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Does sound lending infrastructure foster better financial reporting quality of SMEs?

Xing Huang[a], Xiaodong Wang[a], Liang Han [b] and Benjamin Laker[b]

[a]Portsmouth Business School, University of Portsmouth, Portsmouth, UK; [b]Henley Business School, University of Reading, Reading, UK

ABSTRACT

Using an unbalanced panel dataset that contains financial information of 46,340 small and medium-sized enterprises (SMEs) across 11 European countries over 2007–2015, this study examines the impacts of soundness of institutional factors on SME financial reporting quality as (inversely) reflected by the degree of earnings management. We consider a comprehensive framework of country-level lending infrastructure proxies which includes information, legal, social and regulatory environments and show that SME financial reporting quality is better in economies where there is greater availability, depth and quality of credit information sharing between lenders and credit reporting service providers, as empirically shown by a lower level of earnings management. We also show that a well-established legal system, i.e. better judicial and bankruptcy protection systems, is effective in restraining SME earnings management incentives and, earnings management is less prevalent in economies that are subject to a higher stock of social capital which increases SME borrowing capacity. Furthermore, we find that the stringent tax and regulatory systems can foster better financial reporting quality, as earnings management may be less effective. Overall, our robust findings suggest that the soundness of country-level lending infrastructure plays a vital role in improving SME financial reporting quality.

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1. Introduction

'Higher quality earnings provide more information about the features of a firm's financial performance that are relevant to a specific decision by a specific decision-maker' (Dechow, Ge, and Schrand 2010, 344). Earnings have been identified as a superior indicator for future cash flow to operating cash flows for creditors to make lending decisions (Ball and Nikolaev 2022). There has been ample evidence on the determinants of earnings quality at the firm level, such as firm performance, debt, growth, investment and size, and it has also been acknowledged that external factors, such as capital requirements, political processes, and tax and non-tax regulations are associated with business decision on earnings quality (see Dechow, Ge, and Schrand 2010 for a review). Based on interviews with financial executives of public companies in the UK, Dichev et al. (2013) show that macroeconomic conditions and economic volatility highly affect companies' earnings quality. However, despite an extensive body of empirical research examining the firm-level and industry-level determinants of financial reporting outcomes, there are only a handful of studies that have paid attention to the impacts of institutional-level factors (e.g. Schipper 2005), with limited evidence on the general macroeconomic factors such as investor protection (e.g. Leuz, Nanda, and Wysocki 2003) and accounting standards (e.g. Jeanjean and Stolowy 2008).

Different from the majority of previous studies that have focused on the earnings quality of large or publicly listed US companies (e.g. Jones 1991; Cahan, Chavis, and Elmendorf 1997), we study in the EU SME context

CONTACT Liang Han Liang.Han@henley.ac.uk

and examine the impacts of the soundness of institutional factors on earnings quality. Firms manage earnings for various reasons (see Dechow, Ge, and Schrand 2010 for detail) and existing empirical evidence has primarily focused on publicly listed firms which manipulate earnings information to respond to capital market pressures, for example, to meet or beat financial analysts' forecast (Beatty, Ke, and Petroni 2002). In contrast, earnings quality or earnings management could be important for private firms, especially SMEs, in different ways (Graham, Harvey, and Rajgopal 2005). For example, financial statements are believed to be prepared for taxation purposes and borrowing for SMEs (Maingot and Zhegal 2006) as they are usually not subject to stock market pressure. Sánchez-Ballesta and Yagüe (2021) demonstrated that the financial reporting incentives of SMEs are strongly relevant to their tax aggressiveness and Bowen, DuCharme, and Shores (1995) and Burgstahler and Dichev (1997) also highlighted the importance of earnings management for SMEs to signal their creditworthiness in a debt market when SMEs have limited credit availability and rely more on bank finance (Fraser 2009; Bussière et al. 2021)

