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Cloud Computing Adoption Motivation in the European North and South

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CLOUD COMPUTING ADOPTION MOTIVATION IN THE EUROPEAN NORTH AND SOUTH

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Abstract

The European North-South divide has been one of the most important and widely debated problems of Europe for long time. The countries of the European South have for decades lower levels of economic and technological development and performance than the countries of the European North; though there has been a convergence between the European North and South for some time, recently, due to the economic crisis, this trend has stopped, and on the contrary a divergence is observed. It is widely recognized that in order to overcome this negative situation, and achieve a gradual convergence between these two regions, it is important not only to cut wages and public expenditure in the European South (which has been the dominant approach so far), but also to make wider and better use of new technologies and boost innovation. This paper contributes in this direction, comparing empirically the European North and South with respect to one of the most important, innovative and disruptive new information and communication technologies (ICT): the cloud computing (CC). CC is emerging as a new paradigm of providing ICT support of firms' and activities, which can not only reduce costs (especially investments), but also enable the rapid and low cost experimentation with and exploitation of new emerging technologies, and also support and facilitate innovation and external collaboration. In particular, we empirically investigate and compare Northern and Southern European firms with respect not to the 'quantity' of CC use, but to its 'quality': their CC adoption motivations and orientations. Our study has been based on a dataset collected through the e-Business W@tch Survey of the European Commission from 556 European firms from the glass, ceramic and cement sectors. It has been concluded that Southern European firms of the above sectors view CC as a means of reducing ICT investment, while Northern European ones view it as a means of supporting and facilitating product/service innovation, and also of reducing cost and increasing capabilities of their existing external electronic collaboration (with business partners and experts) for the development of innovations. Furthermore, both Northern and Southern European firms of the above sectors view CC as a means of experimentation with and exploitation of new emerging technologies.

Keywords: cloud computing, adoption, innovation, European North-South divide.

1 Introduction

The European North-South divide has been one of the most important and widely debated problems of Europe for long time (Aiginger, 2013a and 2013b; Landesmann, 2013). The countries of the European South (often referred to as the 'European Periphery') have for decades lower levels of economic and technological development, productivity and performance, and also higher levels of unemployment, than the countries of the European North. The Southern European countries are characterised by some fundamental weaknesses associated with the size and structure of manufacturing, deficits in innovation and education, deficits with respect to the exploitation of economy globalisation and the restructuring of the public sector. They have a larger share of low skill industries and a smaller share of higher skill ones; the technology driven industries are much smaller in comparison with the Northern European countries, and also declining. European periphery countries did not use the advantage of globalization despite being located by the sea and despite a history of global trade connections. Though there has been a convergence between the European North and South for some time, recently, due to the economic crisis, this trend has stopped, and on the contrary a divergence is observed (Aiginger, 2013a). It is widely recognized that in order to overcome this negative situation, and achieve a gradual convergence between these two regions, it is important not only to cut wages and public expenditure in the European South (which has been the dominant approach so far), but also to make wider and better use of new technologies and boost innovation, aiming at increase of productivity and growth.

Cloud Computing (CC) is one of the most important, innovative and disruptive new information and communication technologies (ICT), which changes radically the way firms access and use ICT for supporting their activities: part of the ICT support services required by firms are delivered not by their internal ICT units, but by external providers on an on-demand basis over the Internet, and users pay for the service as an operating expense, based on the real use of it, without having to make significant initial hardware and software investments, and also without having to incur operation, support and maintenance costs (Armbrust et al., 2010; Marston et al., 2011; Venders and Whitley, 2012). CC is defined by the US National Institute for Standards and Technology (NIST) as "[...] a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of computing resources (e.g. networks, servers, storage, applications, services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" (NIST, 2009). CC can provide significant benefits to firms: initially the ICT cost reduction was regarded as the most significant of them, and especially the reduction of the required ICT investments, by converting related capital investments (cap-ex) to operating costs (op-ex); however, it was soon realised that CC could provide, beyond these 'first-level' cost reduction oriented benefits, some additional 'second-level' significant transformation oriented benefits: it can enable the rapid and low cost experimentation with and exploitation of new emerging technologies, and also support and facilitate innovation and external collaboration (Etro, 2009; Brynjolfsson et al., 2010; Marston et al., 2011; Venders and Whitley, 2012). According to Armbrust et al. (2010) CC enables the quick implementation of new ICT-based ideas, as 'developers with innovative ideas for new Internet services no longer require the large capital outlays in hardware to deploy their service or the human expense to operate it'.

