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Firm-level determinants of business tax evasion in emerging economies: the case of Argentina

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ABSTRACT

This paper aims to identify the determinants of revenue underreporting and their temporal evolution from a business perspective in formal firms located in an emerging country with high inflation (Argentina). We propose a conceptual model and we estimate it empirically using a logistic regression based on pooled data 2010-2017 of the World Bank Enterprise Surveys. The findings show that revenue underreporting is a multicausal phenomenon where taxes lose importance in the light of other determinants such as: corruption, regulation and bureaucracy, quality of public and government services, detection probability, sector informality and political instability. Moreover, the outcomes recognize companies' characteristics with a greater propensity to underreport sales (smaller size, selling in domestic market, from manufacturing sector, without external financing, with male entrepreneurs). Our empirical evidence is relevant for the formulation of public policies aimed at reducing revenue underreporting.

Keywords: informal sector; revenue underreporting; tax; corruption; bureaucracy; institutional quality; emerging economy.
JEL classification: E26, H26, O17, M21, D22, H32.
MSC2010: 91G70, 91B02, 62H12, 62P20, 62P05.

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Determinantes microeconómicos de la evasión tributaria empresarial en economías emergentes: el caso de Argentina

RESUMEN

Este trabajo tiene por objetivo identificar los determinantes de la subdeclaración de ingresos y su evolución temporal desde la óptica de los empresarios en compañías registradas de un país emergente con alta inflación (Argentina). Se propone un modelo conceptual y se estima empíricamente mediante una regresión logística a partir de datos fusionados de secciones cruzadas independientes de los años 2010 y 2017 de las bases Enterprise Surveys del Banco Mundial. Los resultados muestran que la subdeclaración de ingresos es un fenómeno multicausal donde los impuestos pierden importancia a la luz de otros determinantes como: corrupción, regulación y burocracia, calidad de los servicios públicos y gubernamentales, probabilidad de detección, informalidad del sector e inestabilidad política. Además, los resultados reconocen las características de las empresas con mayor propensión a subregistrar las ventas (menor tamaño, venta en el mercado interno, del sector manufacturero, sin financiamiento externo, con empresarios del género masculino). La evidencia es relevante para la formulación de políticas públicas tendientes a reducir la subdeclaración de ingresos.

Palabras clave: sector informal; subdeclaración de ingresos; impuestos; corrupción; burocracia; calidad institucional; economía emergente.
Clasificación JEL: E26, H26, O17, M21, D22, H32.
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1. Introduction

The informal economy includes both individuals and companies not registered in regulatory agencies, as well as registered enterprises that report a lower level of sales to reduce the tax burden (La Porta & Shleifer, 2008). In that sense, revenue underreporting represents a part of the informal sector and is, at the same time, a kind of tax evasion (Slemrod & Weber, 2012).

Non-reported activities produce a series of consequences both at a general and private level. In the macroeconomic sphere, they can create a vicious circle, hampering economic growth by diverting resources from productive uses to unproductive ones and distorting official statistics, which makes difficult the task of public policy makers (Putniņš & Sauka, 2015; Schneider & Enste, 2000). At the microeconomic level, although hidden activities generate additional income for companies, various disadvantages also arise. The existence of unreported sales restricts the ability of firms to obtain debt or capital financing because potential creditors and/or investors cannot verify real (hidden) cash flows (Putniņš & Sauka, 2015). In addition, it hinders the management process of the entity generating difficulties in determinant results (declared and undeclared information is required). It also generates inconveniences in stock management and loss of control over resources in general, facilitating potential theft and fraud.

Tax evasion is one of the main problems of emerging and transition economies. In many developing countries, the informal sector accounts for between a third and half of the total economic activity, a share that declines sharply as the economy develops (La Porta & Shleifer, 2008). In Latin America (LA), according to estimates for the period 1991-2015, the informal economy represents 38.81% of the Gross Domestic Product (GDP) (Medina & Schneider, 2017); while in Argentina, the results for the same period indicate that the informal sector represents 24.10% of GDP (Medina & Schneider, 2017), reaching 28.65% in 2016 (Schneider & Boockmann, 2017).

Given the adverse effects of the informal economic activity, numerous studies have focused on identifying its determinant factors (Batra, et al.,, 2003; Dabla-Norris et al., 2008; De Soto et al., 1987; Feld & Schneider, 2010; Johnson et al., 2000; La Porta & Shleifer, 2008; Perry et al., 2007; Santa María & Rozo, 2009; Schneider & Enste, 2000; 2013). However, much of the empirical literature on size and determinants of the informal economy comprises quantitative studies conducted with macroeconomic data (Tedds, 2010; Hibbs & Piculescu, 2010) usually in developed countries; while, in the case of tax evasion, works focused on the individual (personal taxes) predominate (Abdixhiku, Pugh & Hashi, 2018; Alm & McClellan, 2012; Nur-tegin, 2008; Tedds, 2010; Torgler, 2011). The literature review reveals the lack of informality studies in formal companies with microeconomic quantitative approaches, especially in emerging economies.

This research aims to fulfil the identified gap by examining the revenue underreporting with microdata in a developing country. In this sense, the study is relevant because it faces a double challenge: the limited availability of data in underdeveloped countries, and especially on a topic 'invisible by nature' for which it is complex to gather information. Moreover, the proposed microeconomic approach is important because it allows knowing the behaviour of economic agents at the individual level that is central to derive implications of public policies.

Specifically, this paper aims to identify the determinants of revenue underreporting in Argentine formal firms and their evolution from a business perspective. Therefore, our research question is: what are the factors that influence the practice of revenue underreporting in registered companies in Argentina? It is important to clarify that this article studies the underreporting of sales by formal companies, which is, at the same time, a kind of tax evasion. This research does not include the activity of unregistered firms (100% informal) or labour informality (employees not registered in the social security system: 'unregistered employment'). Therefore, the use of the words informal, informality, level or degree of informality and the like should be understood with

the scope mentioned here: linked to the decision to underreport revenue (sales). Some authors use the term "partial informality" to refer to this phenomenon (Perry et al., 2007).

To address the proposed objective, we use the World Bank Enterprise Survey pooled data of 2010-2017 from Argentina. The Argentine economy is an emerging context of particular interest to study business informality given its high tax rates, the low tax morale of its citizens, and the growing inflationary process it faces. Methodologically, we calculate descriptive statistics, and we perform bivariate and multivariate analyses. For the latter, we estimate logit regression models where the binary dependent variable UNDERREPORTING OF REVENUE act as a proxy for the company informality level, and the independent variables represent determinants of underreporting and control variables.

In addition to this introductory section, the article is structured as follows. Section 2 presents the conceptual framework, describes the previous empirical studies, formulating the hypothesis and characterizes business informality in Argentina. Section 3 describes the proposed model and the empirical strategy, detailing the sources of information and variables of interest, as well as the methods of processing and analysing the data. The results are shown in the fourth section: descriptive statistics and multivariate analysis. The fifth section includes the final considerations, indicates limitations of the study and raises future lines of research.

2. Determinants of informality: theoretical pillars and empirical background

2.1. Conceptual framework

Existing informal sector theories assume almost invariably that formality imposes burdens on companies (taxes or costs of compliance with regulatory requirements) and, at the same time, provides benefits (access to quality public goods or services and financing) (Allingham & Sandmo, 1972; Batra et al., 2003; Dabla-Norris et al., 2008; De Soto et al., 1987; Johnson et al., 2000; La Porta & Shleifer, 2008; Perry et al., 2007; Santa María & Rozo, 2009). Basically, this trade-off determines then the decisions of individual economic units whether or not to go informal, and ultimately, the relative size of the informal sector (Dabla-Norris et al., 2008). In these sense, Perry et al. (2007, p. 12) have expressed:

> Once again it seems that companies conduct a careful cost-benefit analysis, comparing the “private” benefits of informality (tax evasion, avoiding excessive regulations) with their “private” costs (risk of fines and bribes, imperfect access to markets and government services) when they select their “degree” of formality’. (p.12)

From the above, it is observed that the literature identifies different determinants of informality: taxes, regulation, bureaucracy, corruption, penalties, public and government services efficiency, quality of institutions and the legal system, among others. Some of these factors come from the theoretical models of tax evasion (Allingham & Sandmo, 1972; Andreoni et al., 1998; Cebula, 1997), while other elements correspond to the precepts of institutional theory (North, 1990; Williams & Horodnic, 2016; Webb et al., 2009) or to psychological and sociological aspects (Schneider & Enste, 2013).

The issues associated with the rational choice theory and institutional elements are captured by Friedman et al. (2000), who recognized the existence of two schools of thought that explain the motivations of entrepreneurs to operate in the informal sector. One of them identifies high tax rates as the main culprit: companies that operate in the unofficial economy are simply trying to keep all of their profits for themselves. An alternative view holds that when unregistered economic activity rises, the political and social institutions that govern the economy are to blame: bureaucracy, corruption, and a weak legal system bear primary responsibility for driving

businesses underground. In this context, firm managers may be willing to be taxed at a reasonable rate, but they are unwilling to tolerate constant extortionate and arbitrary demands.

Thus, the model of informality determinants proposed by Friedman et al. (2000) suggests an important contrast between the effects of excessive regulation and corruption, on the one hand, and tax rates, on the other. Regulatory burden and corruption constitute an unequivocal disincentive to operate in the official sector. In turn, high tax rates have two potentially compensatory effects: the direct effect increases the incentive to hide the activity, while the indirect effect, through the provision of a better legal environment, encourages operation in the official sector. The model suggests that a higher tax rate does not necessarily correlate with greater participation in the informal economy.

2.2. Empirical evidence and hypotheses

The literature review allows us to recognize a large number of works on estimation and determinants of the informal economy with a variety of approaches. Different empirical approaches have been developed to approximate the size of the informal sector (Frey & Pommerehne, 1984; Schneider & Enste, 2000) and identify their causes. The methods that employ direct indicators (questionnaires or tax audits) focus on the behavior of individuals, trying to circumvent their reluctance to provide information. For its part, the underlying logic in indirect methods is that economic activity, whether informed or hidden, leaves observable traces or indicators, such as electricity consumption, use of money and transactions, and official participation rates in the workforce. Such observable indicators are used in several econometric specifications to estimate the true level of economic activity which, when subtracted from the registered economic activity, allows obtaining an estimate of the informal economy (Putniņš & Sauka, 2015).

Most of approaches utilise macroeconomic approaches (Buehn & Schneider, 2012; Cebula, 1997; D'Hernoncourt & Méon, 2012; Dell'Anno et al., 2007; Feige, 1994; Friedman et al., 2000; Ihrig & Moe, 2004; Johnson et al., 1997; Johnson et al., 1998; Lackó, 2000; Loayza, 1996; Schneider & Enste, 2013; Schneider, 1997, 2016; Tanzi, 1983), especially using the Multiple Indicator Multiple Cause Model (MIMIC) (Buen & Schneider, 2011; D'Hernoncourt & Méon, 2012; Dell'Anno, 2007; Dell'Anno et al., 2007; Loayza, 1996; Schneider & Enste, 2013; Vuletin, 2008).