The distinctive adoption of the EU SME sample is also worth mentioning because, first, the SME sector contributes crucially to the EU's economic success and financial stability, where there were 23.9 million SMEs in 2016, accounted for 99.8% of all enterprises, and provided over 93 million jobs (66.7% of total employees) and €4,030 billion (56.8%) of value-added (European Commission 2017). However, despite the sector's economic importance, SMEs are disadvantaged in access to finance in various aspects that could limit their growth potential, thus bringing substantial economic consequences. For example, SMEs face different capital markets compared to their larger counterparts, and due to the limited capability of SMEs' access to other sources of finance, European SMEs still rely heavily on bank loans and internal funds (Thomadakis 2020). As a result, the bank market structure has a strong impact on SME finance (Rice and Strahan 2010) and it has been acknowledged that more than 90% of small businesses headquartered in either moderately or highly concentrated bank markets in U.S (Han, Fraser, and Storey 2009; Han, Zhang, and Greene 2017). In European countries, banking markets for SMEs have also become less competitive since 2011 (Wang, Han, and Huang 2020) and the low level of competition reduces SMEs' access to finance (Love and Peria 2015) and increases the concentration of borrowing from only a few leading banks (Fraser 2009; Bussière et al. 2021). In the UK, for instance, the small business lending market is extremely concentrated, with 85% of business accounts and nearly 90% loan volumes provided by the biggest four banks.[1]

SMEs' limited credit availability and reliance on bank finance could further drive managers to manipulate earnings for the purpose of signalling more creditworthiness to banks. This could be even more pronounced for some countries characterised by a lower degree of economic recovery after the financial crisis, such as PIIGS countries (Portugal, Italy, Ireland, Greece and Spain). Empirical evidence has shown that SMEs in PIIGS countries are more likely to face credit constraints (Andrieş et al. 2018) and to be refused in credit application (Lawless and McCann 2011). As a result, bank market power (e.g. Lerner) has a much stronger impact on SME finance (e.g. credit rationing) in such countries (Andrieş et al. 2018).

Furthermore, the US financial system is market-oriented in which voluntary and mandatory public disclosures are commonly applied, therefore facilitating managers to disclose meticulous financial information to the public. In contrast, most EU countries have bank-based financial systems where SMEs are not required to disclose financial information publicly, making them more informationally opaque and lacking track records of credit history (Wang et al. 2021). Except for these disadvantages, SMEs are also less capable of providing collaterals, causing them to be more financially constrained and therefore affecting their financial reporting decisions to attract bank creditors.

Agency theory suggests that due to the conflicts of interest which arise between managers and relevant stakeholders (especially creditors), managers act in the best interests of themselves instead of creditors (Jensen and Meckling 1976). With the changes in SME credit availability as a result of different lending infrastructures across countries, SMEs face inconsistent borrowing capacity and cost of bank debt. Therefore, managers may react in different ways to avoid undesirable credit conditions and loan terms, such as using their discretions in managing earnings. In this respect, our focus on the banking effect on SME borrowers could provide useful implications for improving SME credit access while controlling for banking market stability (Palacin-Sanchez, Canto-Cuevas, and di-Pietro 2018). Another merit of adopting an EU SME sample is that the cross-country variations allow inferences about a broader theoretical construct instead of specific mechanisms, for example, to understand

the unobservable social capital differences and differences in the demand for credit information. Therefore, it is worthwhile to conduct research focusing on EU SMEs under a framework that includes different aspects of institutional and macroeconomic factors.

This study builds on the strand of literature adopting Berger and Udell's (2006) lending infrastructure theoretical framework which refers to the rules and conditions that affect financial institutions' ability to lend. Such a lending infrastructure framework includes four components that represent major country-level institutional features: the information environment; the legal, judicial and bankruptcy environment; the social environment; and finally, the tax and regulatory environments. The importance of the lending infrastructure on SMEs has been widely acknowledged. For example, small business loan default rate is higher than average in those places with low levels of social infrastructure (DeYoung 2015) and the contract structure between small business borrower and loan officer is also dependent on the level of information infrastructure of the financial system (Berger and Udell 2002). In this paper, specifically, we examine the impact of the soundness of lending infrastructure on the earnings management behaviours of EU SMEs via the lens of SME financing. This is because, by influencing financial institutions' ability to lend, the lending infrastructure may, in turn, affect SMEs' incentives to manipulate earnings around debt financing in an effort to increase borrowing capacity and creditworthiness and to avoid debt covenant violations.

