Strategic Renewal and Corporate Return of Digital Transformation

Authors

Jacques Bughin
Solvay Brussels School of Economics and Management, Université Libre de Bruxelles, Times² (former iCite), Brussels.

Nicolas van Zeebroeck
Solvay Brussels School of Economics and Management, Université Libre de Bruxelles, Times² (former iCite), Brussels.

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Times² - International Research Centre
Université libre de Bruxelles – CP114/05
50, avenue F.D. Roosevelt – B -1050 Brussels – Belgium
Anne-marie.notarianni@ulb.be

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Bughin, Jacques (Times²)
van Zeebroeck Nicolas (Times²)

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Strategic renewal has gained large momentum as an important process made by incumbents when transitioning towards digitization. This research systematically tests and confirms the importance of strategic renewal as a *key leverage* point to reap financial benefits out of using digital technologies . We also explains the paradox of limited strategic renewal in incumbents as a result of major organizational barriers.

Keywords: *Digital transformation, strategic renewal, organizational leadership, capabilities, competition*

1. INTRODUCTION

The advent of digital technologies has witnessed the creation of a new breed, - digital only, firms. Their most successful representatives, called the FAANGs[1], have not only become global brands but have also been financially successful, generating material return on invested capital (ROIC) at level nearly *four times their weighted average cost of capital (*WACC).[2]

For the mirror cases of incumbents, cases such as Kodak or Encyclopedia Britannica had made little doubt that remaining inert in face of digital technologies use by aggressive entrants, may be extremely costly. Each of both companies went bankrupt after the former saw a full collapse of its business model from digital imaging and mobile hardware, while the later firm got competed away by free for advertising internet content.

However, despite the mandate for incumbents to embrace digitization, most incumbents seem to have struggled in transitioning to integrate digital technologies in their own business. While academic studies are rare on the magnitude of returns generated by incumbents when investing in digital technologies, multiple consulting studies such as led by Bain or KMPG have long concluded that 80% of incumbents were generating returns significantly below their cost of capital[3]. More recently, the research by Pfister and Lehmann (2022a) on German medium size companies had reported a median return at just above 5%. In fact, even if companies do not report their investments by technology, indirect evidence can also be revealing. The return on invested capital for publicly traded incumbent firms has remained essentially flat over the past two decades at 10 percent among U.S. and European firms,

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[1] Facebook, Amazon, Apple, Netflix, Google.

[2] Amazon generated an accounting return on invested capital (ROIC) of 21.8%, for a weighted cost of capital (WACC) of 7.7%. Google's return was 32.3% (and a WACC of 7.7%); Facebook reached 41% (and a WACC of 9.3%), while Apple generated 29.8% (WACC of 8.75%), see Financial Dictionary(ROIC^M) (gurufocus.com).

[3] Four Myths Of Digital Transformation: What Only 8% Of Companies Know | Bain & Company; Why 84% Of Companies Fail At Digital Transformation (forbes.com); Harvey Nash / KPMG CIO Survey 2017 - Full report (assets.kpmg)

despite their massive adoption of digital technologies.[4,5] . Macroeconomists themselves (e.g., OECD, 2019), have also struggled to find a significant incremental effect of digital investment on output growth, leading them to invoke Solow's paradox of "seeing the computer and Internet age (read: digital) everywhere but in productivity statistics."[6] .

It is difficult to comment on drivers of returns from firms transitioning into digitization, given the paucity of studies measuring returns achieved by incumbents. Nevertheless, some possible rationales may be put forward why returns from transitioning to digital tecxhnologies may be more or less limited, at least in the short-term.

One reason is that transitioning is costly, and returns take time to unfold as they require investments in new organizational capabilities (Brynjolfsson, et al. 2021). Another reason, which we dig deeper in this paper, is the failure of firm to engage in a major strategic change. In fact, it is well-known that incumbent strategies around digital technologies have been majorly based on a retrenchment strategy , with the goal to preserve value against exacerbated hyper-competition (VanZeebroeck et al, 2021; McAfee and Brynjolfsson, 2008). However, if retrenchment, -or the idea that a firm can survive by entering a niche by reducing its scope-, seems to be adequate at the start of a crisis (Wenzel, et al 2020), scholars have long warned that retrenchment is only a viable solution in the short-term, as it depletes resources and capabilities in the long-term, and makes firms more fragile in the advent of a series of subsequent shocks (Adner and Kapoor, 2016; De Figueiredo, et al, 2019).

4.See, for example, https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/ourinsights/a-long-term-look-at-roic,

5.A powerful database on business performance has been maintained by Aswath Damoradan at NYU. We use this database several times in this research, see http://pages.stern.nyu.edu/~adamodar/New_Home_Page/data. html.

6 See for example The Innovation Enigma by Joseph E. Stiglitz - Project Syndicate (project-syndicate.org)

Digitization can be easily seen as a series of shocks, - from the early days of the connectivity, to the recent advent of Artificial Intelligence. Further, as a general purpose technology ("GPT", Crafts, 2018 and 2021) the source of shock (digital technologies) is itself "strategic" in nature (Yoo et al. 2012, van Zeebroeck et al., 2021), i.e., the inherent properties of digital technologies offer the opportunity for incumbents to pivot from an old strategy, towards new interesting strategic opportunities (Agarwal and Helfat. 2009; Loonam, et al.,2018,. Bughin and Zeebroeck, 2017; Van Zeebroeck et al., 2021 Rothmann, and Koch 2014).

If only a few incumbents have chosen the path towards a major strategic renewal, the case study evidence suggests that those companies daring to pivot their strategy by exploiting digital technologies have actually enjoyed a major success rebound. From the story of how the Swedish car manufacturer Volvo developed its digital connected car autosystem (Svahn et al, 2017), to the media company Schibsted, diversifying to global online classified 5Thruman et al, 2021) , or still, BBVA, a Spanish bank conglomerate, which shifted its online banking to an open API data analytic platform with specialized fintechs to serve more than 30 countries worldwide (Alfaro et al., 2018; Omarini, 2018), all those players are now thriving in their market, and exhibiting significant returns. For its last audited performance in 2021, the BBVA bank delivered the highest ever profit, of which a last part is due to its new strategy engaged a few years before[7]. Schibsted Return on Capital employed is above 20%, and double the rate of its previous newspaper peers.

[7] BBVA posts in 2021 its highest recurring profit in 10 years, €5.07 billion

This research argues that an attractive transition to digital (also called digital transformation, DT, in the literature) is one that builds a significant commitment to strategic renewal to succeed [8].

