E-COMMERCE AND LABOUR TAX AVOIDANCE

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Abstract

This study evidences one of the adverse effects of e-commerce on labour tax avoidance, and more precisely in the loss of firms' social security contributions. With a sample of French e-commerce and traditional retail firms, we find that labour tax avoidance is significantly higher in e-commerce than in traditional retail firms. Results are robust to all measures of labour tax avoidance used in this study, to different estimation methods, sample selection criteria and sensitivity analyses. We discuss and conclude on the adverse effects of the digital economy and e-commerce on employees' welfare and social well-being

Keywords: e-commerce; social security contributions; labour tax avoidance; tax avoidance

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1. Introduction.

This paper aims to provide empirical evidence of the effects of e-commerce on labour tax avoidance (LTAV), namely the amount of social security contributions (SSC) paid and reported by the firms. Following previous empirical research on tax avoidance (Hanlon and Heitzman, 2010), we consider LTAV very broadly, as a wide spectrum of SSC planning strategies and activities, where legal actions are at one end, whereas evasion or illegal activities are at the other end. Hence, we include in LTAV both legal and illegal practices, given that the legality of a transaction cannot be ascertained with the data of this study.

According to the OECD/G20 (2015, p. 52), e-commerce is the sale of goods or services conducted over computer networks. It can be used either to facilitate the ordering of goods or services that are then delivered through conventional channels, or to order and deliver goods and services completely electronically. We use e-commerce as a representative business sector of the digital or platform economy (e.g. Brynjolfsson et al., 2003; Lee, 2001).

There are two important features which have the potential to fundamentally disrupt the work as it has been performed in Western countries until recent times, namely globalization and digital economy.

Globalization encourages mobility of goods, services, labour and capital, with corporations searching profits and favourable conditions across different countries in the world. Sikka (2008) argues that with the globalization nations compete trying to satisfy corporations' demands for lower costs and social obligations, in order to attract business. Globalization has also corrosively impacted on national institutions and regulations of employment and industrial relations (Marginson, 2016). Specifically, it has made labour markets more flexible and employment more precarious in Western advanced countries and post-transition economies (Lissowska, 2017). In addition, it has fostered anti-social tax practices and human rights abuses in developing countries (Otusanya, 2011; Lauwo & Otusanya, 2014).

The technology-driven developments of the digital economy exacerbate the effects of globalization on labour markets. They enable access to goods and services through platform owners providing the infrastructure that mediates between the supplier and the

client, controls the interaction between these parties, and produces a power asymmetry in favour of the platform provider. Some specific types of digital economy give rise to new forms of labour, such as gig work and crowd or cloud work, where digital platforms coordinate various services offered by private individuals, giving employers access to huge on-demand-workforce (Schmidt, 2017). Graham & Grisard (2019) argue that the technology-driven markets, in the current uberization phase, use the poor citizens, those in the margins of society, as a necessary part of the neoliberal economic system. According to these authors, poorness has always played a substantial role, it is not accidental to the functioning of the economic system, with accounting legitimizing its moral order and supporting wealth inequality.

In this context, the International Labour Organization (2016) distinguishes between standard and non-standard forms of employment (NSE). The former are full time and indefinite employments, occurring at a set place of work outside the home, as well as part of a subordinate and bilateral employment relationship. The latter are employment arrangements that deviate from the standard relationships, including temporary employment, part-time work, temporary agency work and other multi-party employment relationships, as well as disguised employment relationships and dependent self-employment. Most of the labour forms provided by the digital economy, such as gig work and cloud or crowd work fall into the NSE category. Important consequences of NSE are the loss of labour rights (Rameshuber and Winger, 2018). In this regard, some studies document the emergence of NSE in the US (Katz and Krueger, 2016), Europe (European Commission, 2016) and the whole world (International Labour Organization, 2016). Specifically, the increasing interconnectedness of business across the world, role of women in the world's labour force, international migration, and flexible and precarious work, among others, bring about a rise in NSE in most countries over time, being self-employment an important form of NSE. Danson, Galloway, & Sherif (2020) argue that there is a deliberate policy push from unemployment to self-employment, to shift the risks and responsibilities of employment from state and employers to individual citizens with lack of opportunities, thus deepening their poverty rather than encouraging their economic engagement.

There is an academic and social debate on the effects of the digital economy on labour. Some theories assert that the digital economy positively influences different aspects of labour, given that it frees labour from the chains of rationalization and control (Mason, 2016; Terranova, 2000), it allows workers to seek for themselves the best possible

working conditions by liberating entrepreneurial energies (Greenwald & Katz, 2012), and it enables direct communication between creative workers and potential consumers or users of their work (Anderson, 2006; Shirky, 2010). In addition, focusing more specifically on e-commerce, Relich (2017) and Nurmilaakso (2009) find empirical evidence that e-commerce diffusion and firms' internet access have positive effects on labour productivity in Europe.

On the other hand, Fish and Srinivasan (2012) question and refute the positive effects. Staab & Nachtwey (2016) stress the labour control and enforcement potential of the digital economy by making specific allusion to e-commerce. Friedman (2014) Konkolewsky (2017) and Greenwood et al. (2017) argue that the digital economy heightens the trend of precarious work and stresses the loss of labour rights and SSC. According to Todolí-Signes (2017), NSE are the dominant work arrangements in the gig-economy platforms fuelled by the digital economy era. Van den Broek (2010) asserts that the context of the digital economy blurs restraints for employers' discretional practices and produces an imbalance against employees. Some authors (Berg, 2016; Schmidt, 2017; Friedman, 2014) argue that the current organization of platforms does not provide decent work opportunities and shifts economic risks and costs from employers to workers. In this vein, employers in the digital economy frequently try to get great flexibility in adjusting wage costs to fluctuating demand, imposing independent contract agreements to their employees, even though they may work exclusively for one platform, thus diverting business risks to employees, with the additional consequence that they do not usually have any social security coverage. The International Social Security Association (2015) outlines the digital economy as one the most important challenges for SSC, which raises important sustainability concerns in most advanced countries. Some authors (Pestel and Sommer, 2017; Kitao, 2014) stress the negative effects of the shortage of SSC on society, such as the sustainability of the social security systems, the regressive effect on household budgets, specifically on low-income households, the increase in inequality, the degradation of the quality of life, medical assistance and public health, etc. Corujo (2017) highlights the lack of compulsory SSC in the gig economy in Spain and its subsequent negative effects on the sustainability of the country's social security system. Accordingly, firms in the digital economy have more ground, than traditional firms, to operate on the fringes of employment laws and they enjoy more opportunities to take profit of the extant deregulation and labour market flexibility.

E-commerce is specially positioned to take advantages of the digital economy. Indeed, it enables firms to circumvent conventional stages of taxation, because location is not a substantial conditioning to the activity compared with traditional firms in physical locations (Frecknall Hughes and Glaister, 2001). In this vein, e-commerce favours the use of low cost work relationships, such as external work or independent contractors. It is also more prone to use work provided by cloud and gig work. It allows an easy allocation of work agreements in the most convenient jurisdiction to avoid SSC where work is not covered, or sufficiently protected, by social security legislation (Rodgers, 2016), because the design of the social insurance systems is usually based on the assumption of standard employment relationships (International Labour Organization, 2016).

To our knowledge, there are no empirical business studies analysing the influence of e-commerce, nor of the digital economy, on LTAV. However, some previous studies examine the opportunities to avoid value added taxes (Hoopes, Thornock and Williams, 2016) or corporate income taxes (Klassen et al., 2014) through e-commerce. On the other hand, Ravenda, Argilés-Bosch and Valencia-Silva (2015) and Ravenda, Valencia-Silva, Argilés-Bosch, & Garcia-Blandón (2020) are the only published research empirically testing some determinants of LTAV, but they do neither deal with the digital economy, nor with e-commerce. Some law studies (Li, 2003; Basu, 2007; Berg, 2016) analyse the potential LTAV of the digital economy, but they do neither quantify the impact, nor test it. The warnings highlighted by these studies are a motivation for our research.

Previous business empirical research on tax avoidance is almost exclusively focused on corporate income tax (Schackelford and Shevlin, 2001; Ravenda et al., 2015; Finér & Ylönen, 2017). However, the far greater amount and economic impact of firms' SSC than firms' income tax deserves research on LTAV. Its lack is a surprising gap in business research and motivates this paper. In this vein, Coe-Rexecode's (2018) study reports 311.9 billion € of firms' SSC in France in 2016, which is a much greater amount than the 49.8 billion € of corporate income taxes. The corresponding amounts are 289.2 and 83.7 billion € in Germany for the same period. The economic importance of SSC is an additional motivation of our study.

Critical research challenges the idea that business endeavour and the pursuit of maximum profit are core social objectives. It tries to analyse broader socio-political questions, such as power, authority, rent appropriation relationships, the ideological underpinnings of scientific writing, etc. The extant tax avoidance accounting literature offers few critical work fully exploring the various different types of tax avoidance and

their several social implications (Ylönen & Laine, 2015). Mainstream accounting research on tax avoidance tends to see taxation as essentially a technical matter produced by skilled management who takes advantage of legal rules and their corresponding loopholes, but untied to ideological considerations. Taxation is regarded as an avoidable cost, rather than a return or contribution from firms to society (Sikka & Willmott, 2010). Moreover, in the professional ground, managers and tax consultants avoid to associate taxes with its societal relevance and try to impose a commercial logic on their corresponding professional decisions, depriving them from an ethical logic (Apostol & Pop, 2019). In this regard, mainstream tax avoidance research produces repetitive research on the various determinants of statutory corporate income tax avoidance isolated from the broader societal context. In contrast, the critical literature positions tax avoidance within broader socio-political questions, as a result of conscious choices of company directors in their pursuit of profits, remuneration, status and media accolades (Sikka, 2010). A socially progressive approach should highlight the various social implications of firms' tax behaviour and its consequences for our understanding of globalization, social justice, and corporate power (Ylönen & Laine, 2015). In line with the critical accounting literature, we consider that research into tax avoidance may unveil additional possibilities of avoiding taxes. Furthermore, it may illuminate the various complex mechanisms used by firms to violate the contract between business and society and to appropriate social rents in the globalization phase of capitalism, not only through corporate income tax avoidance, but also through LTAV. However, we do not abjure verifiable analyses, as some authors have questioned critical analyses for damaging its emancipatory power with its reluctance to perform positivistic analyses (Bowden, 2018). Instead, we use canonical empirical research methodology to perform our study and draw conclusions on this critical topic.