Thus, we adopt the theoretical concept of lending infrastructure as a lens and examine its impacts on earnings management behaviours of SMEs in 11 European countries. The final dataset comprises 46,340 firms over 2007–2015 and the main findings suggest that, **first,** in the EU countries, SMEs' earnings quality (financial reporting quality) is better in countries with better credit information sharing between lenders and credit reporting service providers, i.e. credit bureaus and credit registers, as evidenced by less absolute variations of earnings management. This finding indicates that in countries with better quality and availability of credit information, banks generally have better access to hard information[2] of their SME clients, leading to more transaction-based lending and SME managers are less incentivised to manage earnings. **Second**, SMEs have better earnings quality by engaging in less earnings management activities in countries with better judicial and bankruptcy protection systems, i.e. fewer procedures to enforce contracts and lower debt recovery costs. This result implies that banks are more confident in initiating financial contracts and more willing to engage in SME lending when there is less cost to enforce laws in commercial disputes and bankruptcy resolutions, consistent with Berger and Udell (2006), and thus, SME managers face fewer financial constraints and are less likely to manipulate earnings. **Third**, earnings quality is better in economies with a higher stock of social capital. Since a higher level of social capital can facilitate the writing and enforcement of financial contracts as well as relationship lending, which could ultimately increase SME borrowing capacity (Berger and Udell 2006), managers may also be less incentivised to manage earnings. This is especially the case for those SME-bank pairs that are established on soft and private information processing and acquisition for the purpose of reducing the information asymmetries and agency costs, consistent with evidence that EU commercial and corporate banks involved heavily in relationship lending with informationally opaque firms (Wang, Han, and Huang 2020). **Last**, stringent tax and regulatory systems can foster better earnings reporting quality by reducing SME earnings management activities. The mechanisms behind the effect can be explained in various aspects in Berger and Udell (2006); but in the context of the EU, they argue that the Single Banking Licence could lead to more bank consolidations within countries. One explanation of our finding is that, banks with greater market power (after consolidations) are more likely to invest in private information acquisition and build lending relationships with SMEs to mitigate agency problems (Petersen and Rajan 1995; Marquez 2002), causing earnings manipulation less necessary and effective.

Our study, as the first cross-country empirical analysis of the SME financial reporting using the lending infrastructure theoretical framework, examines lending infrastructure effects on SME financial reporting quality in the EU. In addition to providing novel evidence to the SME financial reporting quality literature from a perspective of the absolute degree of earnings management activities, it also contributes to the limited discussion in the existing literature on the impacts of country-level factors on financial reporting differences (e.g. Ali and Hwang 2000; Ball, Kothari, and Robin 2000; DeFond, Hung, and Trezevant 2007; Isidro, Nanda, and Wysocki 2016; Li et al. 2019). For example, previous literature has studied how a less informationally restrictive environment affects firms' freedom of information disclosure (Shroff, Verdi, and Yu 2014), the effects of legal environments

on management earnings forecast (Baginski, Hassell, and Kimbrough 2002), the influence of culture on earnings management (Doupnik 2008) and accounting judgments (Chand, Cummings, and Patel 2012) and how tax conformity affects accrual choices (Maydew 1997). However, previous research on the effects of country-level factors mostly examines the likelihood and frequency of voluntary disclosure in a single-country context and rarely pays attention to different extents of earnings management across economies. Our study fills the research gap and advances our understanding on the external determinants of earnings quality. Moreover, we consider a well-established institutional framework that allows for the investigation on heterogeneous information, legal, social and regulatory environments effects. To our knowledge, there are only a few studies that use a set of different country-level factors, such as legal environment (Li et al. 2019) and economic development (Gaio 2010), to examine financial reporting quality determinants in the literature. Our study provides a more complete framework of country-level factors. Besides, we take a step further to test the effects of country-level differences on SME earnings management behaviours using the lens of the Berger and Udell's (2006) lending infrastructure theoretical framework. Such a framework allows the incorporation of SME financing literature with earnings management literature. The only studies that examine lending infrastructure on small businesses so far are Mc Namara, Murro, and O'Donohoe (2017) which focuses on capital structure and Mc Namara, O'Donohoe, and Murro (2020) on credit rationing, both among European countries. However, there is little focus on the environmental settings of lending infrastructure and its implications on SME financial reporting quality (i.e. earnings management), which is the main purpose of our study.