Additionally, we identify empirical antecedents on measurement and determinants of informal economy with microeconomic approaches. Within this microdata-based literature, there are two types of studies: one that addresses the phenomenon by comparing registered versus unregistered companies (De Paula & Scheinkman, 2011; Santa María & Rozo, 2009; Siqueira et al., 2016; Villar et al., 2015a, 2015b; Williams & Kedir, 2018; Williams et al., 2016), and another one that focuses exclusively on formal firms. Research on registered companies includes, in turn, studies that examine informality in a comprehensive manner involving unreported sales and wages (Johnson et al., 2000; Putniņš & Sauka, 2015) and others that do it more specifically by analysing only non-reported revenue (Abdixhiku et al., 2017; Abdixhiku et al., 2018; Batra et al., 2003; Alm et al., 2016; Alm & McClellan, 2012; Beck et al., 2014; Dabla-Norris et al., 2008; Nur-tegin, 2008; Pedroni et al., 2018; Pedroni et al., 2019; Pesce et al., 2014; Straub, 2005). The microeconomic approaches are more recent because many of them use data from surveys conducted by the World Bank: Business Environment and Enterprise Performance Survey (BEEPS) and Enterprise Survey (ES). The following paragraphs describe the link between each determinant factor and informality, according to previous empirical evidence. In order to show recent results, sections 2.2.1 and 2.2.2 mainly cite empirical studies published during last decade.

2.2.1. Firm and entrepreneur's characteristics

The literature recognizes a set of company and entrepreneur's characteristics with potential influence on the informality level of a company such as: SIZE, SECTOR, AGE, LEGAL STATUS, OWNERSHIP STRUCTURE, MARKET, FINANCING, and MANAGER'S EXPERIENCE AND GENDER. Firm size is one of the most identified factors for its negative link with the informal economy, that is, formality increases with the size of the company (Abdixhiku et al., 2017; Alm et al., 2016; Alm & McClellan, 2012; Beck et al., 2014; De Paula & Scheinkman, 2011; Pesce et al., 2014; Putniņš & Sauka, 2015; Siqueira et al., 2016;Tedds, 2010; Villar et al., 2015a; Williams & Kedir, 2018).

The empirical findings also indicate that informality is more recurrent in young companies (Beck et al., 2014; Pesce et al., 2014; Santa María & Rozo, 2009; Siqueira et al., 2016; Villar et al., 2015a; Williams et al., 2016), from the services sector (Abdixhiku et al., 2017), organized as sole proprietorships or non-limited partnership (Abdixhiku et al., 2017; Alm et al., 2016; Tedds, 2010; Williams et al., 2016; Williams & Kedir, 2018), nationally owned (Alm & McClellan, 2012; Tedds, 2010), which carry out their economic activities in the domestic market (Williams & Kedir, 2018), and do not resort to external financing (Pesce et al., 2014; Siqueira et al., 2016; Villar et al., 2015a, 2015b; Williams et al., 2016). On the other hand, informality is negatively associated with OTHER FIRMS' CHARACTERISTICS, such as certified financial statements (Beck et al., 2014; Siqueira et al., 2016; Tedds, 2010; Williams & Kedir, 2018) or international quality certifications (Williams & Kedir, 2018), issues that may be capturing the firm size effect.

Likewise, the propensity to participate in the informal sector decreases with the manager's level of education and experience, issues associated with individual productivity considered by informality analytical models. The empirical evidence is divergent regarding the impact of the entrepreneur's gender on informality. Studies that analyse how entrepreneurs start (registered or not) or examine ownership percentages by gender find that women are more likely to operate in the informal sector (De Paula & Scheinkman, 2011; Villar et al., 2015a). However, the evidence from works about tax compliance by gender shows that female entrepreneurs present a lower probability of underreporting revenue (Bazart & Pickhardt, 2009; Gerxhani, 2007; Lewis et al., 2009), cited by Kastlunger et al. (2010).

Considering the previous empirical evidence, we formulate the hypotheses as follows:

(H1) The company and entrepreneur's characteristics influence the level of revenue underreporting in formal companies. Specifically, the probability of not reporting part of the sales is related:

(H1a) negatively to the company size;

(H1b) positively to the services sector;

(H1c) negatively to the firm age;

(H1d) positively to the sole proprietorship legal status;

(H1e) positively to the ownership concentration or to the majority national participation in ownership structures;

(H1f) negatively to the exporter condition;

(H1g) negatively to the use of external financing sources;

(H1h) negatively to other firm's characteristics (certified financial statements, international quality certification);

(H1i) negatively to the entrepreneur's experience;

(H1j) negatively to female entrepreneurs or female owners;

2.2.2. Environmental factors

In addition to the entrepreneurs' characteristics described above, the literature recognizes a set of environmental factors with potential influence on the firm underreporting practice. Consistent with the formal models, different research studies confirm the positive link between CORRUPTION and informality, that is, high corruption contexts generate greater incentives to hide economic activities (Abdixhiku et al., 2017; Abdixhiku et al., 2018; Alm et al., 2016; Alm & McClellan, 2012; Beck et al., 2014; D'Hernoncourt & Méon, 2012; Pesce et al., 2014; Tedds, 2010; Williams & Kedir, 2018; Williams et al., 2016). Some authors point out that the causality of the relationship between corruption and the informal economy can also be read in the opposite direction: the greater the informality, the greater the need for payment of bribes (Johnson et al., 2000), that is, tax evasion can create additional opportunities for corruption to prosper. However, the results of previous studies provide evidence that corruption is a determinant of informality and not vice versa (Alm et al., 2016).

The REGULATION AND BUREAUCRACY factor is also widely analysed in the empirical literature, suggesting that contexts with heavier regulations (in terms of number of laws and requirements, licenses, labor market regulations, trade barriers, etc.) reduce participation in the official economy (Alm & McClellan, 2012; Beck et al., 2014; Buehn & Schneider, 2012; D'Hernoncourt & Méon, 2012; Schneider & Enste, 2013; Tedds, 2010; Williams et al., 2016). In particular, research highlights the incidence of labour regulations (Schneider & Enste, 2000). It is important to note that the concept of regulation is used to refer to the "pro-business" nature of regulations and those rules regarding the preservation of property rights and the execution of contracts (Friedman et al., 2000). With that scope, excessive regulation correlates with more unofficial activity. However, this does not imply that a reasonable regulation, for example, on pollution, health or safety at work, is necessarily associated with a larger size of the informal sector.

The negative relationship between the informal economy and the QUALITY OF INSTITUTIONS, PUBLIC AND GOVERNMENTAL SERVICES is usually used to explain the downward spiral trend of the informality phenomenon (Abdixhiku et al., 2017; Abdixhiku et al., 2018; Beck et al., 2014; Buehn & Schneider, 2012; D'Hernoncourt & Méon, 2012; Putniņš & Sauka, 2015; Williams & Kedir, 2018). That is, under the social contract, individuals fulfil certain obligations (such as paying taxes) and the state should provide an appropriate legal framework for the development of economic activities and quality public services. However, given a poor state provision of such elements, agents do not receive sufficient benefits for the fulfilment of their duties as citizens and, therefore, have greater incentives to develop activities informally. This reduces tax revenues and motivates the tax increase on the formal sector, situations that further undermine the ability of the state to efficiently provide public goods and services (Johnson et al., 1997; Schneider & Enste, 2000).

On the other hand, the empirical literature supports the theoretical predictions regarding the ambiguous relationship between TAXES and informality, although most of the studies find a positive link between the tax burden and the size of the informal economy (Abdixhiku et al., 2017; Abdixhiku et al., 2018; Alm et al., 2016; Beck et al., 2014; Buehn & Schneider, 2012; Gokalp et al., 2017; Pesce et al., 2014; Putniņš & Sauka, 2015; Schneider & Enste, 2013; Tedds, 2010; Williams & Kedir, 2018). The positive relationship between taxes and the informal economy is linked to the declining part of the Laffer curve, where the increase in the tax rate produces a fall in tax revenue that can be read as the increase in informal activities. The negative association between taxes and hidden activity is verified when tax revenues from higher tax rates allow the

state to provide a solid legal environment and quality public goods by reducing the incentives of companies to migrate to the informal sector (Friedman et al., 2000).

The PENALTY and the DETECTION PROBABILITY factors appear to a lesser extent in the empirical studies, although the results are also consistent with the theoretical predictions: the greater the expected penalty and the greater the perceived detection probability, the lesser the incentive to participate in the informal economy (Putniņš & Sauka, 2015).

For its part, according to La Porta and Shleifer (2008), the level of ECONOMIC DEVELOPMENT measured in terms of GDP per capita is one of the most robust determinants of the size of the informal economy. Also, operating totally or partially in the informal sector represents an important opportunity cost for companies because it hinders the possibility of ACCESS TO FINANCING; hence, the negative link found by empirical studies with this factor (Beck et al., 2014; Villar et al., 2015a, 2015b).

Additionally, previous studies find that the level of INFORMALITY OF THE SECTOR in which the company operates can generate a greater propensity for the other firms in the sector to participate in the informal economy, for example, due to competition and survival issues. Informal sector firms obtain unfair competitive advantages as they offer lower prices than formal companies thanks to reduced operating costs (due to tax evasion and unregistered employment). In addition, informal companies circumvent government regulations that may be burdensome due to excessive bureaucracy and corruption of officials. In that sense, formal companies increase their propensity to underreport revenue because they consider tax evasion more acceptable in order to compensate for unfair competition from unregistered enterprises (Golkap et al., 2017; Pesce et al., 2014).

Considering the previous empirical evidence, we formulate the hypotheses as follows:

(H2) Environmental factors affect the level of revenue underreporting in formal companies. Specifically, the probability of not reporting part of the sales is related:

(H2a) positively to corruption;

(H2b) positively to regulation and bureaucracy;

(H2c) negatively to the quality of institutions, public and government services;

(H2d) positively to taxes;

(H2e) negatively to the penalty if discovered;

(H2f) negatively to the probability of detection;

(H2g) negatively to the level of economic development;

(H2h) negatively to the access to financing (market conditions);

(H2i) positively to the sector informality;

(H2j) positively to political and/or economic instability.

2.3. Business informality in Argentina

Argentina is the third largest economy in LA for its GDP and is ranked among middle-income countries by GDP per capita. However, it is the third country in Latin America and the Caribe (LAC) with negative variation of its GDP and leads the region -together with Venezuela- for

having the highest inflation rate (both data for the year 2018). For its part, Argentina shows deficiencies in terms of financing, positioning as the LAC economy with the lowest level of internal credit provided by the private sector (World Bank Group, 2019b).

