

# **Investing in a Website : a Top Dog or a resource-based strategy for firms?**

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## **Abstract**

This article aims at analyzing firms' motivations to invest in a Website. What are the drivers of these investments? To address this question, we consider two alternative theoretical frameworks. The first framework is the resource-based theory. This approach states that firms with higher resources and competencies should invest more in Internet technologies, especially firms which are present in rent-yielding markets (concentrated markets with high entry barriers). The theory of industrial organization constitutes an alternative framework, leading to the alternative conjecture that firms should have more incentives to invest in a Website when they are on highly competitive markets. Indeed, a Website can be a strategic means to create artificial entry barriers and to eliminate rivals. We test these two alternative hypotheses using a French database. We find that the resource-based approach seems to be more relevant to explain the drivers of Website investments. In particular, firms tend to invest more in their Websites when markets are highly concentrated and few opened to international trade.

**Key words:** Internet strategy, e-commerce, entry barriers, resource-based theory

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## I. Introduction

Information and Communications Technologies (ICT) have pervaded the daily life of European firms and have significantly modified the way they innovate, produce, sell, etc. In 2004, almost 100% of European firms were equipped with computers and about 95% had access to the Internet<sup>1</sup>. However, they were fewer to own a Website, especially in France, where only 55% of firms declared to have a Website. Moreover, these Websites are really heterogeneous in their functionalities and contents: some Websites offer limited functionalities and contents and are few updated, whereas others are technically elaborated (numerous functionalities) and are richly endowed with contents. How can we explain this heterogeneity? What are the drivers for investing strongly or moderately in a Website? The goal of this article is to understand the firms' rationale for investing in a Website.

A rich empirical literature exists on the determinants of firms' investments in Internet technologies (IT). But these investments are often modeled as a binary choice of adoption: to have an access to the Internet or not, to have an Intranet or not, to have a Website or not... (see GALLIANO & ROUX, 2004 on French data, DHOLAKIA & KSHETRI, 2004 on US data). Here, we want to go further by also modeling the amount or the nature of IT investments: i.e. by modeling the decisions to invest in a basic Website or in a more sophisticated Website in one hand, and the decisions to introduce transactional or commercial functionality or to restrict the Website to a shop window of the firm on the other hand.

To address this question, we consider two alternative theoretical frameworks. The first framework is the resource-based theory. This approach states that firms with higher resources and competencies should invest more in Internet technologies, especially firms that are present in rent-yielding markets (concentrated markets with high entry barriers). The theory of industrial organization constitutes an alternative framework, leading to the alternative conjecture that firms should have more incentives to invest in a Website when they are on highly competitive markets. Indeed, a Website can be a strategic means to create artificial entry barriers and to eliminate rivals (by extending market reach, by improving the quality of service,...).

We test these two alternative hypotheses on a French database of firms located in Brittany and employing more than 10 persons. Data were collected by the French Institute of Statistics and Economic Studies (INSEE<sup>2</sup>) in the early 2004. We use a sequential probit where in a first stage, we estimate the determinants of having a Website or not, and in a second stage, we estimate the determinants of investing strongly or moderately in the Website. To test the resource-based conjecture, we distinguish between elaborate Websites (multi-functionality Websites with regular

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<sup>1</sup> Source: the United Kingdom Department of Trade and Industry Report (2004).

<sup>2</sup> The survey was partially funded by MARSOUIN : Brittany Network for Research on the Information Society and Uses of the Internet.

updating) and basic Websites (shop window Websites). To test the industrial organization conjecture, we make a distinction between aggressive Websites (commercial Websites) and soft Websites (without transactional functionalities). We find that the resource-based approach seems to be more relevant to explain the drivers of Website investments. In particular, firms tend to invest more in Internet technologies when markets are highly concentrated and few opened to international trade. However, the two approaches are complementary to understand the rationale of Website investments.

The remainder of this article is organized as follows. In the next section, we present the two alternative theoretical frameworks. Then the database is described. After that, we present the econometric method and the variables used to model the choice to invest in a Website. Then we display and comment the results of the regressions.

## **II. Theoretical framework**

We successively consider the resource-based and the industrial organization approaches, and we establish two alternative hypotheses concerning the relationships between market structure and the incentives to invest in a Website.

### **The resource-based approach**

The resource-based theory defines a firm as a collection of resources and capabilities (PENROSE, 1959, BARNEY, 1991 and FOSS, 1998). Resources are inputs used into a firm's production process: physical and immaterial capital, human capital, organizational capital. By continuously acquiring and developing resources and capabilities, a firm can achieve sustainable competitive advantage that yields economic rents. The resource-based view emphasizes that the strategies chosen by a firm are strongly driven by the internal environment (existing resources and competencies<sup>3</sup>): It means that a firm conceives its strategy as a fit between internal capabilities and external opportunities. Through a strategic action, a firm seeks to exploit its (internal) resources in (external) activities that are rent-yielding.