Using a sample of e-commerce and traditional retail French firms over the period 2007-2016, we find that e-commerce is significantly associated with higher LTAV relative to traditional retail commerce. Results are robust to different measures of LTAV, matching procedures, and sensitivity analyses. We also restrict our analysis to the subsample of individual firms that do not belong to a business group, and perform cross-section estimations, providing reinforced support for the influence of e-commerce on LTAV.

It is noteworthy that France is a specially interesting context for this analysis, because it is one of the biggest economies in the world, its firms' SSC rank among the highest in

the OECD (OECD, 2017), and its accounting standards require disclosure of information on wages and SSC in income statements. Therefore, this information is easily available for a large sample of French firms. Moreover, our purpose is to analyse the effects of the digital economy, in the form of e-commerce, on LTAV in a first world European economy, where labour rights and SSC have been traditionally widely warranted and have had a high degree of compliance.

In this paper we make several contributions. We contribute providing evidence of the profound alteration in which a growing proportion of workforce relates to the economy and the new means of rent appropriation in the current stage of capitalism. We also contribute complementing previous law studies with empirical research on this issue. Moreover, our paper is the first empirical business study analysing the influence of e-commerce on LTAV, and therefore, we contribute to the extant academic and social debate on the effects of e-commerce on labour.

The remainder of the article is organized as follows: the second section reviews literature and raises hypotheses, we then formulate our empirical model, explain sample characteristics, present results and finish with concluding remarks.

2. Literature review and hypotheses development

Business empirical research on SSC is almost inexistent. There are studies on labour taxes, where SSC are analysed as a specific case of labour taxes, in the law and public economic fields. They mostly examine macroeconomic effects of changes in labour income taxes and/or SSC on employment, economic growth, competitiveness, or inequality (Antón, 2014; Cahuc and Carcillo, 2014; Bunel and L'Horty, 2012; Garsaa and Levratto, 2015). There are also empirical studies relating labour taxes with the informal or shadow economy (Dell'Anno, Gómez-Antonio, & Pardo, 2007) and the location of firm headquarters (Egger, Radulescu, & Strecker, 2013). Other studies analyse social security compliance at a firm level, the influence of penalties on compliance with SSC (Lesnik, Kracun, & Jagric, 2014) and of SSC on firm performance (S. Lee & Torm, 2017). Castel & To (2012) analyze the evasion of SSC in the informal sector in Vietnam.

Some studies from different fields criticize the digital economy and mention e-commerce as an important part of it, because it is associated with low, or lack of, employment protection and LTAV (Staab and Nachtwey, 2016; Konkolewsky, 2017).

However, these studies do not empirically test these associations. In addition, there are some law, political economics, and even management analyses discussing the challenges of e-commerce for tax authorities, some of them assessing the aggregate impact of tax losses (Basu, 2007; Hale and McNeal, 2011; Agrawal and Fox, 2016). Some studies analyse sale and corporate income tax losses, caused by e-commerce at an aggregate level (Brox & Fader, 1999; Bruce & Fox, 2004; Han, 2018). Nonetheless, they neither discuss SSC, nor develop empirical models explaining LTAV.

As regards business research on tax avoidance, most of it deals with income tax avoidance, as can be seen in the literature reviews by Graham, Raedy, & Shackelford (2012) and Hanlon and Heitzman (2010). Since then, Ravenda et al. (2015) and Ravenda et al. (2020) are the few extant empirical business research testing factors influencing LTAV. They develop measures of LTAV and infer conclusions on the relationship between corporate social responsibility and LTAV. The former uses a sample of Italian firms controlled by the Mafia, and the latter a sample of Spanish firms accused of evading SSC. Besides these papers, no other empirical study deals with LTAV for alternative countries and ordinary types of firms. On the other hand, to our knowledge, Hoopes, Thornock and Williams (2016) and Klassen et al. (2014) are the only empirical articles dealing with tax avoidance in e-commerce. The former empirically tests the existence of competitive advantages for e-commerce firms in avoiding value added taxes with respect to traditional retail firms, while the latter, using a sample of manufacturing firms, find that e-commerce is associated with higher income tax avoidance, when e-commerce interacts with foreign income.

SSC are direct costs for firms that reduce the (expected) after-tax return on firms' activities. From an economic standpoint the rational behaviour would be to minimize costs, and therefore maximize profits. In this vein, higher SSC may stimulate firms to divert employment arrangements, which should be standard subordinate employment, to NSE arrangements, such as, for example, self-employment (Stenkula, 2012).

Regulation on SSC may also trigger LTAV effect on firms' decisions. This effect arises when it is easier to illegally evade or legally avoid costs with a given form of employment with respect to another (Pestieau & Possen, 1991).

There is a large evidence of a wide spread of NSE all over the world, and its important use in e-commerce (International Labour Organization, 2016). A notorious characteristic of NSE is that it has lower social security coverage than standard employment, due to its limited legal protection (Konkolewsky, 2017; Rameshuber and Winger, 2018). In

multinational firms the level of SSC should be an important factor influencing country's attractiveness in terms of business unit locations and employment recruitment. In this regard, Egger, Radulescu and Strecker (2013) find empirical evidence of the influence of SSC on firm headquarters' location. According to them, one percentage point increase in SSC reduces the probability of headquarters' location by 5.5%, by 6.8% when they consider only relocating and new firms, and by 12.2% when they focus on relocating new firms only. This evidence suggests that although firms operating in the digital economy may locate their headquarters in a core advanced city or country, they may easily arrange NSE agreements with employees working in more favourable labour jurisdictions by, therefore, benefiting from lower SSC than traditional firms.

The source and the residence taxation principles are elusive in an e-commerce environment (Basu, 2007). Indeed, the possibilities of hiding transactions and identifying participants are great. E-commerce exacerbates the usual problems of monitoring for tax authorities when firms operate across different tax jurisdictions (Li, 2003), and it adds confusion with respect to where the employer should fulfil its labour duties and obligations.

Internet businesses allow carrying out economic activities with minimal need for personnel to be present, a fact which is evidenced by the greater revenue per employee with respect to other types of firms (OECD/G20, 2015, p. 66-67). Indeed, because transactions are mainly conducted electronically, it is not required for all the personnel involved in transactions to be located in the country where the goods or services are purchased. There are different locations at play, such as the country in which the company has its headquarters, the server hosting the web domain, the effective management of the company and of the different subsidiaries, the office processing the order, the delivery of goods or services, their reception, etc. Therefore, internet firms may decide to locate specific service units in other locations, hire employees in these or even alternative locations and assign tasks to their best convenience.

As Frecknall, Hughes & Glaister (2001) explain, national laws are frequently bedevilled by loopholes in the regulation of e-commerce. According to these authors, national tax jurisdictions are not prepared for the international perspective that the possibilities of e-commerce for avoiding taxes require. Firms' tax planners can exploit the extant law uncertainties and inconsistencies. National tax authorities have not found any certain solution to this problem yet (Yapar, Bayrakdar, & Yapar, 2015).

In the European Union context, the lack of a European law protecting work vulnerability has avoided an effective multinational action to prevent employers abuse, as this kind of legislation was viewed as the preserve of member states. In practice, when different directives were implemented, regulations were extended just to basic working conditions and have been used to encourage some deregulation in the use of fixed-term contracts. Meanwhile, security elements have increasingly been left away, as it was the case in the adoption of the flexicurity principle (flexibility in the labour market combined with security for workers) in the law and policy in the EU (Rodgers, 2016).

E-commerce firms have more facilities than traditional retail firms to use NSE or precarious work. They do not have the location restraints that traditional firms have. These latter firms must endow their brick and mortar locations, where their clients physically buy their goods and services, with hired employees. A considerable share of their sales is generated in rich advanced countries, such as France, the country of our study, where employees enjoy higher salaries, labour rights and social protection than in non-advanced countries. Physical locations of brick and mortar retail firms are exposed to easy monitoring and checking of number of workers, tasks, activities, contracts, labour conditions, etc. by possible governmental inspections. Therefore, traditional firms are more constrained to hire employees in the countries where their sales take place, with standard employments covered by established labour conditions and regulations. On the other hand, e-commerce firms have more ground to arrange NSE. Indeed, due to their blurred physical presence, e-commerce firms are less likely to fall under authorities' scrutiny. They may easily use work under independent contractor arrangements, even for full time employees or for employees with their main or full income coming from this type of arrangements. As most of their businesses are not restricted by a physical presence, they use workers rendering their services in any possible location and keeping them out the authorities' views. In this vein, e-commerce firms are less restricted than traditional firms to hire people working in different countries or places from those where they sell their goods or services. Following this rationale, e-commerce firms will tend to use labour from employees located in countries with low wages, labour rights and effective democratic controls, and reap income from customers in jurisdictions with high purchase power. Conversely, traditional retail firms are more constrained to use labour in the countries where they actually sell to their customers, especially when these are countries with effective democratic controls, labour inspections, and governmental regulations. E-commerce firms will also tend to use more NSE than traditional firms.

As e-commerce firms have more flexibility than traditional firms to use services from business units located in different tax jurisdictions, as well as to perform NSE arrangements, they are more likely to bear lower SSC. We therefore formulate the following hypothesis:

H1. E-commerce is associated with greater LTAV relative to traditional commerce.

3. Methodology

3.1.Empirical model

We formulate an empirical model where our dependent variable *LTAV* depends on our variable of interest, e-commerce (*ECOM*), and a set of control variables (*CONTROLS*), which previous research on labour (Ravenda et al., 2015) and income tax avoidance[1], consider important determinants of tax avoidance, and/or which we consider that they are interesting for our dataset and specific context:

$$LTAV_{i,t} = \beta_0 + \beta_1 \cdot ECOM_{i,t} + \sum \beta_k \cdot CONTROLS_{k,i,t} + \varepsilon_{i,t} \quad (1)$$

where each observation refers to firm *i* in year *t*, β are parameters to be estimated, and ε is the error term, which for simplicity we use as error term in all equations in this paper. The variables (in this and following equations) and their definition can be found in the appendix.