Our goal in this paper is threefold. First, we provide a statistical benchmark of DT success by empirically assessing the returns on digital technology investments made by incumbent firms during their digital transformation. The measure we use is an operational, tangible, measure, of success, -that is, how investments in digital technologies correlates with operating profit/revenue changes 3 years forward.   The 3 years' window accounts for the possible J-curve in gains a shighlighted in Brynjolfsson, et al. (2021). If scholars argue that a large part of gains lies in intangible, we follow Porwita and Subriadi (2019) in choosing a operating gain approach here, as it is rather objective, and can also be compared to studies around types of assets, such as R&D, marketing, or older IT technologies. We also add to the direct effect of investment, the indirect path of strategic renewal, as a multiplier to returns to digital investment.

Second, we test our thesis that the *key to higher returns is a DT embedded into strategic renewal*. We measure the extent of strategic renewal through two dimensions: first, a clearcut deviation of the strategy from before DT, and second, the level of investments devoted to DT. The first dimension is discussed at length in the context of the organizational literature of strategic renewal. The second dimension captures the fact that strategy renewal only materializes when firm goes beyond experimentation and fully exploit the full portfolio of technologies available with significant investment in the organization (Van Zeebroeck et al., 2021).

[8] From now on, we will refer equivalently to returns on transformation and returns on digital technologies (during transformation).

Finally, given that many firms still do not engage in an extensive strategic renewal, we examine the catalysts for large, bold, strategic renewal. Drawing on the existing literature on organizational learning and dynamic capabilities (e.g., Bloom et al., 2002, Brynjolfsson and Hitt 2003, Binns et al, 2014, Tambe, 2014, Bughin 2016a, Tambe et al, 2020, Schmidt et al., 2018, Ciszewska-Mlinarič and Wójcik 2023; Huff et al, 1992; Teece et al, 1997; Vial 2019 or Warner and Wäger, 2019).), we correlate a set of organizational and capability factors that are known to affect the incumbent propensity to engage in strategic renewal. As such, the benefit of endogenizing strategic renewal is that the later can be used as instrumented variable to better assess how strategic renewal entails change in incumbent firm performance.

This article reads as follows. We first briefly review the literature on the profitability of digital transformations and some of the key organizational complements to ICT investments observed in previous work. We then develop our hypotheses and empirical strategy, before presenting the survey data on which our analysis is based, including their shortcomings and robustness. We continue by presenting and discussing the results. A final section concludes.

2. BACKGROUND

2.1.Return benchmarks

A literature has developed and expanded since the nineties which systematically estimates corporate returns to investment in IT technologies. Those studies have documented that the first generation of IT did not deliver large gains, but that the shift to digitization made for higher returns, essentially through boosting productivity (Brynjolfsson and Hitt, 1996 and 2003, Cardona et al., Kretschmer , 2012, Cardona et al., 2013).

Additionally, the literature supports the double claim that technology returns may be more attractive than others types of high value capital such as R&D and marketing (Biontis et al.

2015, Mithra and Rust, 2012), and that returns are ultimately highly dependent on corporations investing in complementary organizational and skills to technology spent (Bloom et al, 2012; Tambe, 2012, Bughin, 2016). Most recent studies, e.g. Rajgopal, Srivastava, and Zhao, (2021) or Pfister and Lehmann,(2023) show that return on digital investment can be relatively attractive, with for the later study, a mean in their 25 case studies of 13,5%, and with some companies even enjoying returns above 50%.

2.2. Return methodology

Most return studies had confined IT technologies to be an input to production, with limited scope for technologies to act as an intangible, i.e, digital technologies could complement new product and business model innovation (Bessen and Righi, 2019; Mithas and Rust 2016, or Bughin and van Zeebroeck, 2017). Here, we allow for a more general framework , considering the possibility that firms exploit digital technologies, and make returns directly from this investment, but also indirectly, as a *source* for strategic change that further help the incumbents gain extra rents.

Our measure of success for incumbents is through a set of convergent methods, either by relating profitability growth to the stock of digital investment (as in Bresnahan et al. 2002, or Tambe et al., 2020), or by relating revenue growth to the share of digital investment (e.g. De Loecker et al., 2019). Those methods measure tangible direct measures associated with DT, which we also enlarge by interacting investments in digital technologies with extent of strategic renewal, as an indirect factor of exploitation of digital technologies towards new competitive performance.

Each method above to compute returns has its advantages. The first method is the only one that directly estimates *absolute* returns as in Mithas et al. (2012), or Pfister and Lehmann, (2022). Our second method derives a proxy for *excess* returns from the WACC, -or a measure of product market rents arising from investment in the DT-, but this also requires making the additional assumption of a Cobb-Douglas production function to interpret the estimate as an measure of excess returns. The last is where we test returns to investment *relative to* rivals, consistent with the idea that a higher commitment to sunk investments such as digital technologies can raise barriers to entry and facilitate returns outside of reduced competition (Lieberman and Montgomery, 1988).

2.3. Strategic renewal as driver to return to technology

The fact that technologies reap more benefits when associated with strategic change is emphasized elsewhere (Antoniou and Ansoff 2004, Agarwal and Helfat 2009, El Sawy et al. 2010, Yoo et al. 2010, Kretschmer and Khashabi 2020, or van Zeebroeck et al. 2020), but this potential is even greater for digital technologies.

With respect to non-digital technologies, David (1990) and later Jovanovitch and Rousseau (2004), explained the prevalence of strong returns from new technologies when firms adapt their strategy and "business models" that take advantage of these technologies. Craft (2018) also highlights the importance of strategic extension in generating returns on technology investment, when he documents that returns on innovation in electricity were boosted by coupling lighting with aggressive mechanization of firms' production facilities. Mithras and Rust (2016) emphasize the importance of coupling strategy change with IT investment to support supranormal returns to IT.

In digital technologies, FAANGs can already prove the value of large-scale engagement in new strategy archetypes, e.g., the keystone of platforms/ecosystems, such as global retail and Amazon's cloud-based B2B marketplace. But there are also clear cases of incumbents known to have generated outsized returns on investment in digital technologies, such as Schibsted, a

Nordic newspaper company that has quickly grown into a global digital classifieds business.[9], Deere in the U.S., Netflix (which started with DVD rentals by mail), or Henkel, which embarked on a major strategic renewal during its digital transformation process. Schibsted has moved from local Scandinavia to the world, and extended its information business strategically to multilocal marketplaces. Deere and Netflix have significantly innovated their business models (IoT-as-a-service in the case of Deere, and video streaming analytics in the case of Netflix). Henkel has made a shift toward direct B2C sales in its beauty care segment using augmented reality that creates meaningful relationships with consumers, while its B2B products are diversifying toward servitization through extensive use of a digital twin platform (Hinterhuber and Nilles, 2021). Besides the media case of Schibsted, Karimi and Walter (2015), also describe the successful journey of a set of well-known legacy media brands that radically changed their strategy and business model to succeed in their industry. Tsou and Chen (2021) focus on financial firms, and demonstrate that the likely strategy change plays a key mediating role between performance and digital technology adoption in Taiwanese financial firms. This is independently confirmed by a study of the European financial industry by Niemand et al (2021), where the authors highlight the importance of strategic vision on digitalization for performance.