Investments in ICT can be part of a resource-based strategy. Such investments require some resources and competencies, but they can, in return, become a new specific asset and reinforce competitive advantage of the firm in the future. For example, a firm can create a Website to exploit the opportunities of the Internet,

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<sup>3</sup> Competencies include labour force's skills, knowledge and routine. See NELSON (1998).

by selling its products online<sup>4</sup> or providing information and additional services to its customers. The resources dedicated to a Website can enable a firm to reduce its retailing costs<sup>5</sup>, and/or to increase its market share and revenues, and can create additional economic rent (provided that the firm has sufficiently invested in its Website).

We can conjecture that well-established firms (in terms of market share, financial assets, oldness, reputation and number of employees...) would have more resources and capabilities to invest in Internet technologies and could better exploit the business opportunities offered by a Website. Such firms are more likely to have an information system department (with computer engineers). So they can internalize the creation and maintenance of their Website<sup>6</sup>, knowing that an in-house Website offers the advantage to create more synergies with the existing resources and capabilities, and to facilitate the integration of this new asset in the global strategy of the firm<sup>7</sup>.

A second conjecture concerns the relationship between market structure and the amount of investments in Internet technologies. We can expect that economic rent is higher on concentrated markets with high entry barriers. On such markets, firms can set price well above marginal costs and extract large profits. For DEMSETZ (1973), the correlation between industry concentration and industry-average profitability that is observed in many empirical studies, might only reflect the higher efficiency rents earned by leading firms in concentrated industries<sup>8</sup>. Moreover, concentration is a source of stability, enabling incumbent firms to better exploit their resources and capabilities. Indeed, a recent study using Japanese data concluded that “highly concentrated industries have high entry barriers and therefore have low turbulence among firms once they have entered. In concentrated industries, the extent of exit is relatively small and industry structure is likely to be stable” (DOI, 1999, p.5). Consequently, firms that are on weakly competitive markets will have more resources to invest in Internet technologies and more incentives to do it, because the uncertainty on the return of these investments is limited on such markets (i.e. it is easier to transform these investments in a rent-yielding specific asset).

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<sup>4</sup> We consider a broad definition of electronic commerce in this paper. It encompasses the online direct transactions and the online influenced transactions, i.e. the transactions that are initiated on the Website of the firm, even if they are concluded or cleared in the physical retailing channel of this firm.

<sup>5</sup> Through the automation of the ordering process, the reduction of menu costs or the reorganization of the production (just-in-time process, flexibility, total quality management,...).

<sup>6</sup> A Website generates maintenance costs to update information and catalog of products (at least once a month) and to provide tools and applications (a system of frequently ask question, a forum, a secured system of online payment, etc.).

<sup>7</sup> Moreover, well-established firms, through their goodwill and brandnames face lower costs to set up a Website, compared to small firms or pure player on the Internet. The latter have to spend a lot of money to advertise their site and to build their reputation.

<sup>8</sup> See for example the sector-based studies of COTTERILL (1986) and MARION (1989) and the survey of SCHMALENSEE (1989).

## **The industrial organization (IO) approach**

The second framework (the theory of industrial organization) focuses on strategic interactions between firms and considers that investments are not only driven by internal efficiency, but also reflect strategic issues. Firms can overinvest or underinvest to eliminate some rivals or relax competition. In this perspective, a Website can appear as a strategic investment. This view is supported by GEROSKI & MARKIDES (2004). The two authors propose an insightful typology of innovations, based on two dimensions: the impact of the innovation on the advantages acquired by existing competitors (depreciating or not their competitive advantage) on one hand and the effect (minor or major) of the innovation on consumer habits and behaviors on the other hand. They emphasize four types of innovations: *incremental innovations* (resp. *major innovations*) that enhance the position of established firms, with minor (resp. major) effects on consumers, *strategic innovations* (resp. *radical innovations*) that depreciate the existing advantages of the incumbents with minor (resp. major) effects on consumers. The Internet can be classified as a *strategic innovation*, by offering an alternative retailing channel and by enabling firms, to experience new business models (services, pricing,...). Some well established firms can be challenged and destabilized by pure players, like Amazon. But for customers, e-commerce is not a radical innovation, but a complementary channel to buy tangible products and to obtain additional services.

Investing in a Website can make the incumbent firm tougher, by deterring the entry of pure players or by avoiding the preemption of the Internet market by one of its rivals. According to FUDENBERG & TIROLE (1984) and their animal taxonomy, tough investments encourage a firm to overinvest and to adopt a Top Dog strategy, if the prior motivation is to eliminate existing or potential competitors. In matter of Websites, a Top Dog strategy consists in investing in transactional functionalities. Through a commercial Website, a firm can credibly appear as a Top Dog that has the ability to reduce its operational costs, to set aggressive prices and to poach on the market shares of its rivals (BESANKO & alii., 2003). Here, we conjecture that the incentives to invest in Internet technologies and particularly in a Website should be higher in industries characterized by low entry barriers or by low sunk costs. In such industries, it is in the interest of incumbent firms to overinvest to erect artificial entry barriers.

## **Testable hypotheses**

The two approaches developed above enable us to formulate alternative testable hypotheses concerning the relationships between market structure and the incentives to invest in a Website. First, the resource-based approach emphasizes that well-established firms have more available resources and competencies to invest in Internet technologies. Furthermore, the amount of investments will be

also driven by market structure. Indeed, an industry characterized by a low degree of competition offers better perspective of economic rent for ICT investments.