The reminder of this paper is structured as follows. Section 2 reviews relevant literature and formulates research hypotheses. Section 3 describes data, variables and empirical models. Section 4 presents the findings. The last section concludes with discussion on its practical implications.

2. Literature and hypotheses development

2.1. Lending infrastructure and earnings management

Lending infrastructure is conceptualised as the rules and conditions that affect financial institutions' ability and decision to lend. Among many kinds of credit provided by financial institutions, bank finance is still the dominant source of external finance for EU SMEs due to their limited capability of accessing other sources of finance, although its usage is lower than trade credit for short-term purposes (Wang et al. 2021). Berger and Udell (2006) argue that the categorisation of lending technologies into either transaction-based and relationship lending is oversimplified and flawed. In such a simplified framework, transaction-based lending targets informationally transparent borrowers and those with traceable credit history, while relationship lending pays attention to the contrast. However, this neglects the heterogeneities among transaction-based lending techniques such as small business credit scoring and asset-based lending. To this argument, Berger and Udell's (2006) framework extends beyond and defines a lending technology as a unique combination of primary information source, screening and underwriting policies/procedures, loan contract structure, and monitoring strategies and mechanisms, which is subject to the lending infrastructure and affects SME credit availability.

In order to improve credit availability, SMEs have various incentives to manipulate their earnings (e.g. to signal a healthier financial position, Jacoby, Li, and Liu 2019). The agency theory suggests that agency problems exist between firm managers and banks in debt financing since managers pursue their personal gains such as compensation rather than collective interests (Jensen and Meckling 1976). From a banking perspective, such a conflict of interests could put banks at potential risk as they are less informed than business managers who have incentives to manage earnings to conceive banks for debt finance. Lending infrastructure, through the alteration of credit supply and lending standards, could affect SMEs' earnings management incentives in different ways. Existing literature suggests that debt covenants in debt contracts are set relatively high which require borrowing firms to maintain a threshold level of an accounting-based metrics (e.g. Ghosh and Moon 2010). Compared with large and publicly listed firms, SMEs that are more financially constrained and more reliant on bank finance, could face more stringent covenants (Vashishtha 2014), leading to undesirable outcomes such as increased lending rates and reduced credit supply that consequently worsen SME financing conditions. Furthermore, banks' pre and post loan origination monitoring could be costly; therefore, SMEs may become more

incentivised to engage in earnings management (Dichev and Skinner 2002; Beneish and Press 1993). Additionally, the incentives may as well be stimulated by a more established lending environment (e.g. infrastructure) that enables banks to set stricter covenants. To these arguments, in an economy that is subject to stricter and more established lending infrastructure, SME credit availability may reduce, leading to an increase in SME managers' incentives towards earnings management for the purpose of better bank credit access (e.g. looser debt covenants, lower lending rates).

2.2. The information environment

Asymmetric information between banks and their borrowers induces adverse selection problems because insiders have better information on firm default risk (Bharath, Sunder, and Sunder 2008). Bank's lending decision-making process involves largely the assessment on the level of transparency of borrowing firms. However, SMEs are especially more informationally opaque than their larger counterparts due to the lack of publicly available information and track record of credit history (Cassar, Ittner, and Cavalluzzo 2015). Therefore, banks faced with asymmetric information may either credit-ration SMEs by both loan amount and credit allocation (Stiglitz and Weiss 1981) or require higher interest rates and more collateral (Bester 1985), both reducing SME credit supply and potentially incentivising them to signal their credibility and future prospects through manipulation of earnings information (Merritt 2013).