[1] We reviewed the following 28 empirical studies on income tax avoidance and recorded the variables most frequently used: (Lisowsky, 2010) (Balakrishnan, Blouin, & Guay, 2014) (C.-Y. Chen, Lin, & Lin, 2008) (Chyz, Ching Leung, Zhen Li, & Meng Rui, 2013) (Doukakis, 2012) (Tsakumis, Curatola, & Porcano, 2007) (Richardson, 2008) (Hanlon, Mills, Slemrod, Hanlon, & Mills, 2005) (Hope, Ma, & Thomas, 2013) (Khurana & Moser, 2009) (Lanis & Richardson, 2011) (Lennox et al., 2013) (Taylor & Richardson, 2013) (Wilson, 2009) (Kubick, Lynch, Mayberry, & Omer, 2015) (Atwood, Drake, Myers, & Myers, 2012) (Huseynov & Klamm, 2012) (Chan, Lin Kenny Z., & Mo, 2010) (Klassen & Laplante, 2012) (Dwenger & Steiner, 2014) (Jiménez-Angueira, 2008) (Taylor, Richardson, & Lanis, 2015) (Taylor, Richardson, & Taplin, 2015) (S. Katz, Khan, & Schmidt, 2013) (Badertscher, Katz, & Rego, 2013) (Hoi, Wu, & Zhang, 2013) (Frank, Lynch, & Rego, 2009) (Desai & Dharmapala, 2009).

In order to avoid our tests being influenced by few influential observations, we winsorize all continuous variables used in this study at the 1st and 99th percentiles, as it is common in empirical research on tax avoidance (e.g.: Gallemore and Labro, 2015; Brown, Drake and Martin, 2016).

3.2. Dependent variables

The French *Plan comptable général* in its profit and loss statement offers information on expenses by nature or type of resources consumed in firms' activities: merchandises, raw materials, personnel expenses, depreciation, etc. With respect to personnel expenses, it distinguishes between *salaires et traitements* (wages) and *charges sociales* (firm's SSC). Starting from this information and following Ravenda et al. (2015), we use four different measures of LTAV: *ABSSCSALE*, *ABSSCWAGE*, *DIFSSCSALQ* and *DIFSSCWAGQ.*

We start with *SSCSALE* and *SSCWAGE*, the ratios of SSC to firms' sales and wages, respectively. The latter measures the firms' SSC with respect to wages paid to their employees. It provides a first indication of LTAV considering that firms may manage employment agreements in order to get convenient levels of wages and contribution rates, taking into account that low wages are subject to lower contribution rates than higher wages in France, because contribution rates are progressive. Given that firms may arrange NSE, and, specifically, they may use self-employed personnel to minimize SSC, *SSCSALE* may provide a comparative evidence of LTAV, beyond their personnel expenses caused by their standard employment. This ratio would not only measure LTAV, but also firm efficiency, given that efficient firms tend to benefit from lower shares of personnel expenses on sales. Indeed, both previous measures do not consider firms' characteristics.

ABSSCSALE and *ABSSCWAGE* are abnormal *SSCSALE* and *SSCWAGE,* respectively. They provide a more precise assessment of LTAV, given that they measure the departure from the social contributions that firms should bear according to their characteristics. Similarly to Ravenda, Argilés-Bosch and Valencia-Silva (2015), they are calculated as residuals from the following regressions, respectively, estimated for each year of data in our sample:

$$SSCSALE_i = \alpha_0 + \alpha_1 \cdot \log SALE_i + \alpha_2 \cdot SALETASS_i + \alpha_3 \cdot INCSALETASS_i + \alpha_4 \cdot WAGETSALE_i + \varepsilon_{i,t} \quad (2)$$

$$SSCWAGE_i = \alpha_0 + \alpha_1 \cdot \log SALE_i + \alpha_2 \cdot SALETASS_i + \alpha_3 \cdot INCSALETASS_i + \alpha_4 \cdot WAGETSALE_i + \varepsilon_{i,t} \quad (3)$$

As mentioned, in Equations (2) and (3) we follow Ravenda et al. (2015), that, in turn, refer to the equations widely used for the computation of abnormal levels of indicators of real activities manipulation (Roychowdhury, 2006; Cohen, Dey, & Lys, 2008).

Finally, we use two additional measures of *LTAV*: differences in firms' *SSCSALE* and *SSCWAGE* with respect to their matched year-size quintile mean values, respectively. The corresponding dependent variables measuring these differences are *DIFSSCSALQ* and *DIFSSCWAGQ*. We use sales, instead of total assets, as size-matching criterion, because the size and composition of assets may be substantially different between e-commerce and traditional firms.

All these six measures indicate greater firms' SSC with greater values for these variables. Therefore, LTAV is inversely related to the values of these variables.

3.3. Independent variables

ECOM is a dummy variable indicating, with value one (and zero otherwise), that a given firm is coded as retail trade via Internet. A significantly negative coefficient for this variable would provide support for hypotheses *H1*.

Our model includes a set of control variables, most of them commonly used in previous literature of tax avoidance.

We use log*SALE* as measure of size. The non-normal distribution of size supports its transformation into logarithm. Given the characteristics of our study the transformation into log with base 10 has no disadvantages with respect to the transformation into natural logarithm. Larger firms find more easy to use labour with different tax regimes, and to acquire the necessary skills and means to do it. They also allow cost benefits from economies of scale, and in this respect, they are less urged to reduce costs, including SSC, than small firms. Therefore, the prevailing expected effect of size on the dependent variable is uncertain.

The share of SSC on firms' sales (*WAGETSALE*) would positively depend on the importance of personnel expenses in firm's operations. Moreover, greater share of wages on sales may be also associated with greater number and types of employees, and therefore with increasing opportunities for LTAV, by hiring employees with lower SSC rates, especially in less skilled categories. However, lower *WAGETSALE* may be an indication of firms paying lower salaries with SSC exemptions. Therefore, the prevailing effect of this variable on the dependent variables is uncertain.

One of the characteristics of the digital economy is the usage of NSE, frequently replacing standard by self-employment, that firms record as external services expenses. Controlling for *SERVTSALE* ensures that the test of our hypothesis is robust to the level of self-employment, and we expect a negative sign for this variable.

Indebtedness (*BANKDEBTA*), property, plant and equipment (*PPETOTA*), inventory intensity (*INVTOTA*) and profitability (*ROA*) may be an indication of firms' urgency to compensate costs with lower SSC. We expect a negative sign for these variables.

Sales growth (*SALEGROW*) may offer the opportunity to change the structure of firm's employees by including NSE agreements or types of employees with lower SSC. We expect a positive influence of this variable on LTAV.

Intangible assets (*INTFATA*) and the change in intangibles (*VARINTFATA*) may be indicators of firm's possibilities to engage in NSE arrangements or to use employment in favourable overseas tax jurisdictions. We expect a negative sign for these variables.

Export sales (*EXPTSALE*), the number of firm's subsidiaries (*NSUBSIDIA*), and the number of firms in the group (*NGROUP*) are measures of firm internationalization and complexity, and may also provide opportunities for LTAV. In the specific case of a subsidiary belonging to a large group, on the one hand, it may entail more bureaucracy than a single firm, but, on the other hand, this firm may benefit from management resources used in the headquarter, thus allowing lower wages and SSC in the subsidiary. Therefore, there is no defined expectation on which effect should prevail for these variables. Our database offers data on *NSUBSIDIA* and *NGROUP* only for the last year of available data. Consequently, we apply the same value for these variables to all previous years for each firm in our panel data.

Assuming that macroeconomic circumstances and contextual factors may influence LTAV, we include in our model dummy variables indicating, with value one and zero otherwise, that an observation belongs to a given year (*YEAR*), and that a firm has its headquarter in a given region (*REGION*).

Governments usually try to fuel economic growth and employment alleviating firms' costs and allowing exemptions in SSC for certain types of work, or circumstances. Moreover, in periods of economic downturn firms find employees more willing to accept precarious employment agreements. On the other hand, governments may use SSC to attain certain goals of economic policy. Given the random influences in the governmental yearly measures, we believe that dummy variables are more appropriate than a single variable taking continuous values for each calendar year. There is no defined expectation for the sign of this variable.

As regards the geographical factor, we expect firms in peripheral regions to have economic disadvantages relative to firms located in central or metropolitan regions, such as less access to skilled and talented workers. Firms in peripheral regions are usually members of business groups whose headquarters are located in metropolitan regions, devoting the subsidiaries in these peripheral regions to deal with the less-significant local customers with less skilled employees (Boussebaa, 2015), who earn lower wages, and with subsequent lower SSC. Workers in peripheral regions, with fewer opportunities, may be forced to accept less favourable working conditions, even in forms of NSE. We expect a prevailing effect of higher LTAV in firms located in peripheral regions.

4. Sample selection and descriptive statics

4.1. Sample selection

We select the retail trade sector, because it is the only industry distinguishing between firms performing traditional and e-commerce sales, in the most important and common industry statistic classifications, such as the Statistical Classification of Economic Activities in the European Union, known also as NACE (the French title *Nomenclature générale des Activités économiques dans les Communautés Européennes*), and the US Standard Industry Classification.

Most countries do not require the disclosure of information on payroll expenses in the profit and loss statements of companies. France, Italy and Spain are among the most important countries requiring the disclosure of this type of information. In Spain, only big firms are required to separately report wages and SSC in their financial statements, whereas medium and small firms merely report aggregate data on payroll expenses. In contrast, France and Italy require the separate disclosure of wages and SSC for all

companies due to publicly report their financial statements. We finally select France because it is the biggest economy among these countries, therefore data are available for a larger number of firms, and its firms' SSC are among the highest in the world. Indeed, according to the OECD's (2017) report, France has the highest employer SSC and the fourth tax wedge on labour income in the OECD.