What we add in this research to the literature is first, a broader test of strategy change; we combine the measure of strategy renewal with the size of digital investment to reflect both the extent of, as well the size of commitment to, change (Shaked and Sutton, 1987 or Weeds, 2012). Second, our empirical investigation includes multiple regions and industries, rather

[9] Schibsted digital classified was recently spun off as Adevinta in 2019 and generated an accounting ROIC in 2019 of 20% return, or 3 times Schibsted's WACC. This ROIC is also in the same order of magnitude as that achieved by Schibsted's main digital native competitor, the auction and classifieds platform, Ebay, which currently generates a book ROIC= 17%.

than narrower case studies, or studies restrained to high-tech and digital natives as in the recent literature.

Finally, if digital technology is a "strategic resource," this naturally raises the question of why not all firms upgrade their strategy at the time of DT. Our final objective is to test the hypothesis that strategy renewal is driven by a set of organizational bottlenecks and complementary capabilities.

In particular, we rely especially on two organizational theories that underpin the logic of strategic renewal. On one hand, the organizational learning theory suggests that strategic renewal arises out of a salient tension between known, stable conduct of business, and the exploration of new, more uncertain, ways of doing businesses. Renewal emerges when old way of doing business build significant shortfall that makes firm chose for the new ways to compete (Crossan and Bedrow, 2003). The second theory rather stipulates that renewal is driven by dynamic capabilities and transformation of the firm’s resources (Agarwal & Helfat, 2009; Warner & Wager, 2019).

Both theories are not exclusive, and we chose here to examine and blend four elements from both theories as antecedents to renewal. The first is the inability to detect disruptions and act as an early follower. This lack of responsiveness was highlighted in the early days of the diffusion of digital technology, marked by the inability of large incumbent companies, such as Kodak or Blockbuster, to make sense of digitization (Tripsas and Gavetti 2000). Theoretically, too, not being a first mover limits the possibility of a competitive product and service differentiation strategy (Zhang et al. 2021).

The second barrier is the risk of cannibalization. Disruptive innovations enabled by digital technologies (Ansari et al. 2016, Christensen and Bower 1996) can lead to a "curse of the incumbent," namely excessive self-cannibalization (Chandy and Tellis 2000).[10]

Another cause is the lack of strong managerial leadership that could give the right signal and guide the scaling of DT for large strategic moves (Helfat and Petera 2015, Gurbaxani and Dunkle 2019, Porfírio et al. 2021).[11] Risk-averse leadership also tends to exaggerate the perceived risk of strategic change, given the heightened uncertainty of the payoff when it comes to technological cases (Lischka,2019).

Finally, the dynamic capability literature (Teece et al. 2016, Nambisan et al. 2017) emphasizes the importance of complementary human capabilities to generate appropriate returns on digital investments. At least in the early days of a new technology's diffusion, excess demand for new capabilities and skills typically accumulates, preventing some incumbents from dynamically expanding their resources and improving their capabilities to increase returns (Kohli and Melville, 2018)[12]. This effect may be important considering the experience of other disruptive technologies in the past, and we should find it particularly relevant in the context of DT.

3. HYPOTHESIS DEVELOPMENT AND EMPIRICAL STRATEGY

3.1 Estimating the average return on digital capital (ROIC)

Let us then denote g_{ij} as the expected *operating profit* of the ith firm engaged in DT and industry j in annual period $t+3$. The three-year window is guided by our data, and is found to be a good

[10] Nonetheless, waiting too long to exploit the disruptive nature of digital technologies can also lead to higher competitive risk (Donoughue, 2010; Lee et al, 2016).

[11] In a different context, Bloom et al, (2012) find that the *new management* practices that should emerge from transformation are rare, and weigh on the ability to evolve transformation.

[12] Skills gap threatens digital transformation (gartner.com)

window for estimating returns in the IT literature (see Brynjolfsson and Hitt, 2003). As in Bresnahan et al. (2002), we write a simple baseline model where *profit* growth, g_{ij} is related to the logarithm of the digital investment stock (DI_{ij}) :

$$g_{ij} = \alpha + \beta log(DI_{ij}) + \mu F_j + \sigma Z_{ij} + \varepsilon_{ij} \qquad (1)$$

Where Z' is a vector of control variables (discussed below), while F is a vector of industry fixed factors. In (1), β>0 provides us with a *direct* estimate of the 3-year DI returns[13] .

For robustness reasons, we test two extensions of our basic model. The first extension replaces the dependent variable, *g*, with *revenue* growth *g*', and the regressor with the share of revenue devoted to the stock of digital investment (digital expenditure intensity, DII). Assuming a Cobb-Douglas production function, the estimated coefficient on m in (1') can then be directly interpreted as the product/service market markup, m= β/WACC >1 (De Loecker et al, 2019).[14]

$$g'_{ij} = \alpha + m. DII_{ij} + \mu F_j + \sigma Z_{ij} + \varepsilon_{ij} \qquad (1')$$

The second extension is related to the idea that firms that invest more than their competitors generate higher returns (Shaked and Sutton 1987, Nuccio and Guerzoni 2019). We therefore

[13] Under a perpetuity formula, the value of the firm V_i is the sum of its earnings over time, divided by the difference between earnings growth, g_{ij} and its weighted cost of capital, WACC. With some approximation, the elasticity of the growth of the firm's value is given by the ratio g_{ij}/WACC. Using (1), we can therefore deduce that the elasticity of DI to firm value is given by b/WACC. This elasticity is greater than 1, and thus increases V_i ,when the firm's return b is greater than WACC.

[14] Under Cobb Douglas, the output elasticity of digital capital is the product of the digital capital share and the markup m. This is exactly (1'), assuming that the price of output is normalized to 1. In practice, estimating (1) means that the industry price effect is handled by the industry fixed dummies. For a more general CES-type production function, the markup is m^s where s is the elasticity of substitution between inputs. In practice, most studies of the production function tend to suggest that s<1 (see Knoblach and Stöckl, 2020), so that our estimate of m might be underestimated.

calculate the numerical intensity *relative to* other incumbents, $DIR_{ij} = (DI_{ij}/(average$ $(DI_{i\neq j}))$ and replace log(DI) with this new regressor in (1), which leads to (1"):

$$g_{ij} = \alpha + \text{d}.\,(DIR_{ij}) + \mu F_j + \sigma Z_{ij} + \varepsilon_{ij} \quad (1'')$$

Where, if the relative scale matters, we should have *that* $d > 0$.

The robustness test is that, at the average of all firms, the estimate of β should converge to both estimates of m.DII' (average of DII), and d.DIR' (average of DIR).