**Hypothesis 1: A firm should have more incentives to invest in a Website on a less competitive (rent-yielding) market that offers lower uncertainty for investments' return.**

The second framework considers the investment in a Website as a strategic innovation that enables to deter entry or eliminate rivals. Consequently, the amount of investments should increase with the expected gain in terms of competitive advantage. This gain is higher when the threat of entry is serious or current competition is intense.

**Hypothesis 2: A firm should have more incentives to invest in a Website on a highly competitive market in order to erect artificial entry barriers and destabilize its rivals.**

We test these alternative hypotheses using data from 850 French firms located in Brittany. The next section describes the database.

### **III. Data**

Data were collected by the French National Institute of Statistics and Economic Studies (INSEE) in the early 2004. A survey on the usage of ICT was sent<sup>9</sup> by mail to a sample of 1852 commercial and industrial establishments<sup>10</sup> employing more than 10 persons and located in Brittany. About 850 establishments responded to the survey (i.e. a response rate of 45.89%). The sample is representative in terms of sector, size and location<sup>11</sup>. We also included data from the Unified Enterprise Statistics System<sup>12</sup> to obtain additional information on the characteristics of the sectors (sector-based concentration and capital intensity) and

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<sup>9</sup> We have excluded from the survey, the firms of the ICT sector.

<sup>10</sup> An establishment is a place of business (plant, stores, ...) that is identified as an autonomous entity by the French administration. A firm can be composed of several establishments.

<sup>11</sup> Representativeness in terms of rural and urban location.

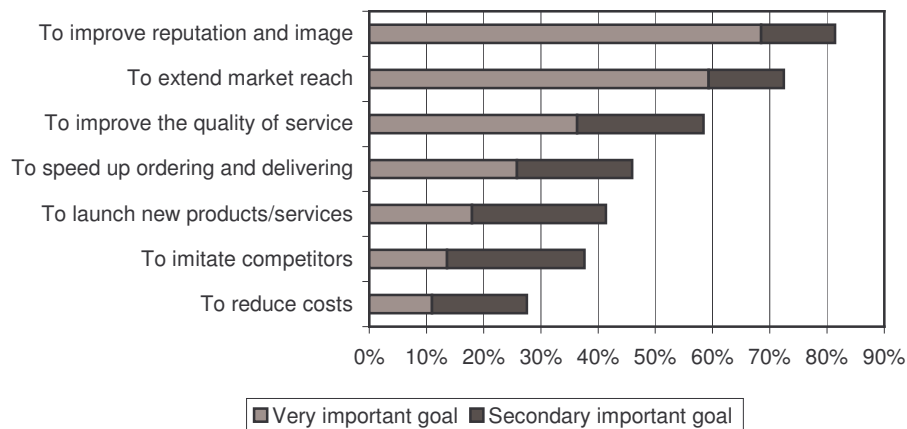
<sup>12</sup> The Unified Enterprise Statistics System (UESS) combines two sources of information : a survey on tax declaration of firms on their revenues and profits and an annual survey. The data are available at a highly disaggregated level.

data from the General Board of Customs, to calculate the openness rate in the sectors covered by our survey<sup>13</sup>.

96.4% of the surveyed establishments are equipped with computers and 84.59% have access to Internet. Furthermore, 54.71% (i.e. 465 establishments) declare to have a Website. However, 43% of these Websites are shared with other firms or other establishments of the group (not a specific Website). For a full description of data, see appendix.

Figure 1 displays the main motivations to create a Website. The investments in a Website aim to increase sales and market shares (to extend market reach and goodwill, to launch new products) and to improve the satisfaction and loyalty of customers (to improve their reputation and the quality of service and of delivering). Cost cutting is only mentioned as the seventh objective.

**Figure 1. The main objectives of a Website**



Note: For 81% of establishments having a Website, the goal of this investment is to improve their image, and for more than 70%, to extend their market reach.

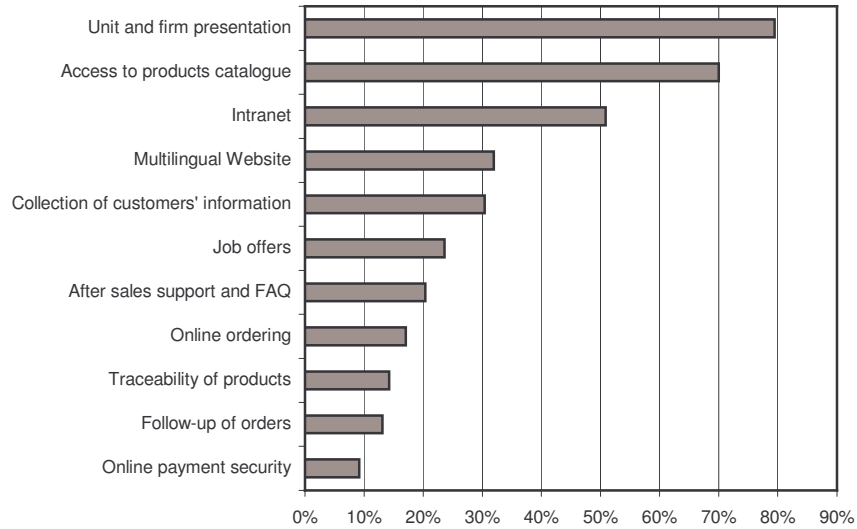
Establishments were also surveyed on the functionalities of their Websites. Figure 2 ranks the different functionalities and applications available on the 465 Websites of our sample. Most of them integrate a presentation of the firm (history, activity, organization,...). The second most frequent function is an online access to the product catalogue. Half of the Websites have an intranet (i.e. a part of the Website is dedicated to internal usage). Transactional functions are less developed: only 17% of the Websites offer online ordering and only 9% have introduced a secured system for online payment. The customer relationship management is not yet the major function of Websites: follow-up of orders and