French firms' social contributions are regulated by a complex system. Firms are taxed through four groups of contributions: URSSAF[2], unemployment (*pôle emploi*), retirement (*retraites complémentaires*) and taxes (*taxes et participations*). There are different chapters or types of contribution (*régimes*) in any of these four groups. While the contributions in the fourth group (*taxes et participations*) are calculated applying a fixed rate to total gross wages, all chapters in the second and third groups (*pôle emploi* and *retraites complémentaires*) limit their respective rates to between one and eight times a wage threshold (*plafond*), established by yearly decrees. All gross wages above the amounts indicated by these numbers of *plafonds* are not taxable. Firm contributions included in the *retraites complémentaires* group are greater for employees classified as executives (*cadres*) than for those classified as non-executives (*non-cadres*): the former are taxed with more contribution *régimes*, less *plafond* constraints, and in some few cases with greater *régime* rates. Most of the *régimes* included in the URSSAF group apply rates to the total gross wages, but some of them limit the contributions to one *plafond*, and there is a specific *régime*, labelled as *allocations familiales*, which apply a slightly greater rate to the highest wages, usually considered as such those above 3.5 times the French minimum wage. We use the term SSC meaning all these social contributions outlined in this paragraph, which expenses are disclosed by French firms in their profit and loss statements.

We use the French DIANE database, the Bureau van Dijk French supplier of French accounting data, and retrieve data for the NACE code 47 (retail except of motor vehicles and motorcycles), distinguishing between firms classified as retail trade via Internet (NACE code 4791) and traditional retail firms (the remaining firms in NACE code 47), for the last available ten years, from 2007 to 2016. We get a total number of 1,469,820

[2] The French URSSAF (*Unions de Recouvrement des Cotisations de Sécurité Sociale et d'Allocations Familiales*) may be translated into English by "Organizations for the Collection of Social Security and Family Benefit Contributions". It is a network of private organizations created in 1960 whose main task is to collect employee and employer social security contributions that finance the *Régime general* (general account) of France's social security system, including state health insurance.

firm-year observations of unconsolidated accounting data for the whole NACE code 47. In order to avoid distorting results for any possible mistake we drop observations with missing (the first drop of missing values in revenues produces 641,039 observations deleted) or negative values for sales, wages, SSC and total assets. We also drop observations with sales equal to zero, as well as with missing or values greater than 1 for the ratio of SSC to wages. These drops provide us with 745,402 firm-year observations. We also delete 6,494 firm-year observations from overseas French regions (*Guadeloupe*, *Martinique*, *Guyane*, *La Reunion* and *Mayotte*), with different characteristics and economic developments with respect to the European regions, and therefore avoiding distorted results from these few different observations. We then have 738,908 firm-year observations after this drop.

Considering available data for all our variables, and the required lags for some variables, we perform our main estimations with a final sample of 114,544 firms (2,110 and 112,434 for e-commerce and traditional firms respectively) and 577,778 firm-year observations (7,870 and 569,908 for e-commerce and traditional firms respectively) from 2008 to 2016 (see column 1 of Table 1). Panels A and B in this table display the number of observations of the full and paired samples for all years and French regions included in our study, respectively. The comparatively low number of observations in 2016 and 2015 (see panel A) may be attributed to delays in accounting disclosure at the date at which we retrieved the data: on July 2017. An important share of both, traditional and e-commerce firms are in Île-de-France and Auvergne-Rhône-Alpes, which are the most important regions from an economic point of view.

(insert Table 1 approximately here)

4.2. Matched sample

Given that our sample includes a much larger number of traditional firms compared to e-commerce firms, results with the full sample might be biased by this unbalanced number of observations. We therefore use the propensity score method to produce a one-to-one matched sample in which the characteristics of e-commerce firms are similar to those of traditional firms, not only in size and period of their corresponding observations, but also according to other characteristics that may influence LTAV. Moreover, some research suggests that propensity score matching can reduce concerns that endogeneity

may affect results (Armstrong, Jagolinzer, & Larcker, 2010), and accounting research frequently uses it as an advantageous matching procedure (Lennox, Lisowsky, & Pittman, 2013; Dyreng and Markle, 2016). We run the matching procedure with a logistic regression where the dependent variable *ECOM* depends on size and all remaining variables in our Equation 1. The procedure provides a matched sample, whose number of observations is showed in column 2 in Table 1. As it can be seen in columns 1 (e-commerce) and 2 (traditional), there are slight differences in the number of observations over the different years and regions between the experimental and control subsamples.

We select a second matched sample applying a classical and less refined procedure, using size as a selection criterion, conditional on observations in the same year and region. Accordingly, the number of observations by all different years and regions are exactly the same for both subsamples (see the number of e-commerce and traditional firms in columns 1 and 3).

Table 2 compares the bias reduction and differences in characteristics between both, the full and the propensity score matched samples. While most variables present standardized percent bias above the conventional value of 5 in the unmatched sample (as can be seen in Panel A in this table), with the exception of *NGROUP* and some dummies of *YEAR* and *REGION*, the corresponding percentage is below this value in all variables in the matched sample. The percent reduction bias is high: above 77 in all continuous variables and above 39 in all dummies (with few irrelevant exceptions: *YEAR*2012 and *Hauts-de-France*). While only *NGROUP* and two dummies do not present significant differences, between traditional and e-commerce firms, in the full sample, only four variables (including one dummy) present significant differences in the matched sample. Panel B displays overall results for both samples. As can be seen, the covariates imbalance of the unmatched sample has been substantially reduced with the paired sample. The chi2 test does not refuse the null hypothesis of balanced covariates at $p<0.01$. The mean and median standardized bias for all of the covariates are reduced from above the conventional threshold of 5 in the unmatched sample, to below this value in the matched sample. The Rubin's B (the absolute standardized difference of the means of the linear index of the propensity score) in the unmatched sample is higher than the conventional value of 25, while it is below this value in the matched sample. The R ratio of e-commerce to traditional firms' variances is between the conventional values of 0.5 and 2 in both samples. Therefore, data from this sample suggest that the propensity core

matching procedure has substantially reduced the likely bias and imbalance of the unmatched sample, and that the matched sample may be considered sufficiently balanced.

(insert Table 2 approximately here)

Table 3 shows descriptive statistics for the winsorized values of the dependent and independent variables for the propensity score matched subsamples. The dummy variables are removed from this table from simplicity. Data in panel A, for the four dependent variables used in the study and the two additional raw ratios of SSC to personnel expenses and sales, reveal significant lower SSC for e-commerce firms, in accordance with our hypothesis H1, with the exception of lower median values of *SSCWAGE*, *ABSSCWAG* and *DIFSSCWAGQ* for traditional firms, but these differences are not significant at $p<0.1$. Moreover, the lower mean *ABSSCWAG* for e-commerce firms are not significant at $p<0.1$.

With reference to the independent variables (see panel B in Table 3), there are no significant differences (at $p<0.1$) between traditional and e-commerce firms in indebtedness, inventories, profitability, variation in intangibles and number of subsidiaries and firms in the group. There are also no significant mean differences in size, despite the corresponding median values are significantly higher for e-commerce firms. However, despite the score matching procedure e-commerce firms in our sample still have lower mean share of wages (*WAGETSALE*) and higher mean share intangible fixed assets (*INTFATA*) than traditional firms. The mean share of property, plant and equipment on total assets (*PPETOTA*) is significantly higher in e-commerce firms, while the corresponding median is significantly lower. The Bartlett's $p<0.01$ cast doubts on the equal-variances assumption between both subsamples, thus granting reliability to the Mann-Witney test. There are still some variables with significant differences in median values, which, with the exception of sales growth, present unequal variances between both subsamples.

(insert Table 3 approximately here)

When matching firms by size conditional on observations in the same year and region (not tabulated), mean and median values are significantly different (at $p<0.01$) between traditional and e-commerce firms in all independent variables, with the exception of size

and number of subsidiaries. There are also significant differences in most of the dependent variables. All dependent and independent variables present significant different values in the full sample (not tabulated).

Considering these results from the univariate analyses, it seems that the propensity score matching provides more reliable results than the those with the classical matching procedure and the full sample. However, we offer analyses for all three samples in this study.

The calculation of two of our dependent variables, both abnormal SSC *ABSSCSALE* and *ABSSCWAGE*, require cross section ordinary least squares estimations of Equations 2 and 3 respectively for each of the 9 years, from 2008 to 2016, of available observations in our sample. All estimations (not displayed for simplicity) present significant goodness of fit, with adjusted R-squared ranging from 0.3476 (on year 2013) to 0.4358 (on year 2008) and from 0.0212 (on year 2015) to 0.0322 (on year 2012) for *SSCSALE* and *SSCWAGE,* respectively.

Table 4 shows Pearson correlations for the independent variables in Equation 1. For simplicity we have removed the dummy variables identifying regions from this table. The highest coefficient -0.353 (significant at $p<0.01$), between the number of subsidiaries (*NSUBSIDIA*) and the transformed variable for size (log*SALE*) is low, thus suggesting that collinearity does not seriously affect our results. The highest variance inflation factor is also low (2.5 for the dummy variable indicating that a given observation belongs to year 2013), again excluding the existence of collinearity problems. Pearson correlations are also low (not tabulated) and collinearity is not a problem both when we consider the matched sample by size, conditional on observations in the same year and region, and when we consider the whole sample: significant Pearson correlations of -0.4142 and -0.352 between these variables for both samples, respectively, and maximum variance inflation factors of 2.46 and 2.03, respectively.

(insert Table 4 approximately here)

5. Results

5.1. Main results

In order to test our hypotheses, we perform estimations of Equation 1 for any of the three samples, matched and full samples, and four dependent variables. The Breusch and Pagan Lagrangian multipliers tests for random effects are significant at $p<0.01$ for all dependent variables. The Coo-Weisberg tests reveal the existence of heteroscedasticity in all dependent variables. Given that the experimental variable, *ECOM*, as well as other interesting variables such as *REGION*, *NSUBSIDIA* and *NGROUP*, take the same value for a given firm over all years, they are excluded for collinearity in fixed effects estimations. We therefore perform our analyses running panel data estimations with random effects and clustering robust standard errors by firm.