3.2 The role of SR into shaping return to digital investment

As discussed in Section 2, we expect returns to be limited if digital investments are *not scaled* through strategic renewal.[15] We introduce the strategic component factor S_{ij}into equation (2) below, which measures the extent (or "boldness") of the focal firm's strategic posture change coupled with the extent of digital investments.

We define a "bold" strategy as a significant strategy change *combined* with our idea of a high commitment to devote significant investment to digital, as this clearly represents a significant departure from a company's core business, in addition to potentially creating a deterrent to entry from rivals.

We therefore create three levels of strategy change: 1) S_{bold} when DIR>1 and the firm associates technology with strategic change; 2) $_{Smedium}$ =1, when DIR>1, (scale only and marginal strategy change), and 3) S_{low} =1 for all other cases.[16]

[15] These strategic moves inspired or driven by digital innovation are discussed at length, for example in Bughin and van Zeebroeck (2017b).

[16] The case of bold strategy and small scale does not prevail in our sample, confirming the common tendency of companies to combine the two.

Note that if S_{bold} (or S_{medium}) provides additional performance, it could do so at the *expense of* its rivals; they would in turn respond and adapt (Ho et al. 2017), in some cases creating overinvestment in the industry (Shaked and Sutton 2007). Among *n* firms in industry j, let us define the average numerical turbulence, $(S_i^n\ S_{bold})/_n$. We then posit that t=1 (=0) when a firm faces more (less) turbulent conditions than the average (El Sawy et al. 2010). Equation (1) is adjusted so that

$$\beta' = \beta \times (1 + t) \times S_{ij} \qquad (2)$$

3.2.2. Endogenization of strategy change

We finally extend our model by *endogenizing* the decision, S, to adopt or not adopt a bold strategy at scale:

$$S_{ij} = e + ORG1.CAP_{ij} + \mathrm{ORG2}.(1 - RA_{ij}) + 0RG3.SENSE_{ij} + ORG4.CEO_{ij} + \mu''F_j + \varepsilon'_{ij} \qquad (3)$$

where ORG are the coefficients to be estimated, e' is a random term, CAP is a measure of relative capabilities[17] (Tambe et al. 2020), RA is risk aversion to digitization (Kammerlander et al. 2018, Lischka 2019), SENSE represents the ability to perceive the urgency of a disruption (Tripsas and Gavetti 2000), and CEO is a measure of CEO commitment to digitization. Our final hypothesis is that *all factors remove barriers to for strategic renewal associated with DT* .

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[17] WTP is a measure of *relative* ability, based on the premise that skill gaps often prevail and confer an advantage on those who are able to obtain those skills that are in short supply (Berger and Frey, 2016) See also [The digital skills gap is rapidly widening. Here's how to close it | World Economic Forum (weforum.org)]

4. DATA

4.1. Survey collection

Our research is based on datasets from *three consecutive annual* online surveys conducted by TNS Sofres in early 2017, 2018, 2019 on behalf of McKinsey and Company regarding digital business transformations. These transformations are clearly defined as business transformations involving digital technologies.

In this research, digital technologies *explicitly included* are internet-based software, cloud, IoT, data/analytics, automation and mobile. It does not include typical on-site IT architecture, and IT hardware. It does not include new generation of tech such as blockchain, and 5G in mobile.

The surveys were sent to a representative panel of 12,000 C-level executives maintained by TNS, covering a wide range of industries (professional services, finance, and high-tech are the top three respondent groups), company sizes, and regions, with response rates ranging from 7 to 10 percent in each case. Respondents are exclusively CEOs or board members, or business unit managers-if not board members. This is critical because the typical questions concern management choices.

The data collection procedure is based on TNS professional practices. The procedure has been validated in multiple studies; see Bughin, LaBerge, and Melbye, (2016) among others. The sample was designed to be representative of the global distribution of GDP, (with approximately 20% of firms from North America, 35% from wider Europe, 20% from Asia for example, averaged over the 3 years).

Because the data are typically reported online, we may be subject to some bias, but we found no apparent evidence of response bias[18] (Podsakoff et al 2003). This lack of bias may have been reinforced by the fact that executives had the choice to skip questions. The annual sample size is limited to 450-550 companies, depending on the year of the research.

We recognize the drawback of the cross-sectional nature of our data. We had attempted to build a panel dimension across years, but a balanced set where firms respond in each subsequent year reduces the final sample size to only 20% of all responses. In addition, the implied panel sample would be self-selecting because it includes firms engaged in early DT programs [19] .

The second caveat is that the companies in the survey are confidential to TNS. This is a *sine qua non* condition set by respondents to reveal valuable company-specific information about their organizational assets, competencies, and strategic moves, and it is strictly enforced by the agency. Although this is a constraint, we show below that the average profile of the firms in the sample (e.g., in terms of growth, etc.) is quite close to what is observed in the public data, - hence our belief that the sample is sufficiently representative.

4.2. High level statistics

Tables 1a and 1b provide a snapshot overview of the data collected. As the data are collected online, companies responses are usually simple, eg binary, or are based on a selecting a range. Eg. revenue growth reported is based on selecting one category among 10% growth range.

[18] We used a pooled analysis of variance according to Podsakoff, et al (2003), when the variance on all questions used in the empirical analysis shows a level 3 times lower than the variance threshold.

[19] For the specific case of big data technology, Bughin (2016) uses a Heckman correction for pioneer firms, which leads to a possible overestimation of the technology contribution by more than 40%.

Hereafter, we use the median of the range as point estimate, so to derive continuous estimates of ROIC of DT. Using a smoothing method based on the distribution across range, new point estimate has been derived but are not statistically different from our main strategy of taking the median of the range.

Tables 1 highlight some key points:

Table 1a- about here -

Distribution by industry and size across the three surveys, 2016-2018.

Table 1b- about here

Sample characteristics, mid-2017, %.

Representativeness. The sample is composed of *large companies*. The average size is about US$2.5 billion in revenue and over 15,000 employees, or about US$200,000 in revenue per job, full-time equivalent.

Comparing our statistics with those of publicly traded companies[20] , our sample's annual revenue growth (8.2%[21]) matches that of large public companies (8%), while the sample's productivity measures (revenue and revenue growth per employee) compare well with the average employee productivity of U.S. and Eurozone companies, with differences never exceeding 5% in each year of observation. Similarly, the incumbents' share of digital

[20] We use the universe of publicly traded firms as maintained by Professor A. Damodaran at NYU. See Damodaran's online homepage (nyu.edu)

[21] We code revenue and earnings growth between 1 and 12, which corresponds to a range of less than -50% to over 50% growth. The average is 7.87, which leads to a nominal revenue growth of just over 8.2%.

revenues over the three-year average was 22.5 percent, consistent with other public estimates[22] .