<sup>13</sup> The openness rate is obtained at a NES 36 level (the French Synthetic Economic List at the level 36). The formula of openness rate is given by  $\frac{\text{Exports} + \text{imports}}{\frac{\text{Sum of added value}}{2}} \cdot 100$



after sales support is present in less than 20% of the Website. Finally, the updating of Websites is made at least once a month for only 35% of the Websites.

**Figure 2. The main Website functionalities**



Note : The presentation of the firm and/or the establishment is supplied by 79% of the Websites in the sample.

To analyze the amount of investments in a Website, we establish a classification of Websites, based on the available functionalities and the frequency of updating. We use two different criteria of classification to fit with the two theoretical hypotheses previously stated. The first classification refers to the resource-based approach and distinguishes basic and elaborate Websites, the latter having at least three functions (among the eleven functions mentioned in Figure 2) and a updating made at least once a month. 138 among the 465 Websites satisfy this definition. A basic Website is a shop window site, that requires low resources and competencies, but cannot yield economic rents, whereas an elaborate Website is resource-consuming, but can become a specific asset of the firm and generate efficiency rent.

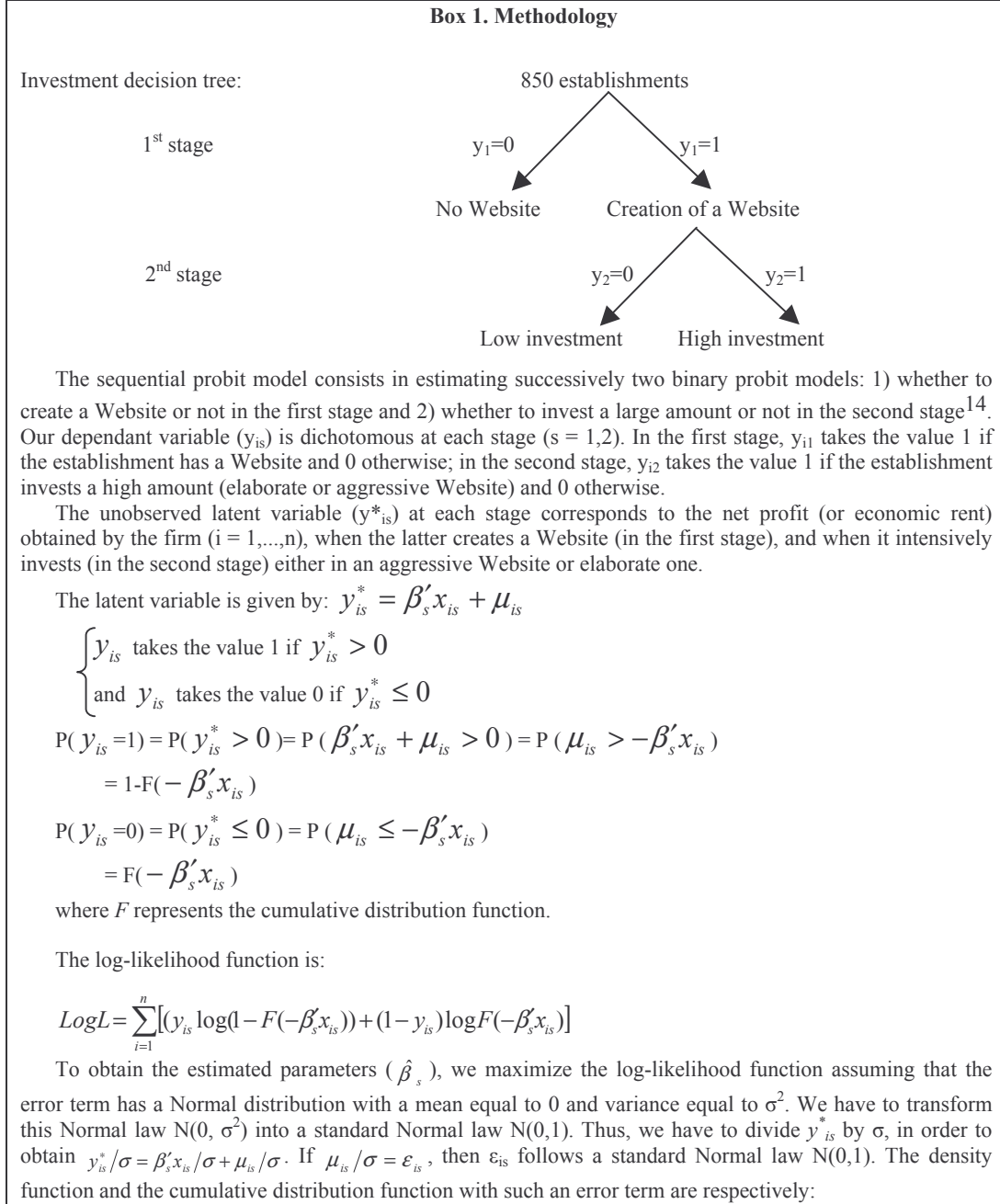
We also use a second classification to test the IO conjecture. We establish a distinction between accomodating Websites and aggressive ones. The latter are characterized by transactional functionalities (at least one of the following functions is available: online ordering, secured system for online payment, orders following and/or traceability of products) and an updating at least once a month. 71 Websites satisfy this criteria and are likely to have a strategic impact on the existing and potential competitors.