Additionally, the Argentine economy is highlighted through the high tax pressure. According to the Paying Taxes 2019 report, the Total Tax and Contribution Rate (TTCR) in Argentina amounts to 106.30%, being twice the LAC average (52.50%) and almost triple the world average (40.40%) (PwC & World Bank Group, 2019). For the calculation of the TTCR the report considers: income or benefits taxes, taxes and labor contributions, and other taxes. Experts indicate that the Argentine TTCR exceeds 100% due, in part, to the lack of fiscal adjustment for inflation and the existence of various taxes at different state levels that generate a multiple taxation: companies can pay three different taxes on the same tax base. Specifically, the Argentine tax system has 163 taxes: 40 national taxes, 41 at the provincial level and 82 that are the responsibility of the municipalities, although only 10 of them summarize 90% of the collection of the entire territory (Instituto Argentino de Análisis Fiscal [IARAF], 2019).

Value Added Tax (VAT) is the main generator of tax revenue in most LA countries. According to Gómez and Morán (2016), the evolution of the VAT evasion rate in LA countries for the period 2000-2014 is fluctuating, varying between 13.4% (Uruguay, 2012) and 49.5% (Peru, 2001). For Argentina, the values range between 19.8% and 34.8% in the period 2001-2007, although recent estimates indicate that the level of VAT evasion is 33.5% (Blanco, 2019). The evasion rates of the corporate income tax in Latin America are higher than the VAT, around 46-52% for legal entities, and 49% for Argentina (Pecho-Trigueros et al., 2012). According to World Bank statistics, Argentina is among the thirty countries with the highest nominal evasion in the world, which, in 2011, that figure was estimated at 25,000 million dollars (Giarrizzo, 2014).

The intrinsic motivation to pay taxes, or tax morale, is one of the factors that influence the behaviour of taxpayers towards their tax obligations (Giarrizzo, 2014). In that sense, tax morale is relatively low in LAC and has been deteriorating since 2011. In 2015, more than half of Latin Americans (52%) were willing to evade paying taxes if possible (OECD et al., 2018). Evasive practices are so rooted in LA that, on average, only 34% of Latin Americans rate tax evasion as "never justifiable," compared to 62% of the Organisation for Economic Co-operation and Development (OECD) economies, and 20% justify fiscal evasion versus 7% of OECD countries (Borja-Díaz-Rivillas & Lindemberg-Baltazar, 2014). In Argentina, the high value of the weighted tax morale index (8.9), even higher than that of LAC (7.94), indicates that a large part of Argentines consider tax evasion totally justifiable (OECD et al., 2018).

In addition, other factors increase the effective tax pressure in Argentina and motivate tax evasion. In that sense, the combination of the strong inflationary process -in 2018, the annual inflation exceeded 50% (World Bank Group, 2019a)- and the absence of the fiscal adjustment for inflation until 2019, results in very high corporate income effective tax rate, close to 60% (Argentina, Federal Court of Córdoba, 2019). If the inflationary effect on assets and liabilities were discounted, many of the companies that nominally record profits would have losses. The tax correction for inflation began to be applied recently in some closed balance sheets in 2019, as it is enabled by the Income Tax Law when accumulated inflation exceeds 55% in the first year initiated after the Fiscal Reform was in force (Argentina, National Executive Power, 2018).

In summary, the relevance of the Argentine economy in LA, its high tax rates, the low willingness of its citizens to pay taxes, the constant and growing inflationary process it faces, as well as the recent implementation of the adjustment for tax inflation place Argentina in a highly interesting emerging context to study the determinants of business informality.

Studies referring to determinants of the informal economy in emerging countries are scarce. Among the antecedents for Argentina, we identify approaches to informality in the labour and credit market (Acosta & Montes-Rojas, 2014; Sarghini et al., 2001); experimental studies

referring to tax compliance and enforcement level (Castro & Scartascini, 2015; Chelala and Giarrizzo, 2014), and some microeconomic research studies on determinants of the informal sector (Pesce et al., 2014; Villar et al., 2015a, 2015b). Specifically, the articles referred to sales underreporting in formal companies in Argentina have a regional scope (Pesce et al., 2014: south of the province of Buenos Aires), while the most comprehensive ones at the geographical level (Villar et al., 2015a, 2015b) study informality by comparing formal and informal microenterprises. The study proposed in this article aims to reduce the identified gap by analysing the determinants of revenue underreporting in registered firms in an emerging country with high inflation (Argentina) and its evolution from a business perspective.

3. Proposed model and empirical strategy

Based on literature review, we propose a conceptual model where the level of revenue underreporting is determined by a series of structural elements (company and entrepreneur's characteristics), a group of environmental factors (corruption, regulation and bureaucracy, taxes, and others), and a set of control variables (equation 1). Specifically, equation 2 details the determinants included in each group, where β, δ and ω are the sensitivities of the perceived level of revenue underreporting before changes in structural determinants, environmental factors, and control variables, respectively.

$$Revenue\ underreporting\ = \alpha + \sum_{i=1}^{I} \beta_i * firm\ and\ entrepreneur's\ characteristic_i + \sum_{j=1}^{J} \delta_j * environmental\ factor_j + \sum_{k=1}^{K} \omega_k * control\ variable_k + \varepsilon \quad [1]$$

$$Revenue\ underreporting\ = \alpha + \beta_1 firm\ size + \beta_2 firm\ sector + \beta_3 firm\ age + \beta_4 legal\ status + \beta_5 ownership + \beta_6 market + \beta_7 financing + \beta_8 other\ firm's\ characteristics + \beta_9 entrepreneur's\ experience + \beta_{10} entrepreneur's\ gender + \delta_1 corruption + \delta_2 regulation\ and\ bureaucracy + \delta_3 public\ and\ government\ services\ quality + \delta_4 tax + \delta_5 penalty + \delta_6 detection\ probability + \delta_7 economic\ development + \delta_8 access\ to\ financing + \delta_9 sector\ informality + \delta_{10} political\ instability + \omega_1 year + \varepsilon \quad [2]$$

3.1. Sources of information and variables of interest

To empirically test the proposed model, we use databases from the Enterprise Survey (ES) conducted by the World Bank, which have been employed in research studies on various topics. The surveys are carried out in 139 countries and the information collected is available free of charge for academic purposes. Surveys are conducted at the firm level on a representative sample of the private sector of an economy and cover a wide range of business environment issues, including access to financing, corruption, infrastructure, crime, competition, and enforcement measures. The data is used to create statistically significant business environment indicators that are comparable between countries (World Bank Group, 2018).

Specifically, for this work, we use the 2010-2017 pooled data from the Argentina ES (Table 1). The complete ES database for Argentina includes 2006, 2010 and 2017 years. However, in the present study, the observations of the year 2006 are not used since the question that defines the dependent variable is only available as of the 2010 ES.

We establish formal companies (registered with the Federal Public Revenue Administration, AFIP) as an analysis unit. The ES includes registered companies with a minimum of five employees. The Micro Enterprise Survey comprises smaller firms and the Informal Survey gathers information about unregistered enterprises.

To approximate the level of informality, we define the dependent variable REVENUE UNDERREPORTING (Y) in binary form as follows:

$Y = 1$ *if the firm declares to compete against registered firms selling goods or services without records*

$Y = 0$ *if the firm declares not to compete against registered firms selling goods or services without records*

The dependent variable corresponds to the question coded as ASCe13 in the ES. In the following sections, for the interpretation of the results, reference will be made to companies that underreport or do not underreport revenue. The reader should consider that this corresponds to the definition of the dependent variable detailed here.

Although the question chosen as a dependent variable does not directly measure the level of compliance by the company, it is designed to act as a reasonable substitute considering the obvious reluctance of respondents to reveal their own compliance (Abdixhiku et al., 2018). Such indirect compliance measures (and other illegal activities) are common in investigations: they seek to limit this misreporting by asking about the behaviour of others. The respondent's answer is assumed to be informed by its own experiences, and is thus supposed to be a reasonable proxy for its own behaviour. Although the indirect nature of the questions mitigates misreporting due to self-presentation reasons, the questions may still be subject to misreporting due to a firm's misperceptions of its own behaviour. If the firm does not realize that it is engaging in tax evasion, then it cannot report its experience with tax evasion. However, the lack of formal high-quality audit data often makes these types of survey data the only way to proceed in investigating tax evasion, especially at the firm level (Alm et al., 2016). Measures of informality through the firm's sector have been used previously in numerous studies (Abdixhiku et al., 2017, 2018; Alm et al., 2019; Beck et al., 2014; Dabla-Norris et al., 2008; Gokalp et al., 2017; Straub, 2005).

Table 1. Sample description.

Sample description	**2010**	**2017**	**Total**
Surveyed firms by year			
Only 2010	743	0	743
Only 2017	0	680	680
2010 and 2017	311	311	622
No. of firms in database	1,054	991	2,045
No. of firms that answered the revenue underreporting question	**974**	**833**	**1,807**
Proportion of firms that underreport revenue y=1	59.64%	62.91%	61.73%

Source: Own elaboration.

In relation to the explanatory variables, we identify questions that correspond to each defined determinant factor. We detail the operational definitions of the variables in Table A.1 in the appendix. It is important to highlight that both dependent and explanatory variables used here capture company manager perception as a proxy of the phenomenon under study, but do not represent objective measurements of informality or its determinants.

3.2. Processing and analysis methods

The data analysis methodology consists of different stages. First, we present the descriptive statistics of the variables per year and for the pooled data, and we perform the Wald and Pearson Chi2 tests (continuous and categorical variables, respectively) to identify if the variations between 2010 and 2017 are statistically relevant.

Second, we develop a multivariate analysis, using a logit regression model (Long & Freese, 2001) where the binary dependent variable is considered as a proxy for the company's informality level and the independent variables represent determinants of sales underreporting and control variables. As these are non-linear models, for the interpretation of the results, we calculate the marginal effects with all the continuous explanatory variables in their average value and the categorical ones in null value. Thus, the sign and the magnitude of the marginal effects exposed show how (+/- sign) and how much each determinant factor affects the probability of a company to underreport sales.

In line with several antecedents (Abdixhiku et al., 2017; Batra et al., 2003; Dabla-Norris et al., 2008 and others), it is assumed that the determinants-tax evasion relationship occurs in a single sense, that is, the factors influence the level of underreporting of sales, but not vice versa. Even this assumption is reinforced by the use of lagged explanatory variables that analyze the sequential and non-simultaneous effect, for example: how the application for credit in a previous period affects the current underreporting level. Likewise, previous research has examined the potential endogeneity of certain factors. In this sense, Alm et al. (2016) study the relationship between corruption and tax evasion: more corrupt societies can allow greater tax evasion (corrupt officials seek more income through bribes) or, conversely, higher levels of tax evasion can create additional opportunities for the corruption (more opportunities for bribery). Their empirical results indicate that corruption is a determinant factor of informality and not the other way around.