Digital Maturity. In the initial set of respondents, 5 out of 6 incumbents *launched a digital transformation journey by the year 2018* (they were 51% in 2016 and increased to 77% at the end of 2017), in line with other sources on the state of digitalization of large companies (Ollagnier et al, 2021)[23] , [24]. Among large firms, this confirms that the issue of DT is not to adopt a DT programme, but more a question of its scale and success. For the purpose of our analysis (returns to DT), we restrict our initial sample to firms that report having already started a DT.

Scale of digital natives. Digital natives had remained a limited species compared to the iniverse of incumbent companies: in our sample, there was about one digital native for every 4 or so legacy companies per industry in the years 2016-2018. Yet within the 22.5% digital share of revenue, the overall revenue share of the digital native industry reached just above 12.2%, to about 10.3% digital revenue for incumbent firms. This means that digital native companies generate (12.2%/(10.3%/4)= 4.7) times *more digital revenue* than the average industry company. This result is consistent with other findings, for example, Amazon's revenue is more than seven times that of Walmart online in the U.S. [25]. This means that

[22] Our digital revenues include revenues that are marketed online, but potentially realized offline. End-oend digital is about 65% of the total, or about 15%. Global e-commerce is just under 33% according to emarketer, while U.S. e-commerce is about 15% of retail by 2020, see ec_current.pdf (census.gov),

[23] This is also consistent with recent figures that 95% of large companies are committed to DT by early 2020, see Ollagnier and colleagues, 2020, at Why Fixing the Planet is also about Seizing Business Opportunities - The European Business Review.

[24] Company size matters, however, as more than a third of companies with fewer than 100 employees have not yet deployed digital transformation programs.

[25] Retail E-Commerce Market Size and Share Report, 2020-2027 (grandviewresearch.com)

digital native companies have achieved a much greater business scale than incumbent traditional companies in the digitization process.

Digital capital. The average capital intensity of the sample as of mid-2017 was about 15% of revenues. Given that for large firms, the ratio of invested capital to revenue is typically around 1, this also means that the digital capital stock reaches 15% of the total capital stock, consistent with other recent estimates for the United States (Tambe et al, 2020).

Competition. Incumbent operators have estimated that 32% of their revenues could be at risk, in the absence of any digitization action. Since this figure is at least twice the market share captured to date by digital natives, this means that the competitive battle of digitization is both incomplete and arises *between all the other incumbents, in* addition to the purely digital players. This is one reason why our measure of disruption, is measured *across all* firms.

Strategy change. We measure a firm's level of strategic response as the degree of change made to its business strategy *in response to* digitalization, while we define turbulence as the average (sales-weighted) level of strategic response played by *third-party incumbents*. The survey proposes a 5-level scale, for strategic change, SC. We code, SC= 1 or 2: no response, or only minor ad hoc changes to strategy) as *weak change*, we code *medium* when there is only a marginal change to long-term business strategy, (SC=3), and *bold* when there are significant changes to long-term business strategy or the firm has introduced the disruption itself, SC=4.5). The average response (outside of the focal firm) is just above SC=3, implying that on average the competition has instead taken an *incremental* approach to digitization, and suggesting that most DTs are using digitization to adapt to their strategy, but not to change it.

Not surprisingly, aggregating companies by industries, high tech emerges as the one with the highest average, SC=4, i.e., digitization is often more associated with a major strategy shift.

Indeed, the high-tech model has significantly shifted from on-premise to cloud computing and from purchase to rental (as a service).

Organizational and capability barriers. As mentioned in the introduction, we also collected information on organizational barriers that may limit major strategy renewal. The data suggest that barriers are widespread and that nearly 3 out of 4 firms have at least one organizational barrier. As an example, we asked respondents whether their organization's *aversion to risk and experimentation* prevails and is a major barrier to achieving their company's digital goals. In our sample, this barrier is still largely visible - with one in three incumbent companies classified as risk averse, consistent with other research (Goran et al, 2017) .

With respect to *capabilities*, we exploit the response to the question about the firm's self-perception of digital capabilities relative to its competitors on a 7-level scale, from "significantly behind peers" (1) to "significantly ahead of peers" (7). Based on the distribution of responses, about *one in six incumbents* say they are materially ahead of their peers, but half think they may be behind their peers. In terms *of CEO involvement* in promoting and developing the company's digital strategy and initiatives (self-assessment on a scale of 1 to 4), *we find that 40% of incumbents feel held back by the CEO's lack of commitment to digitalization.*

5. RESULTS AND DISCUSSION

This section discusses the regression results, based on (1) and its extensions, with the control vector Z, being composed of the following effects. First, we include the type of diversification of the firm, i.e., mono: (mono versus multiple products), product: (product only versus extension to servitization). The effect of diversification on revenue growth tests the concept of economies of scope. The business strategy literature argues for an inverted-Ushaped relationship between firm diversification and firm performance (Rumelt, 1974), although this relationship is also a matter of product relatedness and market context (Chommer, et al. 2019). In general, diversification of product offerings pays off rather well, but the biggest effect occurs with servitization, especially as a complement to digitization (Kohtamäki et al. , 2020). We also include a variety of size indicators to test the Gibrat's law of scale-free growth. The alternative to Gibrat's law is the existence of a mean reversion with size (Leibenstein 1966). When available (depending on the year of the sample), Z also includes the market share attained by the focal firm's digital-only competitors. If competition is primarily driven by digital, we expect that a higher share captured by digital natives will reduce the growth of the incumbent focal firm (Cozzolino et al. 2018). If, however, the incumbent third-party DT program is most competitive with the focal firm, the effect could be reversed. We also control for labor intensity. The effect of labor intensity on firm performance is unknown a priori; it may be negative if it increases marginal costs, instead of endogenous fixed costs (De Loecker et al, 2019) - but the relationship may also become positive, if the labor is a specialized knowledge-based resource (Santoro, et al. 2019). More recent models of automation also suggest that higher employment intensity may reflect firms maturity level in leveraging digital automation tools (Acemoglu and Restrepo, 2018).

5.1. Baseline results

Table 2- about here

Tables 2 and following provide ROIC estimates. Those estimates are heteroskedastic-consistent including region/country and industry fixed effects.

Looking first at Table 2a, we see that, among the factors controlling firms, labor intensity clearly exerts a negative, albeit economically small, impact on revenue and profit growth, while product specialization promotes more robust growth than a product diversification strategy. Finally, there is no evidence that competition from digital natives is more aggressive than that of incumbent peers. This might entail that it is the digital natives who create the disruption, while it is the incumbents who create the intensity competition with the focal firm, through their reactions.