The next section will present the econometric method and the variables used to explain the choice between a basic vs. elaborate Website and between an accomodating vs. aggressive Website.



## IV. Empirical Results

We analyze the decision of investments in a Website thanks to a sequential probit model. The methodology is presented in Box 1.



<sup>14</sup> A sequential probit model requires that the choice in the second stage is independent of the choice in the first stage, meaning that the correlation between the error terms is nul. To check the absence of correlation, we use a test of independence (a LR test) between the equations of the first stage and the second stage. This test is based on a chi-square distribution with 1 degree of freedom.

$$f = \frac{1}{\sigma\sqrt{2\pi}} \cdot \exp\left[-(1/2) \cdot (\varepsilon_{is})^2\right]$$

and 
$$F = \int_{-\infty}^{-\beta'x_{is}/\sigma} \frac{1}{\sigma\sqrt{2\pi}} \cdot \exp\left[-(1/2) \cdot (\varepsilon_{is})^2\right] \cdot d\varepsilon_{is}$$

In order to identify the coefficients  $\beta$  associated with  $\sigma$ , we normalize the standard error  $\sigma$  to 1.

## Used variables and expected effects

Some of the explanatory variables are used in both stages (characteristics of the establishment and characteristics of the firm that owns this establishment), whereas some variables have only been introduced in the second stage (market structure, usage of ICT).

### *The first stage*

To explain the decision to create a Website, we consider the features of the establishments: their location (urban vs. rural area) and the oldness of their current location (more or less than 5 years). We also take into account the characteristics of the firm that owns this establishment: the number of employees (between 10 and 19, between 20 and 49, between 50 and 99, 100 employees or more), its main sector of activities (agro food, consumer goods industry, automobile and equipment industry, intermediate goods industry, services, transports, retailing), its age (less than 10 years, between 10 and 20 years, more than 20 years), its organizational structure (multi-establishments firm, belong to a group). We also introduce variables on the equipment and usage of ICT in order to measure the resources and capabilities of the establishments in ICT: presence of a local network of computers, mobile phones, pocket digital agenda for employees and an access to Internet.

Following the literature on ICT adoption and usage by firms (especially GALLIANO & ROUX, 2004 and DHOLAKIA & KSHETRI, 2004), we can presume that establishments belonging to a well-established firm (in terms of oldness and employees) and/or a group are more likely to set up a Website, thanks to their important collection of resources and competencies. Moreover, a complex organization (a multi-establishment firm) is expected to have a Website to facilitate coordination between the different establishments (through the functionality of an Intranet). Finally, the previous investments in ICT can facilitate the creation of a Website. An establishment will have more ability to set up a Website if it is well equipped or familiar with ICT.

### *The second stage*

The second stage probit uses the same explanatory variables as in the first stage except for the sectorial dummies that are replaced by three new variables:

concentration ratio of the four biggest firms that is usually denoted by CR4<sup>15</sup>, capital intensity and the openness rate to international trade. These three variables aim at measuring the degree of competition faced by the firms. We also introduce additional variables to characterize the activity of the establishment: a dummy variable indicates whether the establishment is the headquarter of the firm. Two other dummies indicate whether the establishment achieves more than 30% of its sales with a single customer and makes more than 30% of its purchases with a single supplier.

The resource-based conjecture is tested through the firm characteristics and market structure. The size, oldness of the firm and the membership of a group are used as proxies for its endowment in resources and competencies. Concentration ratio capital intensity and the openness rate to international trade are proxies to measure entry barriers and the degree of competition. The expected effects of these internal and external factors on the amount of investment in a Website are presented in Table 1. We also expect that the presence of other ICT can stimulate the investments in a Website (complementarity between the different information and communication technologies). Thus, the existence of a call center, EDI (Electronic Data Interchange) or ERP<sup>16</sup> (Enterprise Resource Planning) indicates the accumulation of capabilities in ICT and reduces the cost and the risk to set up a Website.

The IO conjecture is tested through the three proxy of market structure. Here, the expected sign of concentration, capital intensity and openness rate is the inverse of the expected one with the resource-based conjecture (see Table 1). We presume that firms have more incentives to invest in an aggressive Website if they are positioned in a highly competitive and open sector. Indeed, the expected return of a Top Dog strategy is higher on such markets, especially when it enables the firm to erect artificial entry barriers. Furthermore, the presence of a call centre or an ERP could be correlated with an aggressive Website, because such tools can be complementary to sell products and services rapidly to distant customers (synergy with e-commerce). Finally, we introduce a dummy variable that equals one if the firm has a business-to-consumer activity and zero if the firm has a business-to-business activity. We want to investigate through this variable whether the Internet strategies are more aggressive on upstream markets (intermediate markets) or on downstream markets (end markets).