In this paper we empirically investigate and compare Northern and Southern European firms with respect not to the 'quantity' of CC use, but to its 'quality': their CC adoption motivations and orientations. In particular, we investigate and compare to what extent Northern and Southern European firms view CC as a means of: a) ICT investment reduction; b) Supporting and facilitating product/service innovation and process innovation; c) Experimenting with and exploiting new ICT; and d) Supporting and facilitating external collaboration. Furthermore, this investigation is not based on the analysis of firms' managers' subjective perceptions concerning the usefulness of CC along the abovementioned four dimensions (which is the usual approach in the research literature for investigating firms' motivations for adopting various technologies); it adopts a more 'objective' approach, based on the estimation of the firm level association between propensity for CC adoption and each of the above four vari-

ables (adoption of ICT investment strategy, product/service innovation strategy and process innovation strategy; interest in some new emerging ICT (data warehousing and data mining, mobile services); and having external collaborations for the development of innovations) in these two geographic regions. Our study has been based on a dataset collected through the e-Business W@tch Survey of the European Commission from 556 European firms from the glass, ceramic and cement sectors.

This paper consists of seven sections. In the following section 2 a relevant literature review is presented, while in section 3 our research hypotheses are developed. Then in section 4 the data and the method of this study are described. In section 5 the results are presented and discussed. The final section 6 summarizes the conclusions and suggests future research directions.

2 Literature Review

Considerable empirical research has been conducted concerning the factors affecting CC adoption by firms. Most of it has been based on the Technology, Organization and Environment (TOE) theory (Tornatzky and Fleischer, 1990; Baker, 2011), which identifies three groups of factors that affect the adoption of technological innovations in general by firms: technological (= perceived characteristics of the technological innovation), organizational (= firm's characteristics) and environmental (= characteristics of firm's external environment) ones (Low et al., 2011; Mangula et al., 2014; Hsu et al., 2014; Oliveira et al., 2014; Gutierrez et al., 2015); for each group a number of CC related factors are determined, and then the statistical importance of their effects on adoption CC are tested. In particular, Low et al. (2011) examine the effect of a set of technological factors (relative advantage, complexity and compatibility), organizational factors (top management support, firm size and technology readiness) and environmental factors (competitive pressure and trading partner pressure) on CC adoption. They concluded that perceived relative advantage, top management support, firm size, competitive pressure and trading partner pressure have statistically significant effects on CC adoption. Mangula et al. (2014) similarly examine the effect of technological factors (relative advantage, compatibility, complexity, trialability, observability), organizational factors (organizational readiness, top management support) and environmental factors (market pressure, market competition vendor marketing, trust in vendor, government support) on the adoption of Software as a Service (SaaS) services. They conclude that compatibility, observability, market competition and government support have a positive correlation with SaaS adoption, while complexity has a negative correlation with it. Hsu et al. (2014) examine the effect of perceived benefits and business concerns (technological factors), IT capability (IT personnel and budget - organizational factor) and external pressure (environmental factor) on CC adoption intention; they found that the first three of these factors are significant determinants of CC adoption. Oliveira et al. (2014) examine the effects of three CC characteristics from a technological innovation perspective (relative advantage, complexity and compatibility), three organizational context characteristics (top management support, firm size, technological readiness) and two environmental context characteristics (competitive pressure, regulatory support). They found that relative advantage, technological readiness, top management support and firm size have positive effects on CC adoption, while complexity has a negative effect. Another similar study has been conducted by Gutierrez et al. (2015), who examined the effects of a set of technological factors (relative advantage, complexity and compatibility), organizational factors (top management support, firm size, technological readiness) and environmental factors (competitive pressure, trading partners pressure) on CC adoption. They concluded that competitive pressure, complexity, technology readiness and trading partner pressure have a significant influence on the adoption of CC services.