Table 5 displays estimations for the propensity score matched sample, where 8 and 12 dummy variables identifying years and regions respectively are removed for simplicity. All estimations present significant goodness of fit at $p<0.001$, with R-squared overall ranging from 0.0398 (column 1) to 0.4609 (column 3).

(insert Table 5 approximately here)

As regards the variable relevant for our hypothesis, the coefficient of *ECOM* is negative and significant at $p<0.01$ in all columns. These results provide support for *H1*, indicating that LTAV is greater in e-commerce firms than in traditional firms. The shares of SSC on sales and wages are 0.224 and 1.06 percent points lower per year respectively (columns 1 and 2), in e-commerce than in traditional firms, with respect to the share that would correspond to firms' characteristics, which is what the variables *ABSSCSALE* and *ABSSWAGE* pretend to measure. They are also 0.349 and 1.41 percent points lower respectively (columns 3 and 4), with respect to the mean percent of the year and quintile firms' size, similar to the coefficients of this variable when the dependent variable are the raw coefficients of SSC to sales (*SSCSALE*) and personal expenses (*SSCWAGE*), 0.329 and 1.45 respectively, which are not displayed in the table.

As for control variables, most of them present the expected and significant sign in most columns: indebtedness, tangible and intangible fixed assets, inventories and profitability. The significant positive coefficients of *NSUBSIDIA* in all cases, and of *EXPTSALE* and log*SALES* in two out of the four columns suggest that complexity is the prevailing effect in these variables, thus influencing higher SSC. The negative sign of *SALEGROW* in most columns (and significant in columns 3 and 4) suggest that growth allows LTAV. There are some unexpected and/or contradictory results in some variables, such as for example

with *WAGETSALE*, *VARINTFATA* or *SALEGROW*, but it is not a major concern given that all variables are used as matching criterion in the propensity score matching procedure.

Coefficients of dummy variables for *YEAR* (not displayed in Table 5) are predominantly positive and significant at $p<0.01$ for the last years of our sample (2012 to 2016), and predominantly non-significant for the first years of our sample (2009 to 2011).

All dummy variables indicating firms' region (results not displayed in Table 5) present a significant negative sign at $p<0.01$ in all columns, in accordance with expectations on lower LTAV behaviour in capital regions and financial centres than in peripheral regions.

The Wooldridge test for autocorrelation indicate the existence of first-order autocorrelation in all estimations. We repeated all estimations fitting cross-sectional time-series random effects regressions with a generalised least squares estimator, and all results (not displayed for simplicity) are very similar to those of Table 5.

5.2. Robustness analyses

Table 6 shows results for the matched sample by size conditioned to observations in the same year and region. Dummies for year and region are also removed from the table because of simplicity. All estimations present significant goodness-of-fit with adjusted R-square ranging from to 0.0379 to .4434, similarly to those in Table 5. The experimental variable ECOM is significantly negative at $p<0.01$ in all columns. As can be seen in Table 6, the shares of SSC on sales and wages are 0.280 and 1.22 percent points lower per year, respectively, in e-commerce than in traditional firms, according to the share that would correspond to firms' characteristics. They are also 0.372 and 1.53 percent points lower respectively (columns 3 and 4), with respect to the mean percent of the year and quintile firms' size, similar to the coefficients of this variable when the dependent variable are the raw coefficients of *SSCSALE* and *SSCWAGE* (0.370 and 1.57 respectively), which are not displayed in the table. Therefore, these results provide reinforced support for our hypothesis H1. Despite there are slight differences in the estimates of the control variables, results are very similar to those of Table 5.

(Insert Table 6 approximately here)

Results for the full sample are displayed in Table 7. The signs of the experimental variable are negative and significant in all cases (at $p<0.1$ in columns 1, 3 and 4, but at $p<0.1$ in column 2), which provide further support for our hypothesis H1. While, the influences of the experimental variable on the dependent variables are more appropriately isolated with the matched samples, results for the control variables are more reliably assessed with the whole sample. First, because the sample is larger. Second, because some or all independent variables are used as matching criterion in the matched samples. Finally, because the whole sample reflects more appropriately the population's behaviour. In this vein, with few exceptions all control variables present significant coefficients, their signs are according to expectations and no opposite between different columns.

We repeat estimations for the unmatched sample with the raw dependent variables *SSCSALE* and *SSCWAGE* (results not tabulated). The corresponding coefficients of our variable of interest *ECOM* are also negative and significant at $p<0.01$ in all cases, and again reinforce previous results.

(Insert Table 7 approximately here)

A concern with our results is that some e-commerce firms may have been created by a business group with the specific objective of minimizing the overall SSC of their group, and therefore our sample may be biased because firms belonging to a group may behave following a group rationality, and differently from what their individual characteristics would drive. We are not able to perform analyses at group level, because there are only 8 e-commerce firms with consolidated accounts in the DIANE database in the period of our study. In order to deal with this possible bias, we restrict our sample to firms that do not belong to a group. We approach this characteristic restricting the sample to firms with zero value in our variables *NSUBSIDIA* and *NGROUP*.

Table 8 summarizes the estimates of the experimental variable for all four dependent variables and firms that do not belong to a group in both matched samples, with the propensity score matching procedure, and by size conditional on year and region. All signs of the experimental variable are negative and significant at $p<0.01$, for the 6,515 firms that do not belong to a group and the corresponding 10,965 (5,497 and 5,468 for traditional and e-commerce firms respectively) and 11,013 (5,545 and 5,468 for traditional and e-commerce firms respectively) firm-year observations of both matched subsamples respectively (panels A and B in Table 8). The estimations for the non-

matched subsample of firms 410,065 firm-year observations not belonging to a group (404,597 and 5,468 for traditional and e-commerce firms respectively) also yield negative significant coefficients for all dependent variables at $p<0.01$ (not tabulated). These results provide reinforced support for our hypothesis H1, suggesting that group rationality behaviour does not likely bias our results.

(Insert Table 8 approximately here)

We finally perform cross-section robust estimations using the two step Fama and Macbeth procedure. Table 9 presents a summary of these results for the propensity score matched sample. The table displays the average coefficients and their significance over the nine years 2008-2016. Consistent with previous results, all coefficients of the experimental variable are negative. They are significant in columns 1, 3 and 4, at $p<0.05$, $p<0.01$ and $p<0.1$ respectively, but non-significant in column 2. Therefore, these results provide reinforced support for our hypothesis for three out of four dependent variables.

(Insert Table 9 approximately here)

Chen, Hribar, & Melessa (2018) raise concerns on the reliability of results in the typical implementation of the two-step procedure in accounting research when the dependent variable of the second step is the residuals of the regression in the first-step. They claim that this two-step procedure produces biased coefficients and t-statistics. Despite that our results with *DIFSSCSALQ*, *DIFSSCWAGQ*, *SSCSALE* and *SSCWAGE* are not concerned with this procedure and likely biases, variables *ABSSCSALE* and *ABSSCWAGE* may be biased. We follow alternative procedures proposed by these authors, running single panel regressions for the propensity score matched samples with Equations (1) and (2), where the variable of interest *ECOM* and a set of year indicator variables and their interactions with each regressors in these equations are added as independent variables. The coefficients of *ECOM* are very similar to those of columns (1) and (2) in Table 5 and significant at $p<0.001$ (results not tabulated). We finally run regressions for the dependent variables *SSCSALE*, *SSCWAGE*, *ABSSCSALE* and *ABSSCWAGE* on all variables in Equation (1) plus *SALETASS* and *INCSALETASS*, the two dependent variables from Equations (2) and (3) not included in Equation (1). The signs of the coefficient of our variable of interest *ECOM* are again negative and

significant at $p<0.01$ in all cases (results not tabulated), thus suggesting that our results are not biased and providing reinforced support for our hypothesis.

6. Discussion and Conclusions

This study performs an empirical analysis of the influence of e-commerce on LTAV. We estimate a regression model with a panel data sample of French e-commerce and traditional retail firms. Despite our study uses French data, our results and conclusions may be extended to developed countries, and specially to European countries, with similar labour relations regulations to those that apply in France.

We find that e-commerce firms are significantly more labour tax avoidant than traditional firms. Results are robust to all measures of LTAV used in this study, to different estimation methods, sample selection criteria and sensitivity analyses.

This study increases our knowledge of the influence of e-commerce on SSC. It has important social and academic implications, given that it is the first study providing empirical evidence of the higher LTAV practices of e-commerce firms relative to traditional retail firms. Our results suggest a likely loss of SSC caused by the employment agreements adopted in e-commerce firms, as they have more chances to take advantage of the increasing possibilities provided by the digital economy to use NSE agreements and avoid authorities' scrutiny. This hypothesized practice may put an unfair competitive pressure upon the traditional retail industry. As maximum profit and competition are the main capitalism rationales, in a context where taxes are technically regarded as costs, the firms attaining more cost savings are more likely to win a game where ethical behaviours are not part of the rationale.

The loss of SSC produces effects on employees' welfare and social cohesion. It usually degrades the quality of life for people subject to abusive employment conditions. It is of crucial importance to question the shortage of SSC to finance the provision of public health, medical care and pension security. The liberal agenda of globalization assumes that all types of international competition are healthy, including tax competition between countries. Neoliberalism assumes a fictitious symbolic universe (Cooper, 2015). The key underlying assumption is that citizens, whose welfare depends on the taxes collected by their governments, are completely mobile and free to choose a suitable country for their preferences as consumers of public goods. This is not obviously the case, given that capital moves much easier than citizens. Despite formal declarations of freedom and

equality, economical and power inequalities are fundamental constituents of capitalism, which ensure privileged capital relationships over labour. More favourable legal outcomes are required to place back power into hands of society (Rodgers, 2016).