In addition to identifying the determinants of income underreporting in Argentina, we study their 2010-2017 evolution. We incorporate this temporary change in two ways in the logit regression models proposed. In the first group of estimates, a binary variable is included for the observations of the year 2017, while the second set of estimated models contains, in addition to the determinants in levels, interactions between certain explanatory variables (in general, environmental factors) and the year 2017.

The estimation and interpretation of the marginal effects of interactive terms in nonlinear models is a complex issue since the logic from linear models is not applicable. In binary response estimates, the marginal effect of a change in both interacting variables is not equal to the marginal effect of changing only the interaction term, and the statistical significance cannot be determined from the z statistic reported in the regression (Norton et al., 2004). For this reason, we follow Buis (2010) recommendations to calculate the marginal effects of temporary interactive terms. First, we estimate the logit models to obtain the odds ratios and then we calculate the marginal effects as the difference between the expected probabilities 2017 and 2010 for each category (0; 1) of the interacting explanatory variables. The marginal effect is computed as a difference (and not as the derivative of the expected probabilities) because the 'year 2017' is a categorical variable and this discrete variation corresponds more adequately to what is actually observed (Buis, 2010).

When estimating non-linear models such as logit, there are two options to interpret the regression coefficients: to calculate some form of marginal effect or exponentiate the coefficients, obtaining in the latter case a probability ratio or an incidence rate (odds ratio). The marginal effect is an approximation of how much the dependent variable is expected to increase or decrease for a unit change in an explanatory variable; that is, the effect is presented in an additive scale. Instead, the exponentiated coefficients give the reason why the dependent variable varies for a unit of change in an explanatory variable; that is, the effect is presented in multiplicative scale (Buis, 2010). The odds ratio varies between 0 and ∞: if the probability ratio is between 0 and 1,

the marginal effect of the independent variable on the probability of the dependent one is negative, while, if the ratio is greater than 1, it means that the marginal effect of the explanatory variable on the probability of the dependent variable is positive. Odds ratios have a bad reputation for being difficult to understand. However, both marginal and multiplicative effects are accurate representations of the phenomenon under analysis. The choice of one or the other depends on the effect that is wished to report (Buis, 2010).

Following Buis (2010), logit models are estimated with specific Stata commands in order to obtain the odds ratios and the marginal effects.

Since it is a stratified sample, we use sample weights (wmedian) to obtain descriptive statistics as literature suggests (Solon et al., 2013; Winship & Radbill, 1994; World Bank Group, 2018). In that sense, the weighted estimation views the sample through a reverse illusory mirror that undoes the original exaggeration (Solon et al., 2013).

For the multivariate analysis, however, there is a debate regarding the use of a weighting scheme (Solon et al., 2013). In that order of ideas, if the models are estimated with a sample that represents in excess certain parameters (for example, size, regions, etc.), but such factors are included among the explanatory variables, then the model is correctly specified, the error term is not related to the sampling criterion and, therefore, weighting is unnecessary (Solon et al., 2013). Therefore, in the present work, we estimate multivariate models without weights, but incorporating stratification parameters as independent variables (size, sector, and region). Similar positions have been adopted by the studies of Lohr and Liu (1994), Pfeffermann (1993), and Williams & Horodnic (2016). In all cases, to assess the significance of the results, a confidence level of 90% is determined as acceptable.

4. Results

4.1. Descriptive statistics

Table 2 shows the descriptive statistics of the independent variables organized by group and determinant factor for each period (2010, 2017) and for the merged base in the *pooled* column. Unless otherwise indicated, the percentages commented in the text correspond to pooled data. The sample under study is mainly composed of small companies: 36.26% corresponds to micro companies, 60.02% to Small and Medium Enterprises (SMEs), and only 3.72% represent large firms (Figure 1). In addition, in 2017, there is a reduction of both the average annual sales level, the average number of employees and the labour cost. Regarding the sector, manufacturing (43.94%) and commercial (33.12%) firms predominate, being those dedicated to the provision of services and construction the ones with the lowest participation (17.68% and 5.26%, respectively). On the other hand, the average firm age in the sample is 29 years, a variable that shows a reduction in 2017.

Considering the legal status, 83.22% of the sample corresponds to limited partnership companies, modalities that register an increase in 2017. On the other hand, they are mostly firms with a considerable level of ownership concentration (62.21%), noticing a small reduction in 2017. Regarding the financial market, the data reveal a certain setback in 2017 with a decrease in the number of companies with current credit lines and the collateral required in the credits.

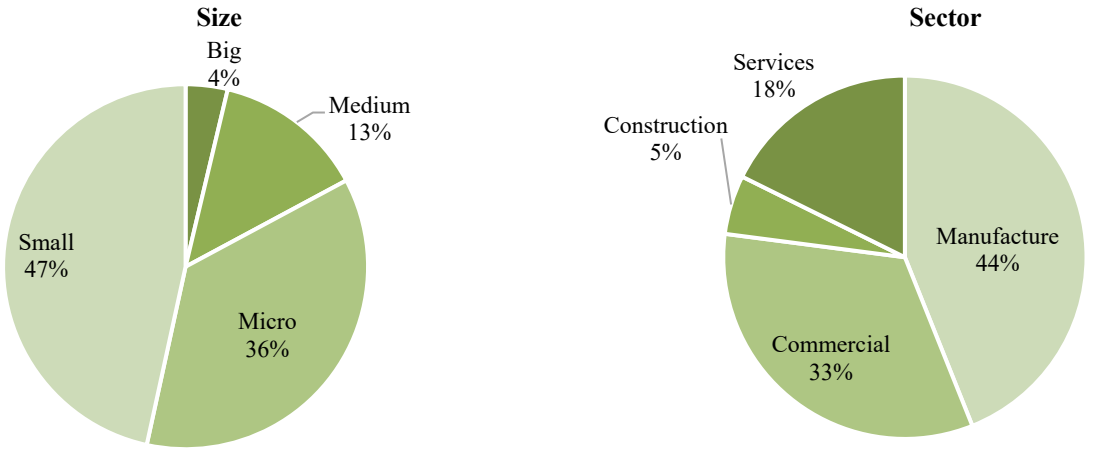
Within the other characteristics of the firm factor, 53.02% of the companies have their last annual financial statements certified by an external auditor, variable that records a fall in 2017, consistent with the smaller size of the companies identified for such period. There is also a reduction in 2017 in the number of companies that made investments in fixed assets in the last fiscal year. Once again, this issue is in line with the reduction in sales and the decrease in access

to bank financing, detailed above. Likewise, 17.06% of the firms have an international quality certification.

In relation to entrepreneur's characteristics, top managers have, in average, 26 years of experience in the sector, almost coinciding with the average firm age. Considering gender, in the pooled data, 50.64% of the company's ownership corresponds to women and this variable indicated an increase in 2017.

Analysing the determinants of the context, the corruption factor indicates that more than half of the companies consider corruption as a severe obstacle to operations. Specifically, 6.97% of the firms declared that, in inspections with tax officials, an informal gift or payment was expected or requested. These variables do not record temporary changes. Within the regulation and bureaucracy factor, labour regulations are highlighted: about half of the companies (49.22%) consider it as a severe obstacle to business operations, while 24.07% of the firms recognize obtaining commercial licenses and permits as a serious obstacle. The aforementioned percentages do not show relevant variations between 2010 and 2017.

Figure 1. Sample characterization: size and sector.



Notes: Graphics are designed with pooled data. Parameter for the definition of the categorical size variable: number of employees. Micro: 5-10 employees; small: 11-50 employees; medium: 51-200; big: more than 200 employees.

Source: Own elaboration.

On the other hand, there is a poor quality of the legal system and justice services. Only 9.93% of companies consider the judicial system is fair, impartial, and non-corrupt (proportion with a reduction in 2017), and 42.33% of the firms reveal that courts a severe obstacle to business operations (the latter variable does not record evolution). However, in 2017, certain variables reflect an improvement in the infrastructure and security and police services: there is a decrease in the proportion of firms that suffered losses due to crime, and in the percentage of companies that declared having suffered power outages.

The tax factor shows deterioration of all its variables in 2017 and yields interesting figures: 73.98% and 53.46% of the companies consider tax rates and tax administration, respectively, as a serious obstacle. The detection probability factor includes variables that attempt to approximate the possibility of being discovered from the experience of the companies (previous inspections) or their location (regions with more or less control by the tax agencies). There is a reduction in the proportion of audited companies in 2017. Regarding the location, most are firms from Buenos Aires. Companies from Chaco were surveyed only in 2010 and those from Tucumán, only in

2017. Longitudinally, there is an increase in the relative participation of firms in Buenos Aires and a reduction in the proportion of companies located in Mendoza.

From the financial market perspective, around one third of companies consider financing as a serious obstacle to business operations, variable with an improvement compared to 2010. For 2017, the variables indicate greater complexity in the procedures for applying to a credit and an improvement in the cost of financing. Considering political instability, 60.95% of the companies identify it as a serious obstacle.

Finally, analysing sector informality, 71.83% of the companies declare to compete with unregistered firms (without temporal evolution), and 68.70% indicate the presence of competitors that hire informal workers, in the latter case there is a small reduction in 2017. For 35.99% and 8.22% of the firms, informality represents a serious obstacle and main difficulty, respectively, both figures with improvements in 2017.

4.2. Multivariate analysis

4.2.1. Determinants of revenue underreporting in Argentina

Table 3 shows the results of the various estimated logit models to identify the determinants of revenue underreporting in formal Argentine companies. The estimated models alternately include representative variables of all the determinant factors, with the exception of: penalty (no variable was identified in the ES to approximate the factor), and economic development (only data from Argentina is used and adding GDP per capita would be a constant for all observations).

We present the explanatory variables with their expected sign organized according to the proposed model: company and entrepreneur's characteristics, environmental factors, and control variables. The expected sign is posed for the operational variable under analysis. This sign may differ from the relationship proposed in the hypotheses for the determining factors at the theoretical level. For example, a negative link is raised between the quality of public services and informality, but a positive relationship with the phenomenon is expected when this factor is approximated with the variable "losses due to crime". To select previously exposed models, we estimate different specifications by approximating each determinant factor with the different independent variables available, taking advantage of database richness.

In general, models 1 (M1) and 2 (M2) are the most comprehensive (higher number of explanatory variables) with variations regarding the approximation of the firm size (M1: sales, M2: number of employees); taxes (M1: tax rates obstacle, M2: tax administration obstacle); and detection probability (M1: Buenos Aires, M2: Mendoza). For their part, models 3 to 5 incorporate determinant factors not included in the first ones such as access to financing (M3); entrepreneur's gender, detection probability (previous inspections), sector informality (M4); other company's characteristics (M5). In the latter case (M5), we include variables representing the trajectory and the growth process of the firm (having international certification of quality and investment in fixed assets) and, for that reason, we exclude company size and firm age determinants.