With respect to the estimated returns, we find that the coefficient $\boldsymbol{\beta}$ is robust and positive. This is confirmed by the positive values found for **d** and **m**. We also see that at the sample mean, all returns provide roughly the same size of returns, while m>1, suggesting that these returns are clearly rent creating, above the WACC[26].

Calculating a simple arithmetic mean return for the three versions yields an ROIC of 25% (standard deviation of 3.0%), after all controls. This estimated return is about 2.5 times higher than that shown in Table 2, but let us remind that the return stated in Table 2 was truncated. Interestingly, the type of additional yield over a 3-year perspective compared well with Tambe et al. (2020).

Table 2b presents the year-by-year estimates for the three years in our sample. Note that the firms included in each year are not necessarily the same, as the survey is conducted independently each year, albeit from the same initial population of 13,000 firms. The annual estimates suggest that the return premium has somewhat increased over the years. This pattern of growth in the markup is consistent with observed trends in markups globally (Ayyagari, et al. 2019), as well as with digitization leading to higher sunk costs and lower marginal costs (Calligaris et al. 2018).

Our average return results exhibited in Table 2 are larger than in Pfister, and Lehmann (2022), who focus on ROI to cloud and analytics for German SMEs, but our estimate relates to much

[26] Furthermore, the WACC associated with digital will be WACC =24%/1.54= 15.5%. This WACC is expected to represent a premium over traditional commerce, in part due to lower leverage and thus a large digital cash flow beta.

larger, mostly international, firms. In contrast, using Tambe et al. (2020) results and translating them from impact on market value to yearly returns, our average results seem to be slightly conservative and in the low range of their study.

As discussed earlier, the mean comparison of ROIC by studies is only indicative, as it clearly depends on sample type, but also on how firms may have used digital technologies beyond the pure efficiency element, and leverage them for sustaining and expanding competitive advantage. We discuss this in the next subsection.

5.2. Extension of the results

Table 3 shows the new equation after substitution of (2) into each version of (1, 1', 1") . This Table is similar to Table 2, focusing on the year 2017. [27]

Table 3- about here

The fit of the equation is significantly improved in this modified version, with an R^2 fit statistic increased by over 50%. This result is quite remarkable, as the data are essentially cross-sectional, and our extension here focuses on strategy change and turbulence, leaving out other factors such as DT's execution ability, etc.

Accounting for strategic changes and competitive turbulence first shows that we can capture a much wider range of firm returns, as estimates now range from -4% to 38% (for statistically significant cases), compared to 23-26% in the base case.

Table 3a shows that returns are systematically *lower* under high turbulence than under low turbulence, highlighting the role of competition in driving returns. The effect is large since

[27] Similarly, Table 3 focuses only on the coefficients related to the returns to digitization, but keep in mind that all equations are estimated with industry and region indicator variables, as well as all other controls in the Z vector. These control variables and their effects are not materially changed from the baseline model (1).

competition reduces the estimates of returns by half. The additional claim that return to investment in digital technology is driven by strategic renewal is confirmed by the fact that DT without strategic change, (S_{low} =1) is dominated by other strategies. In situations of above-average turbulence, returns may even be negative.

Second, the medium strategy can generate better return than the bold strategy in low turbulent environment because deterrence acts as a barrier to entry and disruption by competition remains limited. In contrast, only bold strategies can achieve a significant increase in returns in high turbulence context. Such a prescription is also consistent with the implications of Red Queen competition theory (Robson 2005, Derfus et al. 2008, Ho et al. 2017, Bughin and van Zeebroeck, 2017).

Table 3b presents the 2SLS results, on returns, endogenizing the product of strategic change and of digital technology spent. The instrumental equation has been tested for instrument validity (Stock Yogo F-Test above typical threshold value, and organizational factors included as extra control in the return equation are not significant, after accounting for their indirect effect on strategic renewal) . The 2SLSresults are furthermore superior to the base line: in general, returns are slightly lower (on average by 15% of total returns), demonstrating the existence of a *positive* reinforcement loop between returns and DT change. The main conclusion is that digital returns can be large if DT is embedded in strategic change, and especially under high competitive environment.

Table 4 takes a closer look at the combination of organizational barriers that affect strategic renewal (equation (3))[28] .

Table 5- about here

[28] Appendix 1 provides a larger picture with coefficients related to the control Z vector.

Again, the goodness of fit is relatively good for a cross-section and demonstrates that the organization's level of risk aversion exerts a *negative* effect on both level of strategic change and of investment, although this effect is imprecisely estimated. Nevertheless, the combined effect is multiplicative and clearly creates barriers to strategic change for large incumbents.

The level of CEO involvement in digital initiatives also shows a positive association with strategic renewal. CEO involvement in digital may lead to a *reduced* level of digital investments, but this effect is not significant. Finally, mastery of digital capabilities prior to competition is positively associated with more investment in digital technologies. This fits with other studies findings (Tambe, 2014, Bughin, 2016b and Tambe et al, 2020). We also find that *digital capabilities lead to more strategic renewal*.

5.3. Discussion

5.3.1. Return benchmarks

The implied returns measure the *upside* returns to DT, outside of the preservation value lost if not engaging in DT. As the data have shown, the later may be enough to justifiy to engage in DT, as the average firm indeed senses that the revenue at risk is large, -at about 34% average of incumbent revenue in the long-term.

Still, besides the preservational value, upside returns are very different among firms, and the larger, the better, both from a financial perspective, and a competitive perepsective as incumbent firms must compete with new digital only firms without legacy. Hence, the estimated incumbent returns are an order of magnitude lower than FAANGs (which have reported returns between 30 and 50% over the past 10 years), but the latter benefit from much larger scale and have established large market leadership against competition. Also,the implied returns only measures the returns to DT, and not the returns preserved by not engaging

The estimated premium as a multiple of WACC is slightly higher than the one found for early IT (Brynjolfsson and Hitt, 2003; Mithra and Rust , 2012) and is consistent with the level of accounting return estimates for digital technology in Rajgopal et al. (2021).

The returns are also larger than returns on other types of capital such as intellectual capital, intangible capital, and R&D (Biontis et al. 2015; Peters et al., 2017 and McInnis and Monsen, 2021). Tambe et al. (2020) are probably the most recent estimates for a large time series of U.S. firms, which suggests returns closer to 35-50% per year, or higher than current estimates. Tambe et al. (2020) returns to digital capital fits the top of our range of estimates for digital technologies, when these technologies are used for strategic renewal.

5.3.2. Strategic renewal return contribution

This study confirms that digital transformation is first and foremost a matter of strategy renewal, confirming the argument of Mithas and Rust (2016) that the returns to digitalization should be *crucially mediated* by corporate strategy (see also van Zeebroeck et al. 2021 and Ciszewska-Mlinaric and Wojick, 2023). Nevertheless, there are subtleties in our estimates. The coefficients associated with average and bold strategic change, using the modified equation (1), lead to an average return of about 28.5%[29] or a *threefold* return on digital investments *not accompanied* by minimal strategic change. The strategic renewal effect is thus critical to boosting returns (Schmitt et al, 2018; van Zeebroeck et al, 2021).