Previous literature has suggested that banks can overcome asymmetric information problems through screening and monitoring (e.g. Boyd and De Nicolo 2005). Meanwhile, the information-sharing arrangements between lenders provide an alternative approach. These arrangements can be either voluntary (e.g. private credit bureau) or imposed by regulation (e.g. public credit registers, Miller 2003; Djankov, McLiesh, and Shleifer 2007), both stimulating information sharing and positively correlated to bank lending (Berger and Udell 2006).

Berger and Udell (2006) argue that credit bureaus or credit registers also reduce the incumbent bank's informational advantage over its competitors and its ability to hold up its borrowers and extract information rents. Karapetyan and Stacescu (2014) examine the effects of information sharing on information acquisition and show that information sharing via credit bureaus or credit registers improves banks' willingness to invest in soft (private) and non-verifiable information acquisition. For the incumbent banks, when borrowers' hard information is shared, their soft information remains the only source of informational rents. The higher marginal benefits from investing in the acquisition of soft information motivate banks to research further about their borrowers in order to reduce credit risk. Banks may also charge lower interest rates in the change of credit market competition, enhancing borrowers' performance and reducing the moral hazard problem in earnings management.

Besides, the information-sharing arrangements can discipline SMEs as their negative reputation could be made visible to other potential lenders (Padilla and Pagano 2000). In order to maintain a sound reputation to avoid financial constraints and loan rejections, SMEs may be incentivised to exert more effort to improve the integrity and quality of financial information, especially on earnings. Therefore, information sharing may reduce the SMEs' cost of credit and incentives to manage earnings for better access to finance.

Hypothesis 1: SME earnings management (financial reporting quality) is less prevalent (higher) in an economy that is subject to a greater extent of information sharing.

2.3. The legal, judicial and bankruptcy environments

An effective legal system in an economy is a prerequisite for protecting outside investors or creditors (e.g. banks) by giving them the rightful power to monitor and discipline insiders' (e.g. SME managers) opportunistic behaviours such as earnings management (Demirgüç-Kunt and Maksimovic 1998), and to enforce contracts if necessary. Leuz, Nanda, and Wysocki (2003) argue that the incentives to manage accounting earnings stem from the conflict of interests between firms' insiders and outsiders. They show that robust investor protection and powerful legal enforcement reduce accrual earnings management since insiders (e.g. managers) have limited private control benefits and are less incentivised to manage earnings to conceal firm performance from outsiders (e.g. banks). Similarly, Hung (2001) finds that for countries with stronger shareholder protection, managers are

less likely to opportunistically manipulate accrual accounting. Furthermore, the absolute level of earnings management that is affected by the excessive control power detached from controlling shareholders' (insiders) cash flow rights is found to be significantly limited in countries with strong minority shareholder protection, efficient judicial systems, and disclosures standards (Haw et al. 2004). Bushman and Piotroski (2006) also show that well-enforced legal/judicial systems and investor protections reflect adverse news in reported earnings faster. Overall, the existing evidence suggests that earnings management would be more pervasive in countries where legal environments are weaker and less investor-friendly.

Specifically, for banks, the efficiency of legal, judicial and bankruptcy environments can influence commercial laws relating to property rights and their enforcement, which in turn influence the effectiveness of loan contracts between banks and their borrowers. For instance, collateralisation mitigates agency problems regardless of lending technologies and requires clear and well-defined commercial law and efficient judicial and bankruptcy systems (Inderst and Mueller 2007). However, previous studies have primarily focused on large or publicly listed firms, with little evidence on the relationship between legal system effectiveness and SME earnings management (e.g. Leuz, Nanda, and Wysocki 2003). The distinction is important because compared with large or publicly listed firms, SMEs are more likely to face financial constraints and their growth may be particularly affected under weaker legal systems (Beck, Demirgüç-Kunt, and Maksimovic 2005). These disadvantages in bank financing may in turn incentivise SME managers to abuse their discretion in financial reporting for various reasons such as improving creditworthiness for the purpose of accessing bank finance (Kanagaretnam, Lobo, and Mathieu 2003). Thus, strong legal systems may stimulate and protect SMEs' growth and reduce financing constraints, leading to fewer incentives in managing earnings opportunistically. We, therefore, hypothesise as follows:

Hypothesis 2: SME earnings management (financial reporting quality) is less prevalent (higher) in an economy where legal, judicial and bankruptcy protection systems are more efficient.