Furthermore, there are CC adoption empirical studies that are based on the synthesis of other theoretical frameworks (Benlian et al., 2009; Saya et al., 2010; Benlian & Hess, 2011; Wu et al., 2013). The study of Benlian et al. (2009) developed a SaaS adoption model by combining three theoretical foundations: transaction cost theory (including in their model the application specificity and perceived uncertainty), resource-based view of the firm (including application strategic value and inimitability) and

theory of planned behaviour (including the attitude towards SaaS and also social influence). It has concluded that social influence, adoption uncertainty and application strategic value are the most consistent SaaS adoption drivers across all application types. The study of Saya et al. (2010) formulated a four layers structural equation CC adoption model, based on the institutional theory and the real options theory. It reached the conclusion that institutional influences (e.g. from government, customers, suppliers, competitors, strategic partners, industry and trade organizations, professional bodies) affect organizations perceptions about the technological characteristics of CC (perceived accessibility, scalability, cost effectiveness and lack of security), and through them affect the perceptions on the provided real options by CC adoption (concerning ICT applications growth, abandonment and deferral) and finally the intention to adopt CC). Benlian and Hess (2009) having as theoretical foundation the theory of reasoned action, in combination with previous research on ICT outsourcing and application service provision (ASP), examine the effects of perceived SaaS opportunities (cost advantages, strategic flexibility, focus on core competencies, access to specialised resources and quality improvements) and SaaS risks (performance, economic, strategic, security and managerial ones) on the intention to increase the level of its adoption. They have concluded that the perceived cost advantages have the strongest positive effect, followed by strategic flexibility and the quality improvement, while the security risks have the strongest negative effect, followed by the performance, economic and strategic risks. Wu et al. (2013) conducted a study of CC adoption factors having as theoretical foundations the innovation diffusion theory (DOI) proposed by Rogers (2003) and the 'information processing view' (IPV) of the firm. They concluded that business process complexity and also applications compatibility have negative effects on CC adoption intention, while entrepreneurial culture and applications functionality have positive effects.

However, there is a lack of empirical investigation of the association between CC adoption and various aspects of firm's strategy and operation, which would provide valuable insight into CC adoption motivations and orientations of firms. Also, there is a lack of comparative studies in this respect between geographic regions or countries, from such a 'quality' related perspective, rather than a 'quantity' related one. This study contributes to filling these research gaps, by empirically investigating and comparing Northern and Southern European glass, ceramic and cement sector firms with respect to their CC adoption motivations and orientations.

3 Research Hypotheses

We formulated four research hypotheses, which concern the association of the propensity to adopt CC with four firm's strategic and operational characteristics that correspond to the four main motivations of firms for adopting CC according to previous literature (Armbrust et al., 2010; Marston et al., 2011; Venders and Whitley, 2012): ICT investment reduction, support and facilitation of innovation, experimentation with and exploitation of new emerging ICT, and support and facilitation of external collaborations.

In particular, our first research hypothesis concerns the association between the adoption of an ICT investment reduction strategy and the propensity for CC adoption. Due to the economic crisis that exists in many countries firms have to adopt to a greater or lesser degree strategies of IT investment reduction. This does not allow them to upgrade and enhance their ICT infrastructures in order to meet new business needs, or to take advantage of new emerging technologies (such as data warehousing/mining, mobile technologies, etc.); this can have negative impact on firms' long term competitiveness. CC can be quite useful for such firms, as it enables them to upgrade the computing power of their ICT infrastructures (e.g. by using Infrastructure as a Service (IaaS)), and also their functionality (e.g. by using Software as a Service (SaaS)), without having to make additional upfront ICT investments (Marston et al., 2011; Venders and Whitley, 2012), transforming them to operational expenses based on the real use they make of these services (a 'pay as you go' model), and also without having to incur the corresponding operation, support and maintenance costs. Therefore, we expect that firms

adopting an ICT investment reduction strategy will have a strong propensity to adopt CC. So, our first research hypothesis is:

H1. *The adoption of an ICT investment reduction strategy is positively associated with the propensity for CC adoption.*