Under low turbulence, the average strategy brings the largest returns, and especially when the focal firm is able to invest a *significant amount relative to its peers.* This effect is consistent

[29] This is the weighted average of the weak and strong turbulence.

with a deterrence effect (Lieberman, and Montgomery (1998), and this is the part of the strategy which drives the return, not the change in strategic renewal.

Finally, the results suggest that strategic change drives returns in severe turbulence. The supplementary fact that the markup is *smaller for bold* strategic change than for marginal strategic change implies that major strategic moves are primarily not defensive, but *expansive* (Lischka, 2019 or Autor et al. 2020) [30].

5.3.3. Organizational factors shaping renewal

Finally, we also have gathered evidence of how organizational barriers explain the long tail of poor DT performance. Taking our estimates, Table 6 compares the relative contribution of organizational barriers to returns, changing each organizational effect by one standard deviation in the direction of higher returns.

We find that all factors matter, thus that both organizational learning (Crossan and Derow, 2003); and dynamic capabilities (Agrawal and Helfat, 2009) are complement in predicting strategic renewal in the context of digital technologies. However, we also note that digital capability accounts for most of the effect, in part because of its effect on scale (47%), on strategic change (73%), and on their combined effect (84%).

One finally can compute that one standard deviation in reducing one of the organizational barriers increases business performance by nearly 50%. Clearly, *all organizational enablers are important to DT's success.*

[30] Monopoly Myths: Do Superstar Companies Stifle or Simply Beat the Competition?

6. CONCLUSIONS

This study has shed new light on how incumbent companies have succeeded in their DT. Based on a set of methodology, business returns linked to DT are computed and converge to be on average solid for the incumbents, -- but it also demonstrates that the largest boost in that return originates from incumbent firms operating a highly committed strategic renewal. In turn, this renewal, in both its scope and resources commitment, is activated only with the right organizational antecedents.

Our results also clearly show that returns are influenced by external factors (El Sawy et al. 2010). However, internal forces tend to have a larger swing effect on firm returns than external competition, and return generation is strongly rooted in organizational elements (Ben-Menahem,et al., 2013, Agrawal and Helfat, 2009).

Our data further suggest that organizational barriers had remain high, preventing the development of attractive returns from DT: nearly 40% of incumbents believe that the CEO, and management as a whole, are not active enough in their enterprise digitalization program. 25% of executives also recognize that their organization is too risk-averse.

We see multiple extensions as remedies for the limitations of this research. First, it would be important to construct a panel sample that could also be directly linked to external sources of company data, such as earnings and balance sheet, rather than relying solely on surveys. Second, a granular approach to *the type* of strategic renewal would be welcome. Finally, we note that competitive change can occur both by digital natives and by incumbent peers. Studying the nature of competition by firm type is an important strategic and regulatory issue to study. Finally, DT involves multiple technologies, so it may be interesting to assess tech complementary for success.

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Table 1a- Distribution by industry and size across the three surveys, 2016-2018.

Sectors	**in the sample**	**% of digital transformation launched , cumulative by 2018**
Automotive and assembly	7	89
Business, legal and professional services	22	70
Consumer packaged goods	5	86
Financial Services	21	81
Health systems/pharma and medical products	9	80
High technology	13	77
Infrastructure	5	72
Media and entertainment	5	82
Retail sales	5	77
Telecom	4	88
Travel, transport and logistics	5	86
Staff size		
1-99	29	62
100-499	13	77
500-999	6	85
1,000-10,000	21	77
10,001-20,000	7	95
20,001-50,000	8	96
50,001+	15	99

Source: TNS, authors' calculations

Table 1b- Sample characteristics, mid-2017, %.

Variable	Average	StDev	Min	Max
Revenue growth (range)	7,87	2,25	1	12
Earnings growth (range)	7,74	3,12	1	12
Digital investment compared to competitors	1,11	0,43	0	2
Global reaction of companies to the digital shock	3,16	1,12	1	5
Degree of digital turbulence in the industry (excluding focal company)	3,16	0,37	2,33	3,82
Percentage of revenues exposed to digital disruption risk	31,94	28	0	100
Number of employees (range)	3,91	2,65	1	9
Company revenues (range)	3,6	2,68	1	10
Market share of the focal company	24,61	25,85	0	100
Market share held by digital native companies	12,19	15,12	0	100
Market share held by traditional competitors	16,4	19,22	0	100
Market share held by incumbent competitors who compete digitally	39,58	30,21	0	100
Market share held by incumbents in adjacent industries	7,23	8,69	0	75
The company is public	0,26	0,44	0	1
The company focuses mainly on B2C	0,22	0,41	0	1
The company's portfolio is single-product or single-service	0,18	0,38	0	1
The company's portfolio includes products	0,59	0,49	0	1
Risk aversion	0,25	0,43	0	1
CEO support for digital	0,21	0,41	0	1
Digital capabilities compared to competitors	4,01	1,75	1	7

Source: TNS survey, 2017 (median year). Note: Unbalanced data set.

Table 2a. OLS regression estimates (1-1''), year 2017.

	Equation (1)	(1')	(1'')
Digital Investment Log	0.2285***		
	(0.0734)		
Percentage of revenue devoted to digital investments		1,5012** (0,006)	
Digital investment compared to competitors			0.2317*** (0.0686)
Number of employees (range)	-0.1349**	-0.1295*	-0.1355**
	(0.0822)	(0.0841)	(0.0737)
Company revenues (range)	-0.0031	0.0473	0.0469
	(0.0834)	(0.0805)	(0.0713)
Market share of the focal company	-0.0013	-0.0013	-0.0029
	(0.0051)	(0.0052)	(0.0046)
Market share held by digital competitors	0.0044	0.0036	0.0005
	(0.0051)	(0.0050)	(0.0044)
The company is public	-0.0325	-0.1166	0.0480
	(0.3272)	(0.3249)	(0.2545)
The company focuses mainly on B2C	-0.1353	-0.0849	-0.0352
	(0.2826)	(0.2815)	(0.2541)
The company's portfolio is mono-product/mono-service	0.5294*	0.4873*	0.5276**
	(0.2841)	(0.2856)	(0.2390)
The company's portfolio is a proprietary product	-0.2267	-0.2324	-0.1879
	(0.2608)	(0.2612)	(0.2367)
Constant	7.6086***	8.0416***	6,9881***
	(0.7953)	(0.7825)	(0.7592)
R^2	0.15	0.15	0.13
number of companies	417	417	530
control of the regions	Y	Y	Y
industrial control	Y	Y	Y
firm control	N	N	N

Note: Equations(1)-(1'') are in main text, e. s. in parentheses, mid-year 2017; */**/***=*significant at 10%/5%/1%.*

Table 2b. Range of yield estimates, based on equation (1-1").