Consistent with previous empirical studies (Beck et al., 2014; Dabla-Norris et al., 2008 and others), size factor is negatively associated with revenue underreporting, especially when it is measured by annual sales (with respect to the number of employees). The sector is also a significant determinant of the informality level: manufacturing companies have a lower propensity to underreport sales than commercial, service, or food and textile industries (Santa María & Rozo, 2009; Villar et al., 2015a). The sector variable used in multivariate models corresponds to the stratification parameter by ES industry. This variable differs slightly from the sector exhibited in the descriptive statistics and bivariate analysis, since it was created from the main activity declared by the companies. The purposes of the adequate specification of the model are included in the multivariate estimates, but their interpretation is not possible.

Table 3. Marginal effects of revenue underreporting determinants.

	Determinant factors	Operational variables	ER	M 1 Pr(y=1) 0.5240	M 2 Pr(y=1) 0.7572	M 3 Pr(y=1) 0.7095	M 4 Pr(y=1) 0.6027	M 5 Pr(y=1) 0.5655
Firm and entrepreneur's characteristics	Size	Ln Annual sales [a]	(-)	-0.019 (0.104)				
		Ln Number of employees [a]	(-)		-0.019 (0.117)	-0.019 (0.112)	-0.021 (0.182)	
	Sector	Sector (categorical stratification)			-0.107*** (0.000)	-0.126*** (0.000)	-0.137*** (0.000)	
		Other manufacturing sectors	(-)	-0.266*** (0.000)				-0.288*** (0.000)
	Age	Firm age (years) [a]	(-)	-0.000 (0.615)	-0.001 (0.279)	-0.001* (0.070)	-0.001 (0.220)	
	Legal status	Limited partnership	(-)	0.051 (0.424)	0.060 (0.153)	0.044 (0.340)	0.088 (0.155)	0.040 (0.483)
	Ownership structure	Private domestic ownership (%) [a]	(+)	0.000 (0.529)	0.000 (0.301)	0.000 (0.342)	0.001 (0.345)	0.001 (0.314)
	Market	Domestic market	(+)	0.228*** (0.004)	0.125** (0.033)	0.154** (0.017)	0.188** (0.010)	0.192** (0.011)
	Financing	Current line of credit	(-)	-0.084** (0.036)				
	Other firm's characteristics	Certified financial statements	(-)	-0.075* (0.096)	-0.067* (0.067)			
		Fixed assets investment	(-)					-0.064* (0.098)
		International quality certification	(-)					-0.073* (0.064)
	Entrepreneur's experience	Top manager experience (years) [a]	(-)	-0.003* (0.057)	-0.002* (0.054)			
	Entrepreneur's gender	Female owners	(+)				-0.067* (0.098)	

	Determinant factors	Operational variables	ER	M 1	M 2	M 3	M 4	M 5
				Pr(y=1) 0.5240	Pr(y=1) 0.7572	Pr(y=1) 0.7095	Pr(y=1) 0.6027	Pr(y=1) 0.5655
Environmental factors	Corruption	Corruption obstacle	(+)	0.118*** (0.002)	0.072** (0.014)	0.092*** (0.003)	0.074** (0.046)	0.125*** (0.001)
	Regulation and bureaucracy	Customs/trade regulations obstacle	(+)	0.163*** (0.001)	0.070** (0.041)	0.096** (0.013)	0.111** (0.022)	0.120** (0.013)
		Labour regulations obstacle	(+)		0.051* (0.063)			
	Public services quality […]	Losses due to crime	(+)	0.088** (0.036)				0.056 (0.161)
		Impartial judicial system	(-)		-0.100** (0.024)			
	Taxes	Tax rate obstacle	(+)	0.054 (0.206)				
		Tax administration obstacle	(+)		0.025 (0.378)	0.049 (0.112)	-0.001 (0.976)	0.056 (0.138)
	Detection probability	Buenos Aires	(+)	0.088** (0.022)				0.048 (0.194)
		Mendoza	(-)		-0.219*** (0.000)	-0.207*** (0.000)	-0.251*** (0.000)	
		Fiscal inspection	(-)				0.027 (0.490)	
	Access to financing	Access to finance obstacle	(+)					0.036 (0.359)
		Did not apply to credit - high cost	(+)			0.064 (0.123)		
	Sector informality	Informal sector competitor practices obstacle	(+)				0.303*** (0.000)	
	Political instability	Political instability biggest obstacle	(+)	-0.107* (0.052)	-0.095* (0.064)	-0.095* (0.076)	-0.123** (0.026)	-0.111** (0.045)
	Year	2017		-0.064 (0.145)	-0.043 (0.202)	-0.024 (0.477)	0.004 (0.921)	-0.048 (0.237)
		Pseudo R2		0.1290	0.1187	0.1075	0.1936	0.1188
		Number of observations		1036	1103	1123	1095	1096
		Chi2		131.84	125.70	114.11	169.82	135.45
		Prob>Chi2		0.00	0.00	0.00	0.00	0.00

Notes: All binary variables, except indicated with [a] are continuous. Pooled estimates with robust standard errors, dy/dx calculated with $\bar{x}$ (continuous) and x=0 (categorical). P-value in brackets: * p<0.10, ** p<0.05, *** p<0.01. Abr.: ER: expected relationship, M: model.

Source: Own elaboration.

Firm age has a negative link with the informal sector only in model 3 (in accordance with Santa María & Rozo, 2009; Villar et al., 2015a), while the legal status and ownership structure are not determinants of the phenomenon in none of the estimated models (coincident with Batra et al., 2003; Pesce et al., 2014). On the other hand, as models 1 to 5 show, the market factor is relevant to explain the level of informality: companies that mainly meet domestic demands (their main activity is not exports) have a greater propensity to underreport revenue (in line with Batra et al., 2003; Beck et al., 2014 and others). Likewise, financing is also a significant determinant: those firms with current credit lines have a lower probability of underreporting (according to Siqueira et al., 2016; Williams et al., 2016; and others).

On the other hand, there are other characteristics of the companies that are relevant to explain informality: firms whose last annual financial statements are certified by an external auditor (Beck et al., 2014), or that bought fixed assets the previous year, or that have an internationally recognized quality certification (Williams & Kedir, 2018) have a lower propensity to underreport sales. Considering entrepreneur's particularities, models 1 and 2 show that the manager's experience is negatively associated with revenue underreporting (De Paula & Scheinkman, 2011 and others), while model 3 indicates that the existence of female owners is linked to a lower propensity to underreport sales. This last finding is consistent with the research related to tax compliance (Torgler & Valev, 2010 and others), but contrasts with the studies according to which women are more likely to operate in the informal sector (De Paula & Scheinkman, 2011; Villar et al., 2015a). However, the results must be interpreted with caution because the significant variable 'female owners' is binary and takes unit value if at least one of the owners of the entity is female: it does not represent the percentage of majority ownership.

Within the environment factors group, companies that perceive corruption, commercial licenses, and labour regulations as an obstacle to business operations show a greater probability of revenue underreporting (models 1 to 5). On the other hand, we verify the negative relationship between government services quality and informal sector through two variables. Firms that experienced losses due to crime the previous year (indicating lower levels of public security) are more likely to underreport revenue, while companies that consider the judicial system to be equitable, impartial and non-corrupt show a lower probability of underreporting sales. The links between these variables and informality (at 95% and 99% confidence levels) are consistent with previous empirical studies (Dabla-Norris et al., 2008; Friedman et al., 2000; Johnson et al., 1997; 1998; 2000 and others).

Surprisingly and in contrast to most previous research, the tax factor does not present a significant link with informality, except in model 4 that exhibits a positive relationship between companies that consider the administration of taxes as a difficulty and an underreporting to an 88% confidence level. Despite the observed importance of the tax factor in descriptive statistics and bivariate analysis, its lack of relevance in the multivariate model could be because firms with a greater propensity to underreport revenue face other difficulties such as more severe barriers to the development of their business. That is, taxes are a general obstacle for all companies, but they do not represent a differential factor for those that underreport sales (Pedroni et al., 2018; Williams et al., 2016).

In line with the empirical background (Cebula, 1997; Putniņš & Sauka, 2015), the variables of the probability of the detection factor are significant with the expected sign: companies located in Buenos Aires exhibit a greater propensity to underreport revenue, while firms located in Mendoza show a lower probability of underreporting revenue (in both cases with respect to the remaining regions of the country). This is possibly due to the difficulty of implementing effective controls in atomized cities. The probability of detection measured according to the experience of the companies (tax inspections during the previous year) is not relevant to explain the level of informality.

Unlike some previous works (Beck et al., 2014; Dabla-Norris et al., 2008), general restrictions on access to financing do not present statistical significance as determinants of the informal sector. Only in model 3, the companies that declare not to request credits due to the high costs show a greater propensity to underreport sales, at a confidence level of 87%. On the other hand, the sector informality factor, approximated by the proportion of firms that consider the practices of informal competitors as an obstacle, exposes a significant and positive link with the probability of underreporting sales (Pesce et al., 2014).

Furthermore, political instability proves to be an important determinant of the level of informality in all models, although with the opposite sign to that expected and found by previous studies (Batra et al., 2003; Straub, 2005). Firms that consider political instability as the greatest difficulty for the business have a lower propensity to underreport sales. This finding, although initially contradictory, may indicate a preventive attitude of the companies due to the uncertainty of the context and/or the correlation between political and economic imbalance in the case of Argentina. Explicitly, firms interpret political instability as a negative signal and, therefore, report a level of income closer to the real one (lower underreporting), reducing the risk to be discovered.

Ultimately, to capture the evolution of the phenomenon, all models incorporate the temporary effect, although the estimates do not reveal significant variations in the probability of underreporting sales between 2010 and 2017. Only model 1 seems to indicate that in 2017 companies exhibit a lower propensity to underreport revenue compared to 2010 (with a confidence level of 85%). This could perhaps be capturing the effects of the implementation of greater controls at the technological level by the tax agencies in Argentina (for example, based on electronic invoicing in some categories of the simplified regime).

4.2.2. Temporal evolution of revenue underreporting determinants

In order to evaluate the temporal evolution of revenue underreporting determinants, we estimate models similar to those exhibited in the previous section, but also which included the 2017 year, variable in interaction with the environmental factors and with some company's characteristics. Specifically, we select to interact those firms' particularities that may present variations between 2010 and 2017, such as the variables current credit, market, investment in fixed assets, international quality certification.

In general, the results of the estimated models with temporary effects (Table A.2 in Appendix) are consistent with the initial findings (Table 3). The significance and the sign of a large part of revenue underreporting determinants are stable, as with size, sector, market, entrepreneur's experience, corruption, regulation and bureaucracy, taxes, detection probability, access to financing, and sector informality. Variables that lose statistical significance in the estimates with temporary interactions (compared with the initial ones) are current credit, investment in fixed assets, international quality certification, female owners, labour regulations obstacle, losses due to crime, and political instability biggest obstacle.