It is of crucial importance to question the key tenets of neoliberalism, and unveil abuses by corporations that underpin contemporary social relations, such as the proliferation of NSE and the shortage of SSC to finance the provision of public health, medical care and pension security, which are not only a crisis rooted in demographic trends, but above all a failure of the neoliberal ideology (Sikka, 2006). New discourses are needed to promote emancipation from the institutionalized predominant neoliberalism ideology (Gendron, 2018), as well as activist research inducing social change (Everett, Neu, Rahaman, & Maharaj, 2015). Critical accounting offers a strong emancipatory perspective (Dillard & Vinnari, 2017), to better serve the needs of all members of society with progressive social programs, assuming that accounting is socially constructed and part of political processes (Vinnari & Dillard, 2016). While mainstream accounting research is implicated with predominant economic interests and reproduce them (Arnold, 2009; Bengtsson, 2011), denying its political implications with capitalism (Brown, 2009), critical accounting is more innovative and likely to allow the emergence of alternative and regenerative rationalities (Humphrey & Gendron, 2015).

The new developments of the digital economy fundamentally disrupt the employment relationships between employers and workers in the way that they have been previously arranging and developing. The so-called NSE becomes the new usual and targeted standard of employment (Cherry & Aloisi, 2017), introducing additional disadvantages for labour in terms of economic instability and loss of labour rights. Moreover, it provides facilities to shift the economic burden of SSC from the employer to the employees, a shift that it does not seem to be balanced with greater remunerations. On the contrary, the result is a net loss of welfare and social protection for the most part of the workforce and society (Van den Broek, 2010).

The globalisation has added new complexities, given that corporations may easily hire and exchange work, under different forms of NSE, in various places worldwide, even with no physical presence. Corporations may also provide services at completely different places in terms of social rights with respect to the places where the work is provided. Meanwhile, labour laws are still framed with standard employment and traditional national borders, and may hardly cope with LTAV practices of the digital economy. The

final outcome is an overall damage for citizens in all countries (Killian, 2006), especially the less well-off citizens (Sikka, 2015).

The results of our study stand out the need for more regulation for the employment agreements in e-commerce firms, because this behaviour convey a negative effect for their traditional competitors and, in the end, for the whole society. As Fernández-Macías (2012) evidences, institutions and regulation may significantly moderate or influence market and technological factors in the evolution of employment structures. In the specific case of the European Union, the financial integration has been divorced from any social project (Grahl, 2006). The challenge is to develop a regulatory agenda, that scrutinizes and avoids the loss of SSC in e-commerce, the digital economy, and by extension and the imitation effect that it may produce, in the whole economical system. Governments must put the interests of society before the business interests. They should apply appropriate regulations to protect workers' rights and the provision of social security funds, distributing the entrepreneurial opportunities and risks, as well as social costs more fairly. It is the job of governments to correct the imbalance against the worker part in the digital economy and oblige platform providers and clients, as the parts that mostly benefit from this relationship, to share the corresponding social costs. In doing so, it will lead, not only to a higher social justice, but also to more productive organization of work (Berg, 2016). Not only governmental, but also global actions are needed to fulfil the mentioned challenge.

Our study has several limitations. As to our knowledge there is no available information on the percentage of sales over the internet for a large sample, we analyse the effect of the digital economy with rough data of industry classification. The firms classified in the traditional retail sector may also sell through e-commerce (in actual fact many of them do it) and may also use additional possibilities of LTAV. It may be interesting to perform future research using percentages of sales performed through e-commerce in all kinds of firms and industries. On the other hand, the DIANA database provides information on firms' industry codes in the last year of available data, but not on changes over the period analysed. Despite it seems implausible that a large number of firms may have changed their industry classification to the point that it would significantly bias results, it is, however, a limitation of this research.

Our research does not provide precise information on the triggers, drivers and procedures allowing lower SSC of e-commerce firms. It does not reveal whether this reduction is an intentional outcome or a mere involuntary effect of a different business

model with respect to traditional firms. Our results suggest an intentional engagement in LTAV activities by e-commerce, but do not provide the clear and direct evidence that an in-depth qualitative analysis would allow (Finér & Ylönen, 2017; Ylönen & Laine, 2015). The qualitative analysis of tax-driven mechanisms and specific arrangements to do it, is also an avenue for future research.

Our study neither directly measures the use of crowd nor gig workers, or any other employees working as independent contractors either. It would be interesting to perform further in deep analyses of any form of NSE arrangements used by e-commerce of other firms working in the digital economy.

It would also be interesting to analyse whether the savings in SSC in e-commerce firms are balanced with higher wages with respect to traditional firms, or merely these former firms contribute to reduce the overall country SSC and produces an overall burden shift from the employer to the employees. This issue also deserves future research.

Appendix

: variable definition and abbreviations

Variable definition (expected signs shown only for independent variables in Eq. (1))

Variable name	Expected sign	Variable definition
LTAV		Labour tax avoidance. We use six different measures: *SSCSALE*, *SSCWAGE*, *ABSSCSALE, ABSSCWAGE*, *DIFSSCSALQ* and *DIFSSCWAGQ*
SSCSALE		Social security contributions to sales
SSCWAGE		Social security contributions to wages
ABSSCSALE		Abnormal social security contributions to sales. The residuals form Eq. (2)
ABSSCWAGE		Abnormal social security contributions to wages. The residuals form Eq. (3)
DIFSSCSALQ		Differences in firms' social security contributions to sales with respect to their matched year-size quintile mean values

DIFSSCWAGQ		Differences in firms' social security contributions to wages with respect to their matched year-size quintile mean values
ECOM	–	Dummy variable taking value of 1 if a firm is classified as performing exclusively as retail trade via internet, and 0 otherwise
SALE		Size, measured as sales
log*SALE*	?	Sales transformed into logarithms
SALETASS		Sales to total assets of previous year
INCSALETASS		Increase in sales. Measured as sales of current year less sales of previous year divided by total assets of previous year
WAGETSALE	?	Wages to sales
SERVTSALE	–	Service expenses to sales
BANKDEBTA	–	Bank debt to total assets
PPETOTA	–	Property plant and equipment to total assets
INVTOTA	–	Inventories to total assets
ROA	–	Return on assets. Measured as income before taxes of current year to total assets of previous year
SALEGROW	–	Sales growth. Measured as sales of current year to sales of previous year
INTFATA	–	Intangible fixed assets. Measured as net intangible fixed assets to total assets
VARINTFATA	–	Change or variation in intangible fixed assets. Measured as *INTFATA* of current year less *INTFATA* of previous year
EXPTSALE	?	Export sales to total sales
NSUBSIDIA	?	Number of firm's subsidiaries
NGROUP	?	Number of firms in the group
YEAR	?	Dummy variables indicating, with value of 1, that a firm belongs to a given year, and 0 otherwise. The first year (2008) is the default variable.

REGION	–	Dummy variables indicating, with value of 1, that a firm has its headquarters in a given region, and 0 otherwise. Île-de-France is the default variable.

Abbreviations

LTAV	Labour tax avoidance
NSE	Non-standard employment
SSC	Social Security contributions
URSSAF	The French *Unions de Recouvrement des Cotisations de Sécurité Sociale et d'Allocations Familiales* (Organizations for the Collection of Social Security and Family Benefit Contributions)

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Table 1.

Number of firm-year observations

	(1) Full sample			(2) Propensity score matching		(3) Matched by size conditional on the same year and region	
Year/Region	Traditional	E-commerce	Total	Traditional	Total	Traditional	Total
Panel A: Observations by year							
2008	59,608	628	60,236	581	1,209	628	1,256
2009	64,213	770	64,983	774	1,544	770	1,540
2010	68,651	857	69,508	881	1,738	857	1,714
2011	73,619	957	74,576	970	1,927	957	1,914
2012	79,174	1,103	80,277	1,130	2,233	1,103	2,206
2013	80,921	1,179	82,100	1,142	2,321	1,179	2,358
2014	64,699	1,025	65,724	991	2,016	1,025	2,050
2015	53,292	883	54,175	889	1,772	883	1,766
2016	25,731	468	26,199	512	980	468	936
Panel B: Observations by region							
Île-de-France	102,441	1,902	104,343	1,984	3,886	1,902	3,804
Centre-Val de Loire	18,913	163	19,076	165	328	163	326
Bourgogne-Franche-Compté	24,938	216	25,154	218	434	216	432
Normandie	24,716	200	24,916	204	404	200	400
Hauts-de-France	38,044	536	38,580	560	1,096	536	1,072
Grand Est	40,695	637	41,332	602	1,239	637	1,274
Pays de la Loire	26,693	303	26,996	269	572	303	606
Bretagne	26,393	202	26,595	153	355	202	404
Nouvelle-Aquitaine	55,788	615	56,403	605	1,220	615	1,230
Occitanie	59,859	993	60,852	1,036	2,029	993	1,986
Auvergne-Rhône-Alpes	82,868	1,264	84,132	1,242	2,506	1,264	2,528
Provence-Alpes-Côte d'Azur	62,658	819	63,477	820	1,639	819	1,638
Corse	5,902	20	5,922	12	32	20	40
Total	**569,908**	**7,870**	**577,778**	**7,870**	**15,740**	**7,870**	**15,740**

Table 2.

Comparison between unmatched and propensity score matched samples.