	2016	2017	2018	Panel 2016-18
Log of digital investment (*b*)	0.1961***	0.2285***	0.3215***	0.2990***
	(0.06593)	(0.0734)	(0.0672)	(0.0594)
digital investment intensity (*m*)	1,37**	1,52**	1,60**	1,54**
	(0.55)	(0.61)	(0.63)	(0.65)
Implicit digital investment intensity (*m.DII'*)	0,1918	0,2265	0,2532	0,2464
Digital investment compared to competitors (*d.DIR'*)	0.22571***	0.2571***	0.2777***	0.2866***
	(0.0693)	(0.0764)	(0.1023)	(0.0743)
number of companies	417	417	530	112
control of the regions	Y	Y	Y	Y
industrial control	Y	Y	Y	Y
firm control	N	N	N	Y

Notes: s. e. in parentheses; */**/***=*significant at 10%/5%/1%.*
Total panel data = 2 *112= 224 data points, excluding fixed effects; The set of controls depends on the content collected per year.

Table 3a- Estimates of returns from digitization-

Comparison of turbulence intensity and strategy changes, mid-2017.

	Digital investment		Digital intensity		Digital above its peers	
digital investment	low turbulence	strong turbulence	low turbulence	strong turbulence	low turbulence	strong turbulence
X Low strategy	0,19696	-0,04312	0,368	-2,432*	-0,11504	0,00344
	(0,16072)	(0,13568)	(0,952)	(1,448)	-0,1452	(0,15368)
X Medium strategy	0,34392**	0,214	3,632**	1,936	0,05816	0,29232**
	(0,138)	(0,15312)	(1,824)	(1,448)	(0,152)	(0,14784)
X Bold strategy	0,32648***	0,23144*	1,88***	1,248*	0,03976	0,38912***
	(0,12296)	(0,11488)	(0,624)	0,744	(0,1251)	(0,1044)
R^2	0.23	0.20	0,20	0,19	0.15	0,23
Industry	Y	Y	Y	Y	Y	Y
Region	Y	Y	Y	Y	Y	Y

Notes: s.e. in parentheses, Z control vector not reproduced. S; */**/***=significant at 10%/5%/1%.

Table 3b- Estimates of returns to digitization, 2SLS versus OLS 2017

	Digital investment MCO equation (1')		Numerical investment, 2SLS, equation 3	
digital investment	low turbulence	strong turbulence	low turbulence	strong turbulence
X Low strategy	0,197	-0,043	0,14332	-0,0625*
	(0,113)	(0,029)	(0,097)	(0,032)
X Medium strategy	0,344**	0,214	0,282**	0,191*
	(0,104)	(0,156)	(0,112)	(0,105)
X Bold strategy	0,326***	0,231*	0,266***	0,204*
	(0,137)	(0,145)	(0,779)	(0,921)

Notes: s.e. in parentheses, Ccontrol Z vector not reproduced. */**/***=significant at 10%/5%/1%.

Table 4- Drivers of investment and strategic posture, 2017.

Factors	Digital investment	Strategic response	Digital investment X strategic response
Risk aversion	-1,4529	-0,0307	-5,91912*
	(25,813)	(0,049)	(3,567)
Level of involvement of the CEO in digital	-16,4685	0,0941***	0,19656
(s.e)	(15,364)	(0,025)	(19,548)
Digital capabilities compared to competitors	2,50275***	0,0967***	6,05538***
(s.e)	(0,773)	(0,013)	(0,9545)
Share of revenues threatened by digital disruption	0,5085***	0,0031***	0,44226***
(s.e)	(0,077)	(0,001)	(0,0869)
R^2	0.43	0.35	0.42
N	392	446	355
Industry F.E.	Y	Y	Y
Region F.E.	Y	Y	Y

Notes: Z control vector not reproduced. Y =Yes, N=No. F.E=fixed effects. Normalized robust errors in parentheses. */**/***=significant at 10%/5%/1%. Stock-Yogo F test=19, 1 (blended DI and strategic responses)

Table 6 - Relative Effect on Returns, Adjustment Costs One Standard Deviation Lower

	Digital Investment	Strategic Answer	Digital investment X strategic response
Risk aversion (RA)	4%	4%	12%
Level of involvement of the CEO in digital (CEO)	41%	19%	1%
Digital capabilities compared to competitors (CAP)	52%	72%	86%
Share of revenue at risk of digital disruption (SENSE)	2%	0%	1%
Increased impact on yields	8,7%	5,2%	12,3%

APPENDIX: control effects on digital investments/strategic posture

Table A.1. Control effects on strategic change

	Digital investment	Digital investment: Low turbulence	Digital investment: Strong turbulence	Strategic response	Strategic response: Low turbulence	Strategic response: High turbulence
Number of employees (range)	-0.8345	0.6561	-1.8001*	0.0077	0.0205	-0.0012
	(0.6609)	(0.7935)	-10.358	(0.0174)	(0.0320)	(0.0233)
Company revenues (range)	-0.5772	-0.3873	-0.3344	-0.0078	-0.0219	0.0042
	(0.5506)	(0.4382)	(0.9647)	(0.0165)	(0.0299)	(0.0215)
Market share of the focal company	-0.0605	-0.0518	-0.0776	-0.0003	-0.0013	0.0008
	(0.0488)	(0.0476)	(0.0901)	(0.0012)	(0.0021)	(0.0017)
Market share held by digital competitors	-0.0961**	-0.0740	-0.1091	-0.0000	0.0004	0.0000
	(0.0463)	(0.0478)	(0.0831)	(0.0011)	(0.0019)	(0.0015)
The company is public	-0.3720	-21.082	0.4224	0.0819	0.0835	0.0626
	-22.936	-24.718	-45.754	(0.0589)	(0.0894)	(0.0897)
The company focuses mainly on B2C	3.7127*	0.4497	7.4283*	0.0462	0.1326*	0.0334
	-20.940	-12.137	-39.584	(0.0527)	(0.0784)	(0.0762)
The company's portfolio is single-product or single-service	-0.6723	-16.412	-0.3895	-0.0203	-0.0594	0.0196
	-21.963	-13.940	-48.421	(0.0631)	(0.0903)	(0.0900)
The company's portfolio includes products	29.435	0.5673	55.482	0.0387	0.0408	0.0698
	-20.054	-17.630	-33.895	(0.0485)	(0.0910)	(0.0637)
Constant	12.6917**	12.5596*	26.4861***	-0.4259**	-0.4279	-0.1679
	-63.055	-66.239	-100.197	(0.1983)	(0.2896)	(0.3028)

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