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<sup>15</sup> It corresponds to the sum of market shares of the four biggest firms.

<sup>16</sup> The EDI enhances information transmission between a firm and its suppliers and/or customers, reducing transaction costs and inventory costs. An ERP is a business management system that attempts to integrate and optimize all the functions of the firm, including planning, manufacturing, sales, and marketing.

**Table 1. Expected effects of firm and market characteristics**

	Investment in an elaborate Website (1 <sup>st</sup> classification)	Investment in an aggressive Website (2 <sup>nd</sup> classification)
	Internal motives	Strategic motives
Number of employees, Belong to a group	+	?
Oldness of the firm	+	?
Concentration (CR4)	+	-
Openness rate	-	+
Capital intensity	+	-

## Econometric results

### *The first stage*

Results of the first stage binary probit are presented in Table 2<sup>17</sup>.

**Table 2. The determinants of having a Website<sup>18</sup>**

<i>Variable</i>	<i>Coefficient</i>	<i>Marginal effect</i>
<b>Firm characteristics</b>		
Size between 10 and 19 employees	Ref.	
Between 20 and 49 employees	ns	
Between 50 and 99 employees	0.3413** (0.1479)	0.132
100 employees or more	0.3575** (0.1826)	0.1374
Multi-establishment organization	0.3362*** (0.1074)	0.1322
Belong to a group	0.3661*** (0.1072)	0.144
Agro-food industry	Ref.	

<sup>17</sup> The econometric regression has been conducted on 805 observations (some surveyed establishments were removed because of non response for some of the explanatory variables).

<sup>18</sup> The table provides both the estimated coefficients and the marginal effects associated with the explanatory variables. The marginal effects of an explanatory factor can be interpreted as the variation in the probability of having a Website in response to a 1% variation for a continuous variable or in response to the switching from 0 to 1 for a dummy variable.

Consumer good industry	0.5384* (0.2890)	0.1995
Automobile and equipment good industry	0.4919** (0.2386)	0.1852
Intermediate good industry	0.4797** (0.2313)	0.1813
Retailing	ns	
Transport	ns	
Services for firms	ns	
Age below 10 years	Ref.	
Between 10 and 20 years	0.1197* (0.2095)	0.0516
20 years or more	ns	
<b>Establishment characteristics</b>		
Location in an urban area	ns	
5 years or more in the current location	-0.2946** (0.1388)	-0.1146
<b>Prior technology use</b>		
Local network of computers	0.3968*** (0.1424)	0.1573
Mobile phone for employees	0.2115* (0.1149)	0.084
Pocket Digital Agenda (PDA)	0.3997*** (0.109)	0.1563
Access to Internet	0.7988*** (0.1573)	0.3066
Constant	-1.5004*** (0.2873)	
<b>Correctly classified</b>	67.45%	
<b>Pseudo R<sup>2</sup></b>	0.1567	
<b>Log likelihood</b>	-467.880	

\*, \*\*, and \*\*\* indicate statistical significativity at the 10%-level, 5%, and 1% respectively.

Standard errors are in brackets ; ns : non significant ; Ref. : reference group.

Note : The variable “belong to a group” is significant at the 1%-level. When a firm is a member of a group, it increases by 14.4% its probability of owning a Website.

The econometric results are in conformity with the literature on Internet technologies adoption. We find a positive influence of the proxies for human and financial resources (number of employees, membership of a group). Moreover, the investments in ICT tend to be complementary: the presence of a local computer network, mobile phones, access to the Internet and PDA increases the likelihood of having a Website. Complex organizations (multi-establishments firms) have more incentives to set up a Website. Having a multi-establishment structure increases by 13.2% the probability of having a Website. We also obtain that the firms created between 1983 and 1993 have a higher probability of owning a Website, *ceteris paribus*. Finally, we observe sectorial effects: firms in industrial sectors (equipment goods, intermediate goods or consumer goods) are more likely to create a Website.

## The second stage

The tests of the two conjectures are made on a sample of 427 establishments that declare to own a Website and have answered all the items in the questionnaire. The econometric results for the resource-based approach are displayed in Table 3.