Our second research hypothesis concerns the association between the adoption of an innovation-oriented strategy and the propensity for CC adoption. Changes in customers' needs and preferences, emergence of new technologies and strong competition make it necessary for firms to make innovations in their products and services, and also in their internal production and administrative processes, which have become today highly important for the competitiveness and even for the survival of firms. However, these innovations (both product/service and process ones) usually necessitate the development of complex supporting ICT infrastructures; this can be costly (requiring considerable capital investments), risky (since if the innovation is not successful its supporting ICT infrastructure will become to a large extent useless, leading to waste of significant financial resources) and also can take too much time (which is quite negative in the rapidly changing and highly competitive modern economy). CC can alleviate the above problems: it can reduce the cost of the required ICT infrastructure for supporting an innovation (and make it an operational expense, without having to make ICT investments), and the implementation time (as the required CC services can be rapidly activated and customized), and also reduce the risk (since if the innovation is not successful the CC services used for supporting it can be simply terminated). Previous CC literature has emphasized that it can provide benefits associated not only with the ICT cost reduction, but also with the support and facilitation of innovations as well, as CC enables the rapid development of their required supporting ICT infrastructures, at a low cost, without requiring ICT capital investments (Brynjolfsson et al., 2010; Marston et al., 2011; Venders and Whitley, 2012; Berman et al., 2012). So, we expect that firms adopting an innovation-oriented strategy will have a strong propensity to adopt CC. Thus, our second hypothesis is:

H2. *The adoption of an innovation-oriented strategy is positively associated with the propensity for CC adoption.*

It can be analysed into the following two hypotheses:

H2a. *The adoption of a product or service innovation oriented strategy is positively associated with the propensity for CC adoption.*

H2b. *The adoption of a process innovation oriented strategy is positively associated with the propensity for CC adoption.*

Our third research hypothesis concerns the association between the interest in the adoption of new ICT and the propensity for CC adoption. A major trend of the modern economy is the continuous emergence of new ICT; each firm has to decide which of the multiple new emerging ICT are appropriate and beneficial for its particular activities, processes, products and services, and also sufficiently mature, so they should be adopted, and which of these emerging ICT are not, so they should not be adopted. However, the adoption of a new emerging ICT poses two important problems: on one hand it can be costly and require some capital investment, and on the other hand it carries some uncertainty and risk (as to whether it is really applicable, appropriate and beneficial); if it is not finally successful there will be a loss of valuable financial resources that have been used for the relevant investment. CC can alleviate both these problems: it can reduce the abovementioned required costs, making them operational expenses and eliminating the need for investment; also it can eliminate the inherent risk (since if the adoption is not successful the CC services used can be simply terminated). Previous literature argues that one of the most important advantages of CC is that it enables enhancing firm's ICT infrastructure by incorporating new emerging ICT, rapidly, at a low cost and without having to make additional investments, with the most widely mentioned of them being data warehousing/mining and mobile services (Marston et al., 2011; Venters and Whitley, 2012; Bhagyashree and Borkar, 2012; Verma, 2013). Therefore we expect that firms interested in experimentation with and exploitation of new ICT will have a strong propensity to adopt CC. So, our third hypothesis is:

H3. *Interest in adopting new ICT is positively associated with the propensity for CC adoption.*

Finally, our fourth research hypothesis concerns the association of the collaboration with other firms with the propensity to adopt CC. The globalization, the strong competition, the continuous emergence of new technologies, the fast changes that characterise the modern business environment, as well as the high expectations and demands of consumers for high value-added products and services, and also for continuous renewal and improvement of them, make it difficult for individual firms to survive on their own, relying only on their internal resources, and this results in increasing collaboration among firms having complementary resources, both at the operational and the product/service and process innovation level (Rycroft, 2007; Zeng et al., 2010; Xie et al., 2013; Majava et al., 2013). However, this necessitates extensive exchange of both structured and unstructured information, which can be significantly supported and facilitated through the use of appropriate ICT. The use of CC services enables the development, operation and maintenance of this ICT support of collaboration rapidly, at a low cost, without having to make additional investments. A recent study based on interviews with business and ICT practitioners in the UK revealed that CC has a strong potential to support and facilitate business collaboration at a low cost (Willcocks et al., 2014). For the above reasons we expect that firms having collaboration with other firms will have a strong propensity to adopt CC. So our fourth research hypothesis is:

H4. *Collaboration with other firms is positively associated with the propensity for CC adoption.*

4 Data and Method

In this study we have used firm level data collected through the "e-Business Survey 2009" survey, conducted by the e-Business Market W@tch (www.ebusiness-watch.org) under the auspices of the European Commission. In this survey were collected data concerning the use of various types of ICT, ICT skills, ICT investment, and also innovation activity from 676 firms of the glass, ceramic and cement sectors from six European countries: Germany, France, UK, Italy, Spain and Poland. For this study we focused on the data from the first five of these countries, with the first three belonging to the European North, and the next two belonging to the European South, while the Polish data were not used (as Poland belongs to the Easter European region, which has quite different economic characteristics).

