Nicosia, Ljubljana, Lisbon, London, Luxembourg, Milan, Bratislava, Paris, Prague, Riga, Sofia, Stockholm, Tallinn



NBG INDICATORS				
	Weights		Units	Sources
Startups creation: Determinant factors				
Entrepreneurship	100%			
Procedures	1/5	Ranking		WB/ Doing Business Report (συνολικός δείκτης)
Legal framework	1/5	Scale 1-7 (best)		WEF/ Global Competitiveness Index (Rule of Law)
Intellectual property protection	1/5	Scale 1-7 (best)		WEF / Networked Readiness Index
Trust	1/5	Scale 1-10 (best)		European Digital City Index/Eurobarometer
Perceived opportunities	1/5	% of positive answers in population 18-64 years		GEM global report
Infrastructure	100%			
Download speed	1/2	Mbit/s		OECD
Cost of office space	1/2	€/s.m./time		European Digital City Index
Γεωγραφικά κριτήρια				
Access to other major cities	1/2	Average travel time		European Digital City Index
Available airline seats	1/2	km/week,millions*		WEF /Global Competitiveness Index
Startups development: Determinant factors				
Entrepreneurship	100%			
Procedures	1/5	Ranking		WB/ Doing Business Report (συνολικός δείκτης)
Legal framework	1/5	Scale 1-7 (best)		WEF/ Global Competitiveness Index (Rule of Law)
Intellectual property protection	1/5	Scale 1-7 (best)		WEF / Networked Readiness Index
Trust	1/5	Scale 1-10 (best)		European Digital City Index/Eurobarometer
Perceived opportunities	1/5	% of positive answers in population 18-64 years		GEM global report
Financing	100%			
Venture capital availability	1	Scale 1-7 (best)		WEF / Networked Readiness Index
Academic support				
Universities evaluation	1/2	Score 0-100		Global Innovation Index (QS university ranking)
University/industry research collaboration	1/2	Score 0-100		Global Innovation Index

* Όλες οι μεταβλητές εκφράστηκαν σε σχέση με τον ευρωπαϊκό μέσο όρο (EE(28)=100) και με τρόπο ώστε υψηλότερες τιμές να αντιστοιχούν σε θετικές επιδράσεις

Mapping the SME segment in Greece



** For the purposes of the survey, small enterprises are those reporting turnover of less than €1 million and medium-sized enterprises are those reporting turnover of between €1 million and €10 million.*

Source: SBA Factsheet 2015, Eurostat, EL.STAT. Company Register, NBG Estimates

- ❑ The circa 690,000 SMEs in Greece generate turnover of around €76 billion.
- ❑ 4/5 of SMEs are sole proprietorships, which account for a corresponding share of the total domestic business sector (compared with just ½ of the business sector in Europe).
- ❑ Although sole proprietorships comprise the majority of SMEs, the greater share of turnover (over 60 per cent) is generated by companies of various legal status (SA, limited partnership, limited liability, etc.).

Sample Description

Sample Structure (number of companies)*					
Turnover (in million €)	Manufacturing	Trade	Services	Construction	Total SMEs
1: (0 - 0.1]	45	45	73	30	193
2: (0.1 - 0.5]	45	45	73	30	193
3: (0.5 - 1]	45	45	74	30	194
4: (1 - 2.5]	45	45	74	30	194
5: (2.5 - 5]	45	45	73	30	193
6: (5 - 10]	45	45	73	30	193
Total SMEs	270	270	440	180	1160

* Depending on data availability, there is possible deviation of circa 10 per cent

Greek SMEs segment structure* (based on turnover)					
Turnover (in million €)	Manufacturing	Trade	Services	Construction	Total SMEs
1: (0 - 0,1]	1%	3%	5%	1%	10%
2: (0.1 - 0,5]	3%	13%	6%	1%	23%
3: (0.5 - 1]	2%	9%	3%	1%	15%
4: (1 - 2,5]	3%	11%	4%	1%	19%
5: (2.5 - 5]	4%	8%	4%	1%	17%
6: (5 - 10]	4%	8%	3%	1%	18%
Total SMEs	17%	52%	24%	7%	100%