**Table 3. The factors explaining the investment in a multi-functional (elaborate) Website**

Variable	Model 1		Model 2	
	Coefficient	Marginal effect	Coefficient	Marginal effect
<b>Business environment characteristics</b>				
Openness rate	-0.4518* (0.2589)	-0.1456	ns	
Four-firm concentration ratio (CR4)	0.0122*** (0.0033)	0.0039	0.0088** (0.0035)	0.0028
Capital intensity	ns		ns	
<b>Firm characteristics</b>				
Business to Consumer	...		0.7117*** (0.1968)	0.2437
Size between 10 and 19 employees	Ref.		Ref.	
Between 20 and 49	-0.3417* (0.1839)	-0.1052	ns	
Between 50 and 99	ns		ns	
100 employees or more	ns		ns	
Belong to a group	0.4607*** (0.1646)	0.1466	0.407** (0.1669)	0.1279
Age below 10 years	Ref.		Ref.	
Between 10 and 20 years	-0.3381* (0.1973)	-0.1079	ns	
20 years or more	-0.4706** (0.2129)	-0.1432	-0.4848** (0.2173)	-0.1451
<b>Establishment characteristics</b>				
Location in an urban area	0.3340* (0.1860)	0.1011	ns	
The establishment is the head office	ns		ns	
Setting up for 5 years or more	0.4371** (0.20298)	0.1268	0.3657* (0.2053)	0.1063
30% or more of the establishment's sales made with a single customer	-0.5401** (0.2596)	-0.1481	ns	
30% or more of the establishment's purchases made with a single supplier	ns		-0.3333* (0.1885)	-0.0998
<b>Prior technology use</b>				
Other connection (ISDN, ...)	Ref.		Ref.	
DSL connection	0.3779** (0.1841)	0.1259	0.4585** (0.1903)	0.1517
Leased lines	0.7342*** (0.1961)	0.2595	0.7801*** (0.1995)	0.274
Call centre	ns		ns	
Enterprise Resource Planning	ns		ns	
Electronic Data Interchange	0.2707* (0.1495)	0.0886	0.2796* (0.1523)	0.0904
Website for 3 years or more	ns		ns	
Constant	-1.7565*** (0.3605)		-2.0235*** (0.3770)	

<b>LR Test</b>	0.03	1.17
<b>Correctly classified</b>	76.11%	77.28%
<b>Pseudo R<sup>2</sup></b>	0.196	0.222
<b>Log likelihood</b>	-208.335	-201.533

\*, \*\*, and \*\*\* indicate statistical significance at the 10%-level, 5%, and 1% respectively. Standard errors are in brackets ; ns : non significant ; Ref. : reference group.

The results are contrasted. The variables that measure the resources and competencies of the firm have a limited impact (size is not significant) or have the opposite effect (oldness has a negative impact). However, belonging to a group increases by 14.66% the probability of investing a high amount in a Website and when the establishment has been located in the same place for more than five years, the probability of an intense investment increases by 12.68%, *ceteris paribus* (a stability in the location can enhance the accumulation of resources and facilitate the transformation of these resources into IT assets).

More interestingly, the business environment has the expected effect.<sup>19</sup> A relatively stable, protected market has a significant and positive effect on the choice of investing in a high quality Website. In this way, a 1% increase in the CR4 raises by nearly 0.4% the probability of setting up an advanced Website, while a 1% increase in the openness rate decreases by 14% the probability of setting up a site with high investment.

The other explanatory variables give insightful results. For example, being located in an urban area has a significant and positive impact. Urban areas provide a better and cheaper access to ICT and may reduce the cost to invest in an elaborate Website. If the establishment makes 30% or more of its turnover with the same customer, it has fewer incentives to invest in its Website. Finally, the probability of investing in a multi-functionalities Website increases with the quality of the Internet connection (DSL connection or leased lines). This result emphasizes the strong complementarity in the amount of investments in ICT. Similarly, the existence of EDI, a technology oriented towards the optimization of the production and distribution processes, increases the likelihood of an elaborate Website.

In a second specification, we introduce the variable “Business to Consumer” which is equal to 1 if the firm exercises its activity in a downstream market, and 0 if the firm is on an upstream market. Firms dealing with end-consumers tend to invest more intensively in their Website than firms dealing with business customers. It means that a Website is a more strategic asset on downstream markets than on upstream markets.

Table 4 displays the econometric results for the IO conjecture, stating that Website investment are oriented by strategic issues.

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<sup>19</sup> Nevertheless, the coefficient associated with the sunk costs measure is not significant.



**Table 4. The factors explaining the investment in a commercial Website**

Variable	Model 1		Model 2	
	Coefficient	Marginal effect	Coefficient	Marginal effect
<b>Business environment characteristics</b>				
Openness rate	-1.1726*** (0.3406)	-0.2213	-0.8864** (0.3598)	-0.1639
Four-firm concentration ratio (CR4)	0.0109*** (0.0037)	0.0021	0.0073* (0.0040)	0.0014
Capital intensity	ns		ns	
<b>Firm characteristics</b>				
Business to Consumer			0.6117*** (0.2268)	0.1322
Size between 10 and 19 employees	Ref.		Ref.	
Between 20 and 49	ns		ns	
Between 50 and 99	ns		ns	
100 employees or more	ns		ns	
Belong to a group	ns		ns	
Age below 10 years	Ref.		Ref.	
Between 10 and 20 years	-0.3829* (0.2152)	-0.0714	-0.3649* (0.2198)	-0.0667
20 years or more	-0.5714** (0.2427)	-0.0969	-0.5435** (0.2465)	-0.0907
<b>Establishment characteristics</b>				
Location in an urban area	ns		ns	
The establishment is the head office	ns		ns	
Setting up for 5 years or more	ns		ns	
30% or more of the establishment's sales is made with a single consumer	ns		ns	
30% or more of the establishment's purchases is made with a single supplier	ns		ns	
<b>Prior technology use</b>				
Other connection (ISDN, ...)	Ref.		Ref.	
DSL connection	ns		ns	
Leased lines	ns		ns	
Call centre	ns		ns	
Enterprise Resource Planning	0.3505* (0.1795)	0.0703	0.3596** (0.1810)	0.0709
Electronic Data Interchange	ns		ns	
Website for 3 years or more	0.3500** (0.1746)	0.068	0.404** (0.1786)	0.0773
Constant	-1.4507*** (0.4092)		-1.637*** (0.4216)	
<b>LR Test</b>	0.55		1.13	
<b>Correctly classified</b>	86.42%		87.59%	
<b>Pseudo R2</b>	0.209		0.229	
<b>Log likelihood</b>	-146.712		-143.072	