As dependent variable we used the propensity for CC adoption, which has three possible values (very relevant, partly relevant, not relevant). As independent variables we used three binary variables concerning the adoption or not of an ICT investment reduction strategy, a product/service innovation strategy and a process innovation strategy respectively; two values concerning firm's interest in two new emerging ICT, the data warehousing and data mining, and the mobile services, which have three possible values (very relevant, partly relevant, not relevant); and also two binary variables concerning the existence or not of external innovation collaboration (i.e. with other firms), and also of electronic (i.e. supported by ICT) external innovation collaboration.

We tested the research hypotheses H1 – H4 separately for the European North and the European South, by estimated the association between the dependent variable and each of the abovementioned independent ones, initially for the European North sub-sample (firms from Germany, France and Italy), and then for the European South sub-sample (Italy and Spain). In particular, we calculated widely used measures of association between ordinal variables: Sommer's' D and Kendall's tau-b; they both range from -1 to 1, with the sign indicating the direction of the association, and the absolute value indicating its strength. It should be noted that we did not estimate a regression model because there were high levels of correlation between our independent variables; according to the econometric literature (e.g. Greene, 2011; Gujarati, 2008) if we have high levels of correlation between the independent variables of a regression (problem of 'multi-collinearity'), then the regression coefficients are not reliable estimates of the impact of the independent variables on the dependent variable.

5 Results

In Table 1 we can see the relative frequencies of the three possible values of our dependent variable (propensity for CC adoption) for each of the five countries examined in this study. We remark that in the glass, ceramic and cement sectors of the examined Southern Europe countries there is a higher share of firms considering CC as very relevant or partly relevant than in the examined Northern Europe countries. A possible explanation of this might be that the economic problems of the European South limit the financial resources of firms, and this increases their propensity to use CC for reducing the ICT costs and especially ICT investments; however, a clearer picture on this can be formed by examining the estimated associations of the propensity for CC adoption with our independent variables, which are discussed in the following paragraphs of this section. In Table 2 we can see the relative frequencies of the possible values of our independent variables for each of the five countries examined in this study (for the two triple valued independent variables, concerning firm's interest in data warehousing/data mining, and mobile services, is shown the sum of the relative frequencies of 'very relevant' and 'partly relevant'). We remark in the European South, due to the existing economic problems that reduce demand and sales, it is much higher the percentage of firms of these sectors adopting an ICT investment reduction strategy, in comparison with the European North; also, we have higher percentages of firms making innovations, having electronic external innovation collaboration and being interested in data warehousing/mining.

		Cloud Computing Propensity		
		Very Relevant (%)	**Partly Relevant (%)**	**Not Relevant (%)**
South	**Italy**	4.0	17.8	8.2
	Spain	3.2	12.8	84.0
North	**UK**	0.0	4.7	95.3
	France	1.2	11.6	87.2
	Germany	0.0	4.4	95.6

Table 1. Cloud Computing propensity relative frequencies

		ICT Invest. Reduction Strategy	**Product/ Service Innovation Strategy**	**Process Innovation Strategy**	**Interest in DW/DM**	**Interest in Mobile Services**	**Innovation Collaboration**	**Electr. Innovation Collab.**
South	**Italy**	30.7	39.6	38.6	32.7	44.6	25.7	13.9
	Spain	30.4	36.0	44.0	26.4	57.6	13.6	13.6
North	**UK**	14.1	34.4	40.6	9.4	26.5	18.8	7.8
	France	20.9	20.9	24.4	22.1	41.9	17.0	11.6
	Germ.	16.7	36.1	39.4	17.2	33.9	16.1	9.4

Table 2. Independent variables frequencies

In Tables 3 and 4 we can see for all independent variables their calculated Sommer's D coefficient and Kendall tau-b coefficient values with respect to the independent variable (propensity for CC adoption) for the European North and South respectively (statistically significant values are shown in bold).