As explained in section 3.2, the interpretation and significance of interactive terms can not be evaluated directly from the results of the regression. Therefore, in Table 4, we calculate the marginal effects as the difference between the expected probabilities 2017 and 2010 for each category (0; 1) of the interacting explanatory variables, also analysing their statistical relevance. In that sense, the shaded cells in Table 4 show the variables that present a temporary evolution: current line of credit, customs/trade regulations obstacle, Buenos Aires, Mendoza and informal sector competitor practices obstacle.

Specifically, in 2017 (compared to 2010), the propensity to underreport sales is increased for companies without current line of credit and is reduced for companies with external financing. The first result reinforces the link already found: companies that do not need to verify income before financial institutions have greater discretion to select the level of sales to be reported,

which generally results in low levels of reported revenue, that is, greater underreporting. On the other hand, the second finding could be showing the perception of the firms regarding the greater cross-information in 2017. That is, companies that had credits in 2017 underreport fewer sales because they considered that there was greater verification of cross data than in the year 2010.

Table 4. Temporal evolution of revenue underreporting determinants: marginal effects.

Operational variables		M 1			M 2		
		t_1: 2017	t_0: 2010	Δ t_1-t_0	t_1: 2017	t_0: 2010	Δ t_1-t_0
Domestic market	0	0.690 (0.151)	1.142 (0.000)	**-0.452 (0.460)**	0.700 (0.177)	1.285 (0.001)	**-0.585 (0.365)**
	1	4.919 (0.003)	4.218 (0.000)	**0.701 (0.506)**	4.400 (0.000)	3.877 (0.000)	**0.523 (0.515)**
Current line of credit	0	7.309 (0.000)	4.354 (0.000)	**2.955* (0.091)**			
	1	2.371 (0.000)	3.715 (0.000)	**-1.344* (0.072)**			
Corruption obstacle	0	3.166 (0.000)	2.575 (0.000)	**0.591 (0.420)**	2.811 (0.000)	2.174 (0.000)	**0.637 (0.251)**
	1	6.390 (0.000)	5.311 (0.000)	**1.079 (0.515)**	5.680 (0.000)	5.066 (0.000)	**0.614 (0.642)**
Customs/trade regulations obstacle	0	4.490 (0.000)	2.596 (0.000)	**1.894** ** **(0.023)**	4.093 (0.000)	2.758 (0.000)	**1.335* (0.053)**
	1	6.241 (0.003)	9.499 (0.000)	**-3.258 (0.330)**	5.277 (0.001)	7.239 (0.000)	**-1.962 (0.415)**
Labour regulations obstacle	0				2.993 (0.000)	2.437 (0.000)	**0.556 (0.419)**
	1				5.123 (0.000)	4.691 (0.000)	**0.432 (0.701)**
Losses due to crime	0	4.371 (0.000)	3.306 (0.000)	**1.065 (0.250)**			
	1	7.009 (0.003)	5.307 (0.000)	**1.702 (0.509)**			
Impartial judicial system	0				4.564 (0.000)	3.962 (0.000)	**0.602 (0.481)**
	1				1.697 (0.002)	2.215 (0.000)	**-0.518 (0.476)**
Tax rate obstacle	0	3.350 (0.002)	2.760 (0.000)	**0.590 (0.607)**			
	1	5.066 (0.000)	4.962 (0.000)	**0.104 (0.934)**			
Tax administration obstacle	0				3.817 (0.000)	2.580 (0.000)	**1.237 (0.150)**
	1				4.655 (0.000)	5.231 (0.000)	**-0.576 (0.641)**
Buenos Aires	0	5.019 (0.000)	2.519 (0.000)	**2.500** ** **(0.028)**			
	1	4.572 (0.000)	4.706 (0.000)	**-0.134 (0.915)**			
Mendoza	0				4.406 (0.000)	3.928 (0.000)	**0.478 (0.566)**

Operational variables		M 1			M 2		
		t_1: 2017	t_0: 2010	Δ t_1-t_0	t_1: 2017	t_0: 2010	Δ t_1-t_0
Political instability biggest obstacle	1				3.682 (0.003)	0.936 (0.000)	**2.747**** (**0.031**)
	0	5.021 (0.000)	4.185 (0.000)	**0.836** (**0.438**)	4.488 (0.000)	3.830 (0.000)	**0.658** (**0.422**)
	1	2.285 (0.024)	2.596 (0.000)	**-0.311** (**0.798**)	2.208 (0.037)	2.503 (0.000)	**-0.295** (**0.804**)

Operational variables		M 3			M4			M5		
		t_1: 2017	t_0: 2010	Δ t_1-t_0	t_1: 2017	t_0: 2010	Δ t_1-t_0	t_1: 2017	t_0: 2010	Δ t_1-t_0
Domestic market	0	0.688 (0.183)	1.216 (0.001)	**-0.528** (**0.402**)	1.186 (0.241)	2.169 (0.003)	**-0.983** (**0.429**)	0.773 (0.156)	1.478 (0.002)	**-0.705** (**0.332**)
	1	3.890 (0.000)	3.639 (0.000)	**0.251** (**0.721**)	6.400 (0.000)	7.857 (0.000)	**-1.457** (**0.509**)	4.193 (0.000)	4.078 (0.000)	**0.115** (**0.892**)
Fixed asset investment	0							4.942 (0.000)	4.926 (0.000)	**0.016** (**0.990**)
	1							3.148 (0.000)	3.359 (0.000)	**-0.211** (**0.787**)
International quality certification	0							4.855 (0.000)	4.895 (0.000)	**-0.040** (**0.971**)
	1							1.913 (0.000)	2.271 (0.000)	**-0.358** (**0.496**)
Corruption obstacle	0	2.457 (0.000)	2.100 (0.000)	**0.358** (**0.440**)	4.677 (0.000)	4.145 (0.000)	**0.532** (**0.737**)	2.714 (0.000)	2.358 (0.000)	**0.356** (**0.520**)
	1	5.124 (0.000)	4.731 (0.000)	**0.393** (**0.742**)	7.742 (0.000)	10.432 (0.000)	**-2.690** (**0.381**)	5.489 (0.000)	5.359 (0.000)	**0.131** (**0.926**)
Customs/trade regulations obstacle	0	3.524 (0.000)	2.603 (0.000)	**0.920** (**0.111**)	5.992 (0.000)	5.330 (0.000)	**0.663** (**0.706**)	3.842 (0.000)	2.777 (0.000)	**1.065** (**0.110**)
	1	5.093 (0.001)	6.846 (0.000)	**-1.752** (**0.443**)	7.600 (0.004)	15.714 (0.003)	**-8.115** (**0.150**)	5.347 (0.000)	8.393 (0.000)	**-3.046** (**0.275**)
Losses due to crime	0							3.793 (0.000)	3.384 (0.000)	**0.410** (**0.590**)
	1							5.634 (0.001)	4.872 (0.000)	**0.762** (**0.700**)
Tax administration obstacle	0	3.001 (0.000)	2.487 (0.000)	**0.514** (**0.426**)	4.871 (0.000)	5.251 (0.000)	**-0.379** (**0.818**)	3.722 (0.000)	2.531 (0.000)	**1.191** (**0.145**)
	1	4.392 (0.000)	4.835 (0.000)	**-0.444** (**0.693**)	7.286 (0.000)	10.498 (0.000)	**-3.212** (**0.322**)	4.399 (0.000)	5.859 (0.000)	**-1.460** (**0.291**)
Buenos Aires	0							4.095 (0.000)	2.805 (0.000)	**1.290** (**0.138**)
	1							4.135 (0.000)	4.417 (0.000)	**-0.282** (**0.794**)
Mendoza	0	3.877 (0.000)	3.672 (0.000)	**0.205** (**0.777**)	6.370 (0.000)	7.967 (0.000)	**-1.597** (**0.479**)			
	1	3.395 (0.003)	1.026 (0.000)	**2.370** (**0.044**)**	5.711 (0.007)	1.516 (0.002)	**4.195** (**0.055**)*			
Fiscal inspection	0				5.048 (0.000)	7.806 (0.000)	**-2.758** (**0.247**)			
	1				7.520 (0.000)	7.146 (0.000)	**0.374** (**0.881**)			
Access to finance obstacle	0							4.008 (0.000)	3.088 (0.000)	**0.920** (**0.257**)
	1							4.353 (0.000)	5.155 (0.000)	**-0.762** (**0.589**)
Did not apply to credit – high	0	3.792 (0.000)	3.029 (0.000)	**0.763** (**0.252**)						

Operational variables		M 3			M4			M5		
		t_1: 2017	t_0: 2010	Δ t_1-t_0	t_1: 2017	t_0: 2010	Δ t_1-t_0	t_1: 2017	t_0: 2010	Δ t_1-t_0
cost	1	4.000 (0.005)	5.696 (0.000)	**-1.696 (0.416)**						
IS competitor practices obstacle	0				2.177 (0.000)	1.425 (0.000)	**0.752** ** **(0.049)**			
	1				11.851 (0.001)	16.231 (0.000)	**-4.380 (0.383)**			
Political instability biggest obstacle	0	3.937 (0.000)	3.626 (0.000)	**0.311 (0.663)**	6.576 (0.000)	7.976 (0.000)	**-1.400 (0.538)**	4.299 (0.000)	4.109 (0.000)	**0.190 (0.828)**
	1	2.304 (0.048)	2.198 (0.000)	**0.105 (0.932)**	2.786 (0.061)	3.518 (0.000)	**-0.732 (0.675)**	1.719 (0.020)	2.322 (0.000)	**-0.603 (0.520)**

Notes: marginal effects calculated with margins following Buis (2010). P-values in brackets: * p<0.10; ** p<0.05; *** p<0.01. Abr.: M: model; IS: informal sector.

Source: Own elaboration.

The detection probability approximated by geographical area also exhibits temporary changes. In 2017, companies located outside the metropolitan area of Buenos Aires had a greater propensity to underreport revenue, as is the case, for example, with Mendoza companies. This could be indicating that in 2017 Argentine companies not located in Buenos Aires perceived a lower probability of detection in relation to 2010.

We also verify a greater propensity to underreport sales in 2017 for those companies that do not perceive commercial licenses, tax administration (at a confidence level of 85%), and sector informality as an obstacle for business operations. This would indicate that the increase in the tendency to underreport sales does not result from a perceived worsening in environmental conditions, but probably due to intrinsic decisions of firms (for example, to maintain or increase profit).

In summary, most of the identified factors are significant determinants of informality with the expected sign (Table 5). In particular, we highlight those that show being robust to different estimates: size, sector and market within the company's characteristics; and corruption, regulation and bureaucracy, quality of public services, and detection probability within the environmental factor set. On the other hand, for several factors, there is no relevant link with the informal economy (or it is shown at confidence levels below 90%): legal status, ownership structure, access to financing and, the most striking, taxes. Finally, political instability is a relevant factor to explain the level of informality but with a sign opposite than expected.