* 2007-2013 average

Source: EL.STAT. Company Register (2007), ICAP Data, Eurostat, NBG Estimates

- ❑ Our survey examines a sample of enterprises with a turnover of below €10 million, which, for the purposes of the analysis, we define as small and medium-size enterprises (SMEs).
- ❑ Enterprises were selected using a stratified sampling method, in line with the standards of similar surveys carried out by international organizations. Specifically, a total of 1,160 enterprises were selected in such a way as to enable even distribution of the sample on the basis of two key factors: scale of turnover (6 scales) and sector of activity (Manufacturing, Trade, Services, Construction).
- ❑ In order to draw conclusions that are representative of the SME segment, answers were weighted according to the participation of each sub-set in the total turnover of the segment. Thus, findings were arranged (i) by size, (ii) by sector, and (iii) for the entire SME business sector. In line with the methodology, the segments are weighted on the basis of their shares in total turnover and not the number of enterprises (unless stated otherwise).

- ❑ In order to construct a confidence index for SMEs, we included a number of basic questions regarding the level of business activity in the previous and in the coming half year. The model for the questions is based on the harmonized questionnaire recommended by the OECD and the European Commission, thereby enhancing the comparability of the index.
- ❑ The Index questions offer 3 alternative answers: increase (+), no change (=), decrease (-), or above normal (+), normal (=), below normal (-). To begin with, we convert the number of answers per category (+,=,-) to percentages and then we calculate the net result by subtracting the (-) from the (+) percentage. Last, the confidence index for each sector is the average of the net results for the following questions:
 - ✓ For **manufacturing**: The level of orders, inventories, and future production trend.
 - ✓ For **services**: The business situation of the firm in the previous half year, past and future demand trend.
 - ✓ For **trade**: Level of inventories, past and future demand.
 - ✓ For **construction**: Level of backlog, and future employment trend.
- ❑ For the SME segment, the business confidence index has been estimated as a weighted average of its subsectors (the weights being the shares of the sectors' turnover in the economy).
- ❑ By carrying out the survey on a regular 6-month basis we should be able to form a picture of SMEs' course over time, as reflected in the index. To draw reliable conclusions, comparison will be made between the current index level and its long-term average (so as to correct possible over-optimism or over-pessimism bias).
- ❑ The evolution of the confidence index (and any other reviews over the course of time) does not take into account the closing of companies, just the developments regarding enterprises operating during the period this survey is carried out.

- ❑ Company: TNS ICAP
- ❑ Methodology: Quantitative research in the form of Computer Aided Telephone Interviewing - C.A.T.I., using a 20-minute structured questionnaire.
- ❑ Sample: A total of 1,160 interviews were conducted (960 within the context of the current assessment plus 200 booster interviews with SME IT Services):
 - ✓ 580 enterprises with annual turnover up to €1 million (freelancers, sole proprietorships, unlimited partnerships, limited partnerships, limited liability companies, SAs) - 100 of which are IT services
 - ✓ 580 enterprises with annual turnover between €1 million and €10 million (unlimited partnerships, limited partnerships, SAs, limited liability companies) - 100 of which are IT services
- ❑ Geographical coverage:
 - ✓ Athens, Thessaloniki, Heraklion, Ioannina, Kavala, Larissa, Patras
- ❑ Sampling: multi-stage, stratified, non-proportional sampling for sector, turnover size & geographical area in each of the two sets of samples. Quotas relating to turnover and for the booster sample.
- ❑ Statistical error: in each of the two sets of samples of 480 enterprises the maximum statistical error is estimated at +/- 4.15 per cent at a 95 per cent confidence level.
- ❑ Period of survey: 25/9/15- 9/11/15
- ❑ Survey framework: The survey was carried out in line with ESOMAR and SEDEA (Association of Greek Market and Opinion Research Companies) codes of conduct and the quality control requirements set by PESS (Quality Control in Data Collection). A total of 47 researchers and 5 reviewers with experience and know-how in business surveys participated in the field research.



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