We remark that in both regions there is a statistically significant positive association of the interest in the two examined new emerging ICT, data warehousing/mining and mobile services, with the propensity for CC adoption. Therefore, hypothesis H3 is supported in both regions. This indicates that both Northern and Southern European firms of the examined sectors view CC as a low cost and risk means of experimentation with and exploitation of these new emerging ICT. We can see that in both regions the Sommer's D and Kendall tau-b values for these two variables are the highest among all our independent variables, which indicate that experimentation with/exploitation of emerging ICT seems to be a very strong motivation for the adoption of CC by firms of these three sectors in both Northern and Southern Europe; this appears to be stronger in the Southern Europe, as indicated by the higher values of both Sommer's D and Kendall tau-b for this region (see Table 4) in comparison with the Northern Europe (see Table 3), as the economic problems and the lower market demand in the former put pressure on them to exploit the extensive capabilities for low cost and risk use of new emerging ICT offered by CC.

Independent Variable	Sommer's D	Kendall tau-b	Research Hypothesis
ICT Investment Reduction Strategy	.094	.102	H1
Product/Service Innovation Strategy	.044	.053	H2a
Process Innovation Strategy	**.107**	**.131**	**H2b**
Interest in Data Warehousing/Mining	**.182**	**.199**	**H3**
Interest in Mobile Services	**.124**	**.155**	**H3**
Innovation Collaboration	.063	.067	H4
Electronic Innovation Collaboration	**.276**	**.280**	**H4**

Table 3. Sommer's D and Kendall tau-b values for the European North

Independent Variable	Sommer's D	Kendall tau-b	Research Hypothesis
ICT Investment Reduction Strategy	**.205**	**.208**	**H1**
Product/Service Innovation Strategy	.113	.116	**H2a**
Process Innovation Strategy	.104	.106	H2b
Interest in Data Warehousing/Mining	**.328**	**.334**	**H3**
Interest in Mobile Services	**.232**	**.245**	**H3**
Innovation Collaboration	.118	.118	H4
Electronic Innovation Collaboration	.112	.113	H4

Table 4. Sommer's D and Kendall tau-b values for the European South

Furthermore, we remark that only in the European South there is a statistically significant positive association of the adoption of an ICT investment reduction strategy with the propensity for CC adoption; so hypothesis H1 is supported only in the European South. On the contrary, only in the European North there is a statistically significant positive association of the adoption of a product/service inno-

vation strategy with the propensity for CC adoption; so hypothesis H2a is supported only in the European North. Also, there is not statistically significant association of the adoption of a process innovation strategy with the propensity for CC adoption; so hypothesis H2b is not supported. The above results indicate that the Southern European firms of the above sectors view CC as a means of reducing ICT investment; CC enables them to upgrade and enhance their ICT infrastructures in order to meet new business needs, without having to make new investments, which would difficult to finance in the problematic economic context of the European South. On the contrary the Northern European firms of the above sectors view it as a means of supporting and facilitating product/service innovation.

Finally, in none of these two regions there is statistically significant positive association of the external innovation collaboration (i.e. collaboration with other firms for the development of innovations in products and services) with the propensity for CC adoption; only in the European North there is a statistically significant positive association of the electronic (i.e. supported by ICT) external innovation collaboration with the propensity for CC adoption. Therefore, hypothesis H4 is only partially supported. These results indicate that firms of these sectors from both regions do not view CC as a means of providing electronic support of innovation oriented collaboration with other firms, despite the arguments of relevant literature that CC has a strong potential to support and facilitate business collaboration at a low cost (Willcocks et al., 2014); however, in the European North firms already having electronically supported innovation collaboration with other firms view CC a means of reducing the cost and increasing the capabilities and flexibility of the existing ICT support of their external innovation collaborations.

6 Conclusions

One of the most important problems of Europe for long time has been the gap in economic and technological development and performance between the European North and the European South, referred to as the 'European North-South divide'. Though for some time a gradual convergence between these two regions was in progress, recently, due to the economic crisis, this has stopped, and on the contrary a new divergence has started. It is widely recognized that in order to reverse this negative trend and achieve a gradual convergence between these two regions, it is of critical important to make wider and better use of new technologies and boost innovation in the European South in order to improve its productivity. This study makes a contribution to this 'European North-South divide' debate, by empirically investigating and comparing European North and South with respect to the one of the most important, innovative and disruptive new ICT: the CC; this technology changes radically the way firms access and use ICT for supporting their activities, and also the economics of business computing (as it enables the conversion of relevant capital investments (cap-ex) to operating costs (op-ex). In particular, we investigate and compare the 'quality' (instead of the 'quantity' usually examined by similar studies) of CC use (or planned use) by the Northern and Southern European firms: we examine to what extent they view CC as a means of: a) ICT investment reduction; b) Supporting and facilitating product/service innovation and process innovation; c) Experimenting with and exploiting new ICT; and d) Supporting and facilitating external collaboration. Our study has been based on a dataset collected through the e-Business W@tch Survey of the European Commission from 676 European firms from the glass, ceramic, cement and sectors.