Table 5. Summary of the obtained empirical evidence.

	Factor	Operational variable/s	Link with informality	
			Expected	Found
Firm and entrepreneur's characteristics	**Size**	Annual sales; number of employees	Negative	Negative
	Sector	Other manufacturing sectors	Negative	Negative
	Age	Firm age (years)	Negative	Negative
	Legal status	Limited partnership	Negative	Non-significant
	Ownership structure	Private domestic ownership (%)	Positive	Non-significant
	Market	Domestic market	Positive	Positive
	Financing	Current line of credit	Negative	Negative
	Other firm's characteristics	Certified financial statements; fixed asset investment; international quality certification	Negative	Negative
	Entrepreneur's experience	Top manager experience (years)	Negative	Negative

	Entrepreneur's gender	Female owners	Negative	Negative
Environmental factors	Corruption	Corruption obstacle	Positive	Positive
	Regulation and bureaucracy	Customs/trade regulations or labour obstacle	Positive	Positive
	Public and government services quality	Losses due to crime	Positive	Positive
		Impartial judicial system	Negative	Negative
	Taxes	Tax rate/administration obstacle	Positive	Non-significant
	Detection probability	Buenos Aires	Positive	Positive
		Mendoza	Negative	Negative
		Fiscal inspection	Negative	Non-significant
	Access to financing	Access to finance obstacle; did not apply to credit - high cost	Positive	Non-significant
	Sector informality	Informal sector competitor practices obstacle	Positive	Positive
	Political instability	Political instability biggest obstacle	Positive	Negative

Source: Own elaboration.

5. Concluding remarks

This paper aims to identify the determinants of revenue underreporting in Argentine formal firms and their evolution from a business perspective. Our results confirm most of the hypotheses. Sales underreporting in formal companies is positively associated with corruption, regulation and bureaucracy, and sector informality; and negatively linked with firm size, sector, company age, exporter condition, use of external financing, certified financial statements, international quality certifications, top manager's experience, female entrepreneurs, detection probability, the quality of institutions, public and government services, and political instability.

There is no evidence to affirm that the legal status, ownership structure, taxes, and access to financing are significant determinants of revenue underreporting in Argentine companies. The findings on these last two factors are interesting because tax burden and narrow access to the financial market are the determinants usually identified as causing informality in the theoretical-empirical background. The lack of relevance of the tax factor in multivariate models could be due to the fact that in Argentina taxes are an important obstacle for all companies, so they do not represent a differential factor for those that underreport sales (in line with Pedroni et al., 2018; Williams et al., 2016).

In addition, it is important to highlight the result found for the entrepreneur's gender determinant because the previous literature is divergent with respect to its link with the informal economy. Part of the studies on determinants of informality analyse how enterprises are initiated (registered or not) or examine ownership percentages by gender, finding that women have a greater propensity to operate in the informal sector (De Paula & Scheinkman, 2011; Villar et al., 2015). However, the findings of the present study show that when companies have at least one female owner, they have a lower probability of underreporting sales, presenting greater consistency with the background regarding differences in tax compliance by gender (Hasseldine & Hite, 2003; Kastlunger et al., 2010; Torgler & Valev, 2010).

Another interesting result comes from the political instability factor: the greater the imbalance perceived by companies, the lesser the propensity to underreport sales. In the Argentine context, this finding is probably due to the correlation between political and economic instability, and it would be indicating that firms interpret political instability as a negative signal and,

therefore, report a level of revenue closer to the real one (lower underreporting), reducing the risk to be discovered.

Regarding the evolution of the phenomenon, there are no relevant changes in the general propensity to underreport sales between 2010 and 2017, although there are relevant temporal variations in some determinant factors. Specifically in 2017 (compared to 2010), the propensity to underreport sales is increased for: companies without current line of credit; located outside the metropolitan area of Buenos Aires; that do not perceive the obtaining of commercial licenses, tax administration, or sector informality as an obstacle to business operations. These findings may be showing that in 2017 Argentine companies not located in Buenos Aires (the capital city) perceived a lower detection probability in relation to 2010. They are also indicative that the increase in the tendency to underreport sales does not result from a worsening perceived in environmental conditions, but probably due to intrinsic decisions of firms (for example, to maintain or increase profit).

At a pragmatic level, the findings of this paper are relevant for public policy makers because they allow identifying where efforts should be directed in order to reduce revenue underreporting. In that sense, considering the results referring to economic and institutional causes, the importance of the tax factor in descriptive statistics and its lack of relevance in the multivariate analysis shows that revenue underreporting is a multicausal phenomenon where taxes lose importance in the light of other determinants such as corruption, regulation and bureaucracy, quality of public and government services, detection probability, sector informality, and political instability. In this way, our results support the school of thought that places political and social institutions that govern the economy as the main factors responsible for informality, over those who blame high taxes (Friedman et al., 2000).

Based on the findings presented, the expected policy measures include the reduction of corruption levels, the development of administrative and fiscal simplification programs, which reduce the incidence of bureaucracy and the cost of compliance with regulations, the improvement in infrastructure, government services and the quality of public institutions, and the provision of a stable regulatory environment. Consideration could also be given to the development of training programs for entrepreneurs regarding regulations or procedures that are usually conflicting, and the implementation of mechanisms with an impact on detection probability (real or perceived), mainly in the large metropolitan regions.

On the other hand, the results referring to firm and the entrepreneur's characteristics allow describing certain profiles of companies with a greater propensity to underreport revenue. In this way, the relevant particularities allow individualizing the objective sample when developing or implementing detection and control measures: smaller companies (which also lack certified financial statements or international quality certifications), operating in certain manufacturing sectors, that sell mainly to the domestic market, that do not resort to the financial market to obtain funds, and whose entrepreneurs are male and have little experience.

The research also recognizes the existence of certain limitations. The main one comes from the study of a sensitive issue (illegal practice) based on perceptions, since respondents have incentives to adulterate their answers -especially by underestimating the percentage of non-reported sales- which can lead to bias. Additionally, the inability to directly measure certain determinants of informality makes it necessary to use proxies' explanatory variables to approximate them.

Underreporting of sales by formal companies represents a large portion of the GDP of developing countries, although empirical literature on the subject is scarce in these economies. In this sense, this research is relevant because it studies business informality with a microeconomic quantitative approach in an emerging context where its development is more frequent, and which, however, has been little examined: high tax pressure and high inflation.

At a conceptual level, the study presents several contributions that constitute an indication for the development of future studies aiming to identify the determinants of tax evasion in emerging economies. First, it shows that the determinants of informality usually identified by previous research -especially taxes- seem to have no universal relevance to explain underreporting, as in the Argentine economy. Second, our work reveals that political instability can have an inverse influence on expectations -it reduces the propensity to underreport sales- and that the existence of female owners discourages the practice, in line with the empirical background on tax compliance. Third, we propose a conceptual model integrating the determinants of the informal sector and we analyse their joint effect by incorporating them simultaneously into multivariate estimates. Finally, this article extends the small amount of research with pooled or panel data (Abdixhiku et al., 2018; Beck et al., 2014).

In addition to examining the factors whose impact on business informality seems ambiguous or contrary to expectations, we recognise different directions for further research on the subject. First, based on the formulated model, comparisons of the causes of the tax evasion between countries and/or regions with similar or different institutional settings can be made. On the other hand, quantitative approaches should be complemented and deepened with qualitative methodologies, such as conducting interviews with the different agents involved: entrepreneurs, tax officials or tax experts. Experimental economics provides the opportunity to extend the issues that influence tax morale, to determine in which cases awards or punishments deter underreporting, and to identify underlying cultural differences. Additionally, it is possible to expand the analysis of the informal economy by incorporating unregistered companies, labour market informality or other forms of tax evasion such as overdeclaration of costs.

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Appendix

Table A.1. Operational definition of the independent variables

Variable	Definition	ES
Firm and entrepreneur's characteristics		
Size		
Annual sales (thousands of dollars, PP 2010)	Quantitative variable: firm total annual sales in the last fiscal year in thousands of dollars deflated to 2010.	d2
Ln. Annual sales	Quantitative variable: natural logarithm of firm total annual sales in the last fiscal year.	d2
Labour cost (thousands of dollars, PP 2010)	Quantitative variable: total annual labour cost including salaries, bonuses, social security contributions in thousands of dollars deflated to 2010.	n2a
Number of employees	Quantitative variable: number of permanent full-time workers in the firm at the end of the last fiscal year.	l1
Ln. number of employees	Quantitative variable: natural logarithm of number of permanent full-time workers in the firm at the end of the last fiscal year.	l1
Micro firm, small firm, medium firm, big firm	Categorical variable that reflects the size of the company according to the number of permanent full-time workers at the end of the last fiscal year. Micro firm: 5-10 employees; small: 11-50 employees; medium: 51-200 employees; big: more than 200 employees.	l1
Sector		
Manufacture, commercial, construction, services	Categorical variable that reflects the economic sector to which the company belongs based on its main activity in the last fiscal year.	d1a1a
Sector (categorical stratification)	Categorical variable representing the parameter used for stratification by industry: food; textile; other manufacturing sectors; commerce; services.	a4a
Other manufacturing sectors	Dummy variable that takes value one if the company frames as "other manufacturing" (other than textile and food) according to the stratification by industry parameter.	a4a
Age		
Firm age (years)	Quantitative variable: firm age since this firm began operations up to 2017.	b5
Legal status		
Limited partnership	Dummy variable that takes value one if the firm's current legal status is shareholding company with trade/non-traded shares or shares traded privately or a limited partnership, zero otherwise.	b1
Ownership structure		
Ownership concentration	Quantitative variable: percentage of firm property held by largest owner or owners.	b3
Private domestic ownership (%)	Quantitative variable: percentage of firm property held by private domestic individuals, companies or organizations.	b2a
Market		
Domestic market	Dummy variable that takes value one if the local or national markets were the main ones in which this firm sold its main product during the last fiscal year, zero otherwise.	e1
Financing		
Current line of credit	Dummy variable that takes value one if the firm has a line of credit or a loan from a financial institution at this time, zero otherwise.	k8
Collateral in credit line	Dummy variable that takes value one if financing of the most recent credit/loan line required collateral, zero otherwise.	k13
Other firm's characteristics		
Certified financial statements	Dummy variable that takes value one if the firm has an internationally recognized quality certification, zero otherwise.	k21