Panel A: variables comparison

	%bias			t-test			
				t		*p*>|t|	
VARIABLE	Unmatched	Matched	%reduction bias	Unmatched	Matched	Unmatched	Matched
SALES	5.7	-1.2	78.3	4.31	-0.31	0.000	0.760
WAGETSALE	-14.4	-3.2	77.9	-14.3	-1.91	0.000	0.056
SERVTSALE	88.2	2.9	96.8	94.06	1.46	0.000	0.144
BANKDEBTA	-51.5	1.4	97.3	-39.87	1.08	0.000	0.278
PPETOTA	-48.3	2.3	95.2	-37.79	1.85	0.000	0.064
INVTOTA	21.7	-1.7	92.2	20.87	-0.98	0.000	0.329
ROA	11.8	-0.2	98.4	13.74	-0.1	0.000	0.918
SALEGROW	38.2	2.9	92.4	46.91	1.47	0.000	0.141
INTFATA	-77.8	2.1	97.3	-55.41	2.01	0.000	0.045
VARINTFATA	-7.3	-1.0	85.7	-6.69	-0.71	0.000	0.475
EXPTSALE	38.9	-3.6	90.9	48.95	-1.61	0.000	0.106
NSUBSIDIA	12.9	0.7	94.3	13.75	0.4	0.000	0.688
NGROUP	1.9	-0.1	96.8	1.63	-0.04	0.103	0.970
YEAR2008	-8.6	2.1	75.9	-7.15	1.41	0.000	0.160
YEAR2009	-4.8	-0.2	96.6	-4.14	-0.11	0.000	0.915
YEAR2010	-3.6	-1.0	73.6	-3.13	-0.61	0.002	0.542
YEAR2011	-2.3	-0.5	78.2	-1.99	-0.32	0.046	0.752
YEAR2012	0.4	-1.0	-179.3	0.31	-0.62	0.754	0.537
YEAR2013	2.2	1.3	39.9	1.97	0.83	0.048	0.406
YEAR2014	5.1	1.3	74.2	4.64	0.81	0.000	0.417
YEAR2015	6.2	-0.3	95.9	5.65	-0.15	0.000	0.880
YEAR2016	6.4	-2.5	60.9	6.06	-1.45	0.000	0.147
Centre-Val de Loire	-7.7	-0.2	98.0	-6.15	-0.11	0.000	0.911
Bourgogne-Franche-Compté	-8.8	-0.1	98.4	-7.04	-0.1	0.000	0.922
Normandie	-9.9	-0.3	97.2	-7.79	-0.2	0.000	0.840
Hauts-de-France	0.5	-1.2	-125.5	0.48	-0.75	0.633	0.452
Grand Est	3.6	1.7	53.4	3.26	1.04	0.001	0.300
Pays de la Loire	-4.1	2.1	48.2	-3.48	1.45	0.001	0.148
Bretagne	-11.1	3.3	69.8	-8.68	2.63	0.000	0.009
Nouvelle-Aquitaine	-7.0	0.4	93.6	-5.86	0.3	0.000	0.766
Occitanie	6.6	-1.7	74.2	6.07	-1.02	0.000	0.306
Auvergne-Rhône-Alpes	4.2	0.8	81.6	3.8	0.48	0.000	0.632
Provence-Alpes-Côte d'Azur	-1.9	0.0	97.8	-1.66	-0.03	0.098	0.979
Corse	-9.8	1.3	87	-6.84	1.42	0.000	0.157

Panel B: Samples comparison

Sample	Ps R2	LR chi2	p>chi2	Mean bias	Median bias	Rubin's B	R
Unmatched	0.179	14,919.25	0.000	15.4	7.0	145.8	1.03
Matched	0.002	43.40	0.130	1.3	1.2	10.5	1.08

Table 3.

Descriptive statistics for the propensity score matched sample (7,870 firm-year observations each subsample)

	Traditional firms						E-commerce firms							
	mean	median	max	min	p25	p75	mean	median	max	min	p25	p75	t-test	Mann-Witney
Panel A:Dependent variables														
SSCSALE	0.046	0.038	0.183	0.000	0.019	0.063	0.043	0.032	0.183	0.000	0.015	0.057	***	***
SSCWAGE	0.317	0.326	0.833	0.000	0.209	0.412	0.311	0.333	0.833	0.000	0.195	0.413	**	
ABSSCSALE	0.002	0.001	0.073	-0.076	-0.011	0.015	0.001	0.000	0.073	-0.076	-0.011	0.013	***	**
ABSSCWAG	0.012	0.017	0.478	-0.328	-0.092	0.109	0.009	0.028	0.478	-0.328	-0.103	0.108		
DIFSSCSALQ	-0.004	-0.010	0.125	-0.068	-0.029	0.013	-0.006	-0.013	0.125	-0.068	-0.032	0.009	***	***
DIFSSCWAGQ	0.014	0.017	0.531	-0.301	-0.093	0.107	0.007	0.026	0.531	-0.301	-0.110	0.106	***	
Panel B: Independent variables														
SALE	8,808.630	395.000	2.E+07	1.000	154.000	1,138.000	7,862.000	448.000	2.E+06	1.000	167.000	1,564.000		***
WAGETSALE	0.150	0.128	0.544	0.019	0.081	0.194	0.147	0.115	0.544	0.019	0.071	0.186	*	***
SERVTSALE	0.298	0.255	0.737	0.030	0.159	0.396	0.302	0.272	0.737	0.030	0.184	0.386		***
BANKDEBTA	0.083	0.005	0.810	0.000	0.000	0.115	0.086	0.002	0.810	0.000	0.000	0.116		
PPETOTA	0.066	0.032	0.672	0.000	0.005	0.091	0.069	0.026	0.672	0.000	0.004	0.083	*	***
INVTOTA	0.308	0.252	0.862	0.000	0.078	0.500	0.304	0.275	0.862	0.000	0.060	0.496		
ROA	0.083	0.059	0.583	-0.480	0.000	0.168	0.082	0.063	0.583	-0.480	-0.021	0.200		
SALEGROW	1.191	1.037	2.733	0.510	0.944	1.234	1.202	1.071	2.733	0.510	0.932	1.315		***
INTFATA	0.064	0.000	0.866	0.000	0.000	0.052	0.068	0.002	0.866	0.000	0.000	0.054	**	***
VARINTFATA	-0.002	0.000	0.163	-0.164	0.000	0.000	-0.002	0.000	0.163	-0.164	-0.005	0.000		***
EXPSTOSAL	0.045	0.000	0.480	0.000	0.000	0.000	0.042	0.000	0.480	0.000	0.000	0.028		***
NSUBSIDIA	0.085	0.000	2.000	0.000	0.000	0.000	0.088	0.000	2.000	0.000	0.000	0.000		
NGROUP	16.932	0.000	944.000	0.000	0.000	2.000	16.868	0.000	944	0.000	0.000	2.000		**

***p<0.01, ** p<0.05, * p<0.1

Table 4.

Pearson correlations between independent variables in the propensity score matched sample (dummies of regions excluded for simplicity)

	ECOM	log*SALES*	*WAGETSALE*	*SERVTSALE*	*BANKDEBTA*	*PPETOTA*	*INVTOTA*	*ROA*	*SALEGROW*	*INTFATA*	*VARINTFATA*	*EXPTSALE*	*NSUBSIDIA*	*NGROUP*
ECOM	1													
log*SALES*	0.071***	1												
WAGETSALE	-0.015*	-0.352***	1											
SERVTSALE	0.012	-0.267***	0.213***	1										
BANKDEBTA	0.009	-0.039***	-0.004	-0.014*	1									
PPETOTA	0.015*	0.055***	0.030***	0.004	0.306***	1								
INVTOTA	-0.008	-0.060***	-0.202***	-0.09***	0.077***	-0.122***	1							
ROA	-0.001	0.138***	-0.245***	-0.311***	-0.153***	-0.049***	-0.084***	1						
SALEGROW	0.012	0.052***	-0.111***	-0.062***	0.034***	0.025***	-0.037***	0.238***	1					
INTFATA	0.016	-0.021***	0.070***	-0.001	0.212***	0.000	-0.155***	-0.114***	-0.030***	1				
VARINTFATA	-0.006	0.04***	0.019**	-0.010	0.043***	0.022***	0.018**	-0.032***	-0.073***	0.148***	1			
EXPTSALE	-0.013	0.103***	-0.038***	0.061***	-0.044***	-0.073***	0.000	0.010	0.03***	-0.043***	0.007	1		
NSUBSIDIA	0.003	0.353***	-0.032***	0.011	-0.002	0.001	-0.079***	-0.022***	-0.032***	-0.013	0.014*	0.068***	1	
NGROUP	0.000	0.239***	-0.027***	0.001	-0.026***	0.037***	-0.052***	-0.08***	-0.017**	-0.002	0.006	0.019**	0.125***	1

*** p<0.01, ** p<0.05, * p<0.1

Table 5
Robust random effects estimations of Equation 1 for the propensity score matched sample.

VARIABLES	(1) *ABSSCSALE*	(2) *ABSSCWAGE*	(3) *DIFSSCSALQ*	(4) *DIFSSCWAGQ*
ECOM	-0.00224***	-0.01060***	-0.00349***	-0.01410***
	(0.00062)	(0.00396)	(0.00070)	(0.00401)
log*SALES*	-3.68e-05	0.00558***	0.00675***	-0.00028
	(0.00021)	(0.00147)	(0.00024)	(0.00150)
WAGETSALE	0.01420***	0.04440**	0.24000***	-0.19600***
	(0.00422)	(0.02040)	(0.00531)	(0.02070)
SERVTSALE	-0.00015	-0.00663	0.00072	-0.00306
	(0.00192)	(0.01170)	(0.00224)	(0.01190)
BANKDEBTA	-0.006910***	-0.03750***	-0.00754***	-0.03530***
	(0.00193)	(0.01210)	(0.00226)	(0.01220)
PPETOTA	-0.00802***	-0.05070***	-0.00640**	-0.04120**
	(0.00277)	(0.01790)	(0.00320)	(0.01830)
INVTOTA	-0.00865***	-0.05650***	-0.00866***	-0.05210***
	(0.00105)	(0.00724)	(0.00117)	(0.00733)
ROA	-0.00373***	-0.02130***	-0.00702***	-0.03670***
	(0.00125)	(0.00785)	(0.00141)	(0.00799)
SALEGROW	0.00109**	-0.00027	-0.00296***	-0.02620***
	(0.00044)	(0.00279)	(0.00050)	(0.00283)
INTFATA	-0.00577**	-0.05350***	-0.00170	-0.03710***
	(0.00237)	(0.01400)	(0.00259)	(0.01400)
VARINTFATA	0.00724	0.07310**	0.00640	0.07030**
	(0.00523)	(0.03210)	(0.00596)	(0.03240)
EXPTSALE	0.00108	0.04350***	0.00148	0.05320***
	(0.00212)	(0.01360)	(0.00236)	(0.01390)
NSUBSIDIA	0.00256***	0.0109***	0.00163**	0.01690***
	(0.00068)	(0.00387)	(0.00081)	(0.00392)
NGROUP	-7.37e-07	-1.57e-05	-2.14e-06	-1.28e-05
	(1.71e-06)	(1.07e-05)	(1.86e-06)	(1.12e-05)
YEAR (dummies)	Yes	Yes	Yes	Yes
REGION (dummies)	Yes	Yes	Yes	Yes
Constant	0.00578***	0.01650	-0.07140***	0.11900***
	(0.00209)	(0.01420)	(0.00234)	(0.01450)
Observations	15,740	15,740	15,740	15,740
Number of firm	9,139	9,139	9,139	9,139
R-sq overall	0.0398***	0.0418***	0.4609***	0.0422***

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6.