\*, \*\*, and \*\*\* indicate statistical significance at the 10%-level, 5%, and 1% respectively.

Standard errors are in brackets ; ns : non significant ; Ref. : reference group.

Results are less significant than in the resource-based model. Moreover, the conjecture that a market with low entry barriers should lead to more aggressive Website investments is rejected. Capital intensity is not significant, the openness rate is significant but negative, and the degree of concentration is also significant

but positive. Strong competition seems to prevent firms from investing in a commercial or aggressive Website. Conversely, well-established firms whose markets are protected are more likely to invest in transactional functionalities. By this way, they strengthen the existing entry barriers and increase their market power.

Besides, the resources owned by a firm have no influence on the strategic decision to invest in an aggressive Website. The complementarity between this type of Website and the other ICTs is also weak, except for the ERP. By increasing the flexibility and reactivity of the organization, an ERP may facilitate the setting-up of a commercial Website. Finally, a Website that has been created for at least three year increases by 6.8% the probability of investing in transactional functionalities. Perhaps implementing such functionalities requires a learning process that may last several years.

In the second specification with the business-to-consumer dummy, we obtain a positive impact. The decision to invest in an aggressive Website strongly depends of the nature of the customers. Firms have more incentives to invest in a commercial Website when they face consumers (downstream markets), than business customers (upstream markets). Hence, strategic issues (detering entry, preempting market) are more accurate on the downstream markets.

## **V. Conclusion**

This article has proposed two alternative approaches (the resource-based theory and the theory of industrial organization) to understand the motivations of firms for investing in a Website. The first one focuses on the resources and competencies of firms as the main drivers for investments in Internet technologies, whereas the second highlights strategic interactions between competitors. These two theoretical frameworks lead to contradictory conjectures on the relationship between market structure and the amount of investments in Websites. The resource-based conjecture establishes that a poorly competitive market (high entry barriers, high concentration) is favorable to intensive investment in Websites, whereas the industrial organization conjectures presumes the inverse impact. The econometric estimations tend to validate the resource-based conjecture. Elaborate Websites are more likely to appear on protected markets.

A limit of this empirical study is the way we measure the degree of competition. We used rough proxies at a sector-based level. This level is imperfectly relevant to characterize competition playing field of our surveyed establishments. Our future research should address this limitation by integrating in the forthcoming surveys sent to the firms, some specific questions on market structure and competition perceived by managers.

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### Appendix: Description of the data

	<i>Whole sample</i>		<i>Firm owning a Website</i>	
	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>
<b>Business environment characteristics</b>				
Openness rate			0.3338	0.3082
Four-firm concentration ratio (CR4)			0.2693	0.2438
Capital intensity			42.3110	37.1921
<b>Firm characteristics</b>				
Business to Consumer			0.2796	0.4493
Size between 20 and 49	0.3271	0.4694	0.3140	0.4646
Between 50 and 99	0.1565	0.3635	0.1914	0.3938
100 employees or more	0.1094	0.3123	0.1484	0.3559
Multi-establishment organization	0.4224	0.4942		
Belong to a group	0.4588	0.4986	0.5376	0.4991
Consumer goods	0.0447	0.2068		
Automobile and equipment goods	0.0918	0.2889		
Intermediate goods	0.1035	0.3048		
Retailing	0.3471	0.4763		
Transport	0.1141	0.3181		
Services for firms	0.2094	0.4071		
Time existence between 10 and 20 years	0.4370	0.4963	0.4685	0.4996
20 years or more	0.3550	0.4788	0.3446	0.4758
<b>Establishment characteristics</b>				
Location in an urban area	0.7388	0.4395	0.7591	0.4281
The establishment is the head office			0.6925	0.4620
Setting up for 5 years or more	0.8389	0.3679	0.8290	0.3769
30% or more of the establishment's sales is made with a single consumer			0.1140	0.3181
30% or more of the establishment's purchases is made with a single supplier			0.2495	0.4332
<b>Prior technology use</b>				
Local network of computers	0.8280	0.3776		
Mobile phone for employees	0.7094	0.4543		
Pocket Digital Agenda	0.3682	0.4826		
Access to Internet	0.8459	0.3613		
DSL consumer connection			0.3341	0.4722
DSL technical connection			0.2473	0.4319
Call centre			0.2215	0.4157
Enterprise Resource Planning			0.3699	0.4833
Electronic Data Interchange			0.3978	0.4900
Website for 3 years or more			0.4464	0.4977