It has been concluded that in the European South firms of the above sectors have in general a higher interest in and propensity for the adoption of CC than in the European North. However, the motivations and orientations of the former with respect to CC adoption have some similarities with the ones of the latter, but also important differences as well. Both Northern and Southern European firms of the examined sectors view CC as a low cost and risk means of experimentation with and exploitation of new emerging ICT, and this seems for both regions to be the strongest CC adoption motivation among the examined ones. However, we have found for the Southern European firms a higher interest in the experimentation with/exploitation of the examined new emerging ICT in comparison with the North-

ern European ones (see Table 2), and also a stronger association of it with the propensity for CC adoption (see Tables 3 and 4), which indicates a stronger motivation/orientation of the Southern European firms to use CC for experimentation with/exploitation of the new emerging ICT. The economic problems and the lower market demand in the European South put pressure on firms to exploit the extensive capabilities for low cost and risk use of new emerging ICT offered by CC.

Furthermore, it has also been concluded that Southern European firms of the above sectors view CC as a means of reducing ICT investment; this does not hold for the Northern European ones, which on the contrary view CC as a means of supporting and facilitating product/service innovation, and also of reducing cost and increasing capabilities of their existing external electronic collaboration (with business partners and experts) for the development of innovations. This indicates that Southern European firms are mainly oriented towards 'first-level' cost (and especially investment) reduction related benefits from CC, while on the contrary Northern European firms are mainly oriented towards 'second-level' transformation related benefits from CC, which are associated with support and facilitation of innovation and external collaboration. The difficulty of financing investments in the problematic economic context of the European South, in combination with the longer and stronger tradition of the European North concerning the use and advanced exploitation of complex new technologies, are a possible explanation for this.

The findings of this empirical study have interesting implications both for research and practice. With respect to research it makes a contribution to the existing body of knowledge concerning the impact of the national context of ICT adoption, focusing on a very important and disruptive ICT (the CC), and also not on the 'quantity' of its adoption, but on its 'quality' (motivations and orientations of CC adoption). With respect to practice, our conclusions can be useful for government agencies, both at national level and at European level, in order to formulate effective technology adoption and transfer policies, and also for CC services providers, in order to optimize their offerings in taking into account the specific characteristics and needs of each national market. Our study has two main limitations: its limited sectoral and national scope, and also the use of a rather broad dependent variable (propensity for CC adoption in general). So further research is required concerning the motivations/orientations of the adoption of various types of CC services (e.g. IaaS, PaaS, SaaS), in various sectorial and national contexts.

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APPENDIX – Variables definitions – questions

Variable	**Definition**
Cloud Adoption Propensity	How relevant is cloud computing for your company (very relevant, partly relevant, or not relevant)?
IT Investment Reduction Strategy	Has the economic crisis lead you to cancel or significantly downsizing any ICT investments/projects in the last 12 months? (yes/no)
Product/Service Innovation	During the past 12 months, has your company launched any new or substantially improved products or services? (yes/no)
Process Innovation	During the past 12 months, has your company introduced any new or significantly improved internal processes? (yes/no)
Interest in Data Warehousing	Do you consider the topic of data warehouses and data mining to be very relevant, partly relevant, or not relevant for your company? (very relevant/partly relevant/ not relevant)
Interest in Mobile Services	Do you consider the topic of mobile services such as mobile commerce and remote access technologies to be very relevant, partly relevant, or not relevant for your company? (very relevant/ partly relevant/ not relevant)
Innovation Collaboration	Were external experts or business partners involved in developing the new products or services? (yes/no)
Electronic Innovation Collaboration	Does your company use online software applications other than e-mail to collaborate with business partners in the development of new products and services? (yes/no)