Robust random effects estimations of Equation 1 for the sample matched by size conditional on the same year and region

VARIABLES	(1) ABSSCSALE	(2) ABSSCWAGE	(3) DIFSSCSALQ	(4) DIFSSCWAGQ
ECOM	-0.00280***	-0.01220***	-0.00372***	-0.01530***
	(0.00079)	(0.00454)	(0.00090)	(0.00461)
log*SALES*	-7.07e-05	0.00533***	0.00645***	-0.00030
	(0.00022)	(0.00141)	(0.00025)	(0.00143)
WAGETSALE	0.00660	0.03320	0.22900***	-0.20500***
	(0.00430)	(0.02040)	(0.00553)	(0.02080)
SERVTSALE	0.00254	0.00398	0.00336	0.00992
	(0.00261)	(0.01380)	(0.00310)	(0.01410)
BANKDEBTA	-0.00632***	-0.03400***	-0.00583***	-0.02990***
	(0.00166)	(0.00983)	(0.00196)	(0.00993)
PPETOTA	-0.01080***	-0.07410***	-0.01070***	-0.06990***
	(0.00221)	(0.01330)	(0.00257)	(0.01350)
INVTOTA	-0.00924***	-0.05710***	-0.00928***	-0.05340***
	(0.00129)	(0.00826)	(0.00147)	(0.00837)
ROA	-0.00328**	-0.01870**	-0.00658***	-0.03310***
	(0.00141)	(0.00822)	(0.00161)	(0.00838)
SALEGROW	0.00128**	-3.29e-05	-0.00278***	-0.02610***
	(0.00053)	(0.00312)	(0.00061)	(0.00317)
INTFATA	-0.00616***	-0.03630***	-0.00313*	-0.02370***
	(0.00160)	(0.00905)	(0.00183)	(0.00914)
VARINTFATA	0.00547	0.03530	0.00324	0.03110
	(0.00475)	(0.02790)	(0.00546)	(0.02810)
EXPTSALE	-0.00064	0.04200**	-0.00012	0.05090***
	(0.00305)	(0.01820)	(0.00336)	(0.01860)
NSUBSIDIA	0.00179***	0.01060***	-0.00012	0.01750***
	(0.00065)	(0.00388)	(0.00081)	(0.00392)
NGROUP	-2.87e-06**	-2.47e-05***	-4.36e-06***	-2.32e-05***
	(1.35e-06)	(8.19e-06)	(1.45e-06)	(8.12e-06)
YEAR (dummies)	Yes	Yes	Yes	Yes
REGION (dummies)	Yes	Yes	Yes	Yes
Constant	0.00684***	0.00997	-0.06870***	0.11000***
	(0.00233)	(0.01450)	(0.00268)	(0.01480)
Observations	15,740	15,740	15,740	15,740
Number of firm	9,043	9,043	9,043	9,043
R-sq overall	0.0379***	0.0433***	0.4434***	0.0427***

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7
Robust random effects estimations of Equation 1 for the non-matched sample.

VARIABLES	(1) ABSSCSALE	(2) ABSSCWAGE	(3) DIFSSCSALQ	(4) DIFSSCWAGQ
ECOM	-0.00171***	-0.00694*	-0.00277***	-0.01040***
	(0.00057)	(0.00359)	(0.00064)	(0.00366)
log*SALES*	-0.00107***	-0.00454***	0.00592***	-0.01200***
	(7.72e-05)	(0.000455)	(9.04e-05)	(0.00047)
WAGETSALE	-0.03470***	-0.17800***	0.18800***	-0.43300***
	(0.00122)	(0.00589)	(0.00148)	(0.00600)
SERVTSALE	-0.00217***	-0.01750***	-0.00250***	-0.01960***
	(0.00078)	(0.00411)	(0.00092)	(0.00420)
BANKDEBTA	-0.00585***	-0.03510***	-0.00540***	-0.03170***
	(0.00027)	(0.00161)	(0.00029)	(0.00162)
PPETOTA	-0.00586***	-0.03840***	-0.00560***	-0.03300***
	(0.00040)	(0.00231)	(0.00045)	(0.00234)
INVTOTA	-0.00570***	-0.03290***	-0.00587***	-0.03220***
	(0.00033)	(0.00194)	(0.00037)	(0.00197)
ROA	-0.01170***	-0.06000***	-0.01470***	-0.07320***
	(0.00030)	(0.00166)	(0.00033)	(0.00168)
SALEGROW	0.00123***	0.00764***	-0.00247***	-0.01600***
	(9.51e-05)	(0.00058)	(0.00011)	(0.00058)
INTFATA	-0.00444***	-0.01240***	-0.00229***	-0.00370*
	(0.00034)	(0.00194)	(0.00038)	(0.00197)
VARINTFATA	0.00358***	0.01460***	0.00279***	0.01230***
	(0.00061)	(0.00374)	(0.00067)	(0.00376)
EXPTSALE	0.00046	0.01700***	0.00047	0.01950***
	(0.00070)	(0.00417)	(0.00081)	(0.00422)
NSUBSIDIA	0.00278***	0.01730***	0.00055*	0.02450***
	(0.00026)	(0.00140)	(0.00032)	(0.00143)
NGROUP	-6.51e-06***	-3.61e-05***	-7.86e-06***	-3.67e-05***
	(3.75e-07)	(2.20e-06)	(4.16e-07)	(2.29e-06)
YEAR (dummies)	Yes	Yes	Yes	Yes
REGION (dummies)	Yes	Yes	Yes	Yes
Constant	0.01910***	0.09060***	-0.05850***	0.20500***
	(0.00068)	(0.00404)	(0.00079)	(0.00412)
Observations	577,778	577,778	577,778	577,778
Number of firm	114,544	114,544	114,544	114,544
R-sq overall	0.0147***	0.0159***	0.3618***	0.0351***

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8.

Robust random effects estimations of Equation 1 the subsample of firms that do not belong to a group: coefficients of variable ECOM, number of firms and observations. The estimates of control variables and goodness-of-fit are not displayed for simplicity.

	ABSSCSALE	*ABSSCWAGE*	*DIFFSSCSALQ*	*DIFSSCWAGQ*
Panel A: Propensity score matching				
ECOM: Coefficient	-0.00240***	-0.01520***	-0.00339***	-0.01881***
ECOM: Std deviation	(0.00076)	(0.00486)	(0.00085)	(0.00492)
Firm-year observations	10,965	10,965	10,965	10,965
Number of firms	6,561	6,561	6,561	6,561
Panel B: Matching by size conditional on the same year and region				
ECOM: Coefficient	-0.00372***	-0.01958***	-0.00474***	-0.02225***
ECOM: Std deviation	(0.00096)	(0.00558)	(0.00111)	(0.00567)
Firm-year observations	11,013	11,013	11,013	11,013
Number of firms	6,515	6,515	6,515	6,515

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9.

Two step robust estimations with Fama and Macbeth procedure. Average coefficients for 2008 to 2016.

VARIABLES	(1) ABSSCSALE	(2) ABSSCWAGE	(3) DIFFSSCSALQ	(4) DIFFSSCWAGQ
ECOM	-0.00126**	-0.00302	-0.00236***	-0.00604*
	(0.000506)	(0.00267)	(0.000576)	(0.00273)
log*SALES*	0.000593**	0.00855***	0.00729***	0.00294
	(0.000213)	(0.00129)	(0.000280)	(0.00164)
WAGETSALE	0.0253***	0.105***	0.254***	-0.126***
	(0.00187)	(0.00732)	(0.00365)	(0.0114)
SERVTSALE	-0.00112	-0.0188*	-0.00109	-0.0118
	(0.00108)	(0.00870)	(0.00134)	(0.00853)
BANKDEBTA	-0.0104***	-0.0612***	-0.0115***	-0.0622***
	(0.00136)	(0.0114)	(0.00162)	(0.0111)
PPETOTA	-0.00627**	-0.0539***	-0.00324	-0.0446***
	(0.00215)	(0.0133)	(0.00212)	(0.0131)
INVTOTA	-0.00871***	-0.0637***	-0.00802***	-0.0591***
	(0.000963)	(0.00647)	(0.00115)	(0.00686)
ROA	-0.00533***	-0.0348***	-0.00770***	-0.0484***
	(0.00110)	(0.00714)	(0.00131)	(0.00699)
SALEGROW	0.000475	-0.00604**	-0.00341***	-0.0319***
	(0.000456)	(0.00181)	(0.000387)	(0.00153)
INTFATA	-0.00749***	-0.0617***	-0.00342	-0.0448**
	(0.00220)	(0.0131)	(0.00254)	(0.0140)
VARINTFATA	0.00817*	0.107***	0.00751*	0.108***
	(0.00383)	(0.0194)	(0.00347)	(0.0193)
EXPTSALE	0.00210	0.0438**	0.00330	0.0550***
	(0.00298)	(0.0140)	(0.00292)	(0.0142)
NSUBSIDIA	0.000945*	0.00797**	-0.000120	0.0144***
	(0.000460)	(0.00256)	(0.000404)	(0.00270)
NGROUP	4.88e-07	1.83e-06	-1.61e-06	7.83e-06
	(1.86e-06)	(1.35e-05)	(1.94e-06)	(1.22e-05)
REGION (dummies)	Yes	Yes	Yes	Yes
Constant	0.00319	0.0172	-0.0741***	0.115***
	(0.00217)	(0.0119)	(0.00285)	(0.0170)
Observations	15,740	15,740	15,740	15,740
R-squared	0.055***	0.060***	0.474***	0.062***
Number of groups	9	9	9	9

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1