Variable	Definition	ES
International quality certification	Dummy variable that takes value one if the firm has its annual financial statements checked and certified by an external auditor, zero otherwise	b8
Fixed asset investment	Dummy variable that takes value one if the firm purchased any new or used fixed assets in the last fiscal year, zero otherwise.	k4
Entrepreneur's experience		
Top manager experience (years)	Quantitative variable: years of experience of the top manager in the sector (if less than 1 year = 1).	b7
Entrepreneur's gender		
Female owners	Dummy variable that takes value one if the firm has any female owner/s, zero otherwise.	b4
Female property	Quantitative variable: percentage of female property.	b4a
Female top manager	Dummy variable that takes value one if the top manager is female, zero otherwise.	b7a
Environmental factors		
Corruption		
Informal payment in tax inspection	Dummy variable that takes value one if a gift or informal payment was expected or requested in tax inspections/meeting during the last fiscal year, zero otherwise.	j5
Informal payments in contracts (% contract value)	Quantitative variable: percentage of the value of the contract that the company would normally disburse in informal payments or gifts to secure it when establishments like this do business with the government.	j6
Corruption obstacle	Dummy variable that takes value one if the company considers corruption as a major or very severe obstacle to business operations, zero otherwise.	j30f
Regulation and bureaucracy		
Labour regulations obstacle	Dummy variable that takes value one if the firm considers labour regulations as a major or very severe obstacle to business operations, zero otherwise.	l30a
Labour regulations biggest obstacle	Dummy variable that takes value one if labour regulations represent the biggest obstacle faced by the company, zero otherwise.	m1a
Customs/trade regulations obstacle	Dummy variable that takes value one if the firm considers customs and trade regulations as a major or very severe obstacle to business operations, zero otherwise.	j30c
Public and government services quality		
Power outages	Dummy variable that takes value one if the firm experienced power outages during the last fiscal year, zero otherwise.	c6
Impartial judicial system	Dummy variable that takes value one if the firm tends to agree or strongly agree with the statement "the court system is fair, impartial and uncorrupted", zero otherwise.	h7a
Courts obstacle	Dummy variable that takes value one if the firm considers courts as a major or very severe obstacle to business operations, zero otherwise.	h30
Courts biggest obstacle	Dummy variable that takes value one if courts are the biggest obstacle faced by the company, zero otherwise.	M1a
Losses due to crime	Dummy variable that takes value one if the firm experienced losses as a result of theft, robbery, vandalism, arson on this firm's premises or Internet hacking or Internet fraudulent transactions in the last fiscal year, zero otherwise.	I3
Taxes		
Tax rate obstacle	Dummy variable that takes value one if the firm considers tax rates as a major or very severe obstacle to business operations, zero otherwise.	j30a
Tax administration obstacle	Dummy variable that takes value one if the firm considers tax administration as a major or very severe obstacle to business operations, zero otherwise.	j30b
Detection probability		
Buenos Aires, Rosario, Mendoza, Córdoba, Tucumán, Chaco.	Categorical variable that reflects where the company is located.	a3a

Variable	Definition	ES
Fiscal inspection	Dummy variable that takes value one if the firm was visited or inspected by tax officials or required to meet with them during the last fiscal year, zero otherwise.	j3
Access to financing		
Access to finance biggest obstacle	Dummy variable that takes value one if access to finance is the biggest obstacle faced by the firm, zero otherwise.	m1a
Access to finance obstacle	Dummy variable that takes value one if the firm considers access to finance as a major or very severe obstacle to business operations, zero otherwise.	k30
Did not apply to credit - complex procedures	Dummy variable that takes value one if complex application procedures were the main reason why this firm did not apply for any line of credit or loan, zero otherwise.	k17
Did not apply to credit – high cost	Dummy variable that takes value one if unfavourable interest rates were the main reason why this firm did not apply for any line of credit or loan, zero otherwise.	k17
Political instability		
Political instability biggest obstacle	Dummy variable that takes value one if political instability represents the biggest obstacle faced by the firm, zero otherwise.	m1a
Sector informality		
Unregistered or informal competitors	Dummy variable that takes value one if the firm competes against unregistered or informal firms, zero otherwise.	e11
Tax avoidance from IS competitors	Dummy variable that takes value one if the practice of unregistered or informal firms that affects the firm the most is tax avoidance, zero otherwise.	ASCe12
Informal workers hired by IS competitors	Dummy variable that takes value one if the firm competes against registered firms hiring workers without formal contracts, zero otherwise.	ASCe14
IS competitors practices obstacle	Dummy variable that takes value one if the firm considers practices of competitors in the informal sector as a major or very severe obstacle to business operations, zero otherwise.	e30
IS competitor practices biggest obstacle	Dummy variable that takes value one if practices of competitors in the informal sector represent the biggest obstacle faced by the firm, zero otherwise.	m1a
Control variables		
2017 year	Dummy variable that takes value one if the observation corresponds to the year 2017.	

Notes: ES indicates the code of the question/s from which the variable/s is/are defined. Abbreviations: PP: Purchasing Power; IS: Informal Sector

Source: Own elaboration.

Table A.2. Revenue underreporting determinants: temporary interactive effects (*odds ratio*)

	Determinant factors	Operational variables	ER	M 1	M 2	M 3	M 4	M 5
Firm and entrepreneur's characteristics	Size	Ln Annual sales [a]	(-)	0.919*				
				(0.080)				
		Ln Number of employees [a]	(-)		0.910	0.912*	0.920	
					(0.116)	(0.107)	(0.212)	
	Sector	Sector (categorical stratification)			0.555***	0.543***	0.565***	
					(0.000)	(0.000)	(0.000)	
		Other manufacturing sectors	(-)	0.311***				0.284***
				(0.000)				(0.000)
	Age	Firm age (years) [a]	(-)	0.998	0.996	0.994**	0.996	
				(0.582)	(0.238)	(0.043)	(0.195)	
	Legal status	Limited partnership	(-)	1.160	1.406	1.251	1.493	1.156
				(0.567)	(0.154)	(0.342)	(0.137)	(0.542)
	Ownership structure	Private domestic ownership (%) [a]	(+)	1.002	1.003	1.002	1.002	1.003
				(0.379)	(0.217)	(0.293)	(0.362)	(0.153)
	Market	Domestic market	(+)	2.934***	2.371***	2.565***	2.07***	2.461***
				(0.002)	(0.007)	(0.003)	(0.007)	(0.009)
		Domestic market # 2017 year		1.018	1.369	1.333	1.808	1.237
				(0.982)	(0.711)	(0.736)	(0.532)	(0.788)
	Financing	Current line of credit	(-)	1.042				
				(0.839)				
		Current line of credit # 2017 year		0.426***				
				(0.008)				
	Other firm's characteristics	Certified financial statements	(-)	0.757	0.689**			
				(0.136)	(0.034)			
		Fixed assets investment	(-)					0.809
								(0.316)
		Fixed assets investment # 2017 year						0.972
								(0.929)
		International quality certification	(-)					0.851
								(0.427)
		International quality certification # 2017 year						0.733
								(0.320)
	Entrepreneur's experience	Top manager experience (years) [a]	(-)	0.989*	0.987**			
				(0.078)	(0.031)			
	Entrepreneur's gender	Female owners	(+)				0.763	
							(0.110)	
Environmental factors	Corruption	Corruption obstacle	(+)	1.504**	1.564**	1.580**	1.332	1.550**
				(0.050)	(0.031)	(0.019)	(0.192)	(0.032)
		Corruption obstacle # 2017 year		1.125	1.000	1.122	1.118	1.230
				(0.725)	(0.999)	(0.708)	(0.741)	(0.524)
	Regulation and bureaucracy	Customs/trade regulations obstacle	(+)	2.866***	1.793**	1.954**	1.870**	2.107***
				(0.000)	(0.038)	(0.016)	(0.036)	(0.009)
		Customs/trade regulations obstacle # 2017 year		0.449*	0.640	0.650	0.632	0.572
				(0.077)	(0.288)	(0.307)	(0.300)	(0.200)
		Labour regulations obstacle	(+)		1.274			
					(0.222)			
		Labour regulations obstacle # 2017 year			1.111			
					(0.736)			

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Table A.2. Revenue underreporting determinants: temporary interactive effects (*odds ratio*) (Cont.)

	Determinant factors	Operational variables	ER	M 1	M 2	M 3	M 4	M 5
Environmental factors (Cont.)	Corruption	Losses due to crime	(+)	1.241				1,146
				(0.297)				(0.502)
		Losses due to crime # 2017 year		1.407				1.246
				(0.390)				(0.554)
		Impartial judicial system	(-)		0.678*			
					(0.087)			
		Impartial judicial system # 2017 year			0.708			
					(0.406)			
	Taxes	Tax rate obstacle	(+)	1.289				
				(0.216)				
		Tax rate obstacle # 2017 year		0.921				
				(0.835)				
		Tax administration obstacle	(+)		1.335	1.404*	1.077	1.556**
					(0.180)	(0.094)	(0.746)	(0.041)
		Tax administration obstacle # 2017 year			0.706	0.802	0.801	0.616
					(0.291)	(0.486)	(0.512)	(0.142)
	Detection probability	Buenos Aires	(+)	1.866***				1.490**
				(0.002)				(0.044)
		Buenos Aires # 2017 year		0.537*				0.605*
				(0.052)				(0.099)
		Mendoza	(-)		0.201***	0.256***	0.216***	
					(0.000)	(0.000)	(0.000)	
		Mendoza # 2017 year			4.046***	3.078**	3.392**	
					(0.003)	(0.015)	(0.012)	
		Fiscal inspection	(-)				0.880	
							(0.577)	
		Fiscal inspection # 2017 year					1.700*	
							(0.108)	
	Access to financing	Access to finance obstacle	(+)					1.292
								(0.211)
		Access to finance obstacle # 2017 year						0.737
								(0.361)
		Did not apply to credit – high cost	(+)			1.623*		
						(0.094)		
		Did not apply to credit – high cost # 2017 year				0.644		
						(0.343)		
	Sector informality	IS competitor practices obstacle	(+)				7.638***	
							(0.000)	
		IS competitor practices obstacle # 2017 year					0.648	
							(0.269)	
	Political instability	IS competitor practices obstacle	(+)	0.756	0.673	0.655*	0.706	0.770
				(0.285)	(0.111)	(0.084)	(0.158)	(0.311)
		IS competitor practices obstacle # 2017 year		0.600	0.794	0.975	0.612	0.593
				(0.318)	(0.665)	(0.963)	(0.369)	(0.309)
	Year	2017 year		1.957	0.625	0.687	0.474	1.348
				(0.438)	(0.601)	(0.665)	(0.462)	(0.722)
		Pseudo R2		0.1425	0.1290	0.1143	0.2032	0.1274
		Number of obs.		1.036	1.103	1.123	1.095	1.096
		Chi2		149.24	138.69	126.50	181.42	146.32
		Prob>Chi2		0.0000	0.0000	0.0000	0.0000	0.0000

Notes: All binary variables, except indicated with [a] are continuous. Pooled estimates with robust standard errors; # indicates interaction. p-values in brackets: * p<0.10; ** p<0.05; *** p<0.01. Abr.: M: model; ER: expected relationship; IS: informal sector.

Source: Own elaboration.