2.4. The social environment

With respect to the impacts of the social environment, social capital and trust are two crucial influences in contractual writing and enforcements (Berger and Udell 2006). Social capital is defined as the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalised relationships of mutual acquaintance and recognition (Bourdieu 1985), and features of social life - networks, norms and trust, enable participants to act together more effectively to pursue shared objectives (Putnam 1993). Voluntary cooperation is facilitated and selfish opportunism is reduced in an environment with a substantial stock of social capital (Putnam 1993). For example, Hasan et al. (2017) find that banks have less strict collateral and covenant requirements for firms headquartered in regions with a higher level of social capital, and debt holders believe social capital works as an environmental pressure and restraining function towards firm managerial opportunism in debt contracting. Therefore, the managerial opportunism in earnings management may also be limited by the managers' perceived marginal costs and environmental pressure.

Besides, financial contracts (e.g. loan contracts) are the ultimate trust-intensive contracts, and this kind of trust does not only build on the legal enforceability of contracts but also on the trust between lenders and borrowers (Guiso, Sapienza, and Zingales 2004). As a result, borrowing firms may be less likely to engage in opportunistic behaviours in a better social environment. Jha (2017) also shows that managerial misbehaviour is less common in regions with higher social capital because of higher self-imposed moral standards, more external monitors and expensive costs of a bad reputation, and firms in regions with higher social capital have lower incentives towards financial fraud, lower levels of discretionary accruals, and much more readable (higher quality) financial reports.

Although empirical studies have found favourable impacts of social capital on SMEs from different perspectives such as equity financing (Dowling et al. 2019), performance (Adlesic and Slavec 2012) and growth (Clarke, Chandra, and Machado 2016), there is little evidence on its impacts on SME earnings management behaviours. The favourable impact of social environment on SME credit availability is effective through relationship lending that is advantageous in alleviating information asymmetries and monitoring potency compared with transaction-based lending (Han et al. 2014). Dowling et al. (2019) support this argument using a large SME

survey sample in Europe, whereby the differences in countries' social capital of trust can be directly and positively related to cross-country variations in SMEs' confidence in financing. Furthermore, Harhoff and Korting (1998) show that SMEs which share considerable trust with bank lenders also benefit from maintaining a more prolonged lending relationship in a German sample. Consequently, SMEs' incentives in engaging earnings management can be reduced by the benefits of a sustainable lending relationship with their main banks, such as lower lending rates. We therefore hypothesise as follows with regard to social-environmental effects.

Hypothesis 3: SME earnings management (financial reporting quality) is less prevalent (higher) in an economy that has a higher level of social capital.

2.5. The tax and regulatory environments

Sound regulatory quality may effectively limit managers' incentives to manage earnings through tax authorities and regulation abuse (Watts and Zimmerman 1986). In a stringent regulatory environment, managers are expected to behave more disciplined and are supervised in the reporting process of financial information, to meet the requirements set out by regulators. In a less stringent regulatory environment, managers could be more opportunistic and motivated to manage earnings for their personal gain, thus damaging financial reporting quality.

Desai, Dyck, and Zingales (2007) conjecture that governments could be the largest minority 'shareholders' due to their tax claim right on cash flow. However, unlike most minority shareholders, the government does not face a free-rider problem in monitoring and is more interested in firms' taxable profits. Thus, a sound corporate tax system is likely to monitor the private benefits extracted by controlling shareholders and the increased tax enforcement can strengthen corporate governance. In most continental countries where banks, governments and founding families are shareholders of companies, external financial reporting is mainly for creditor protection and tax purposes. Although it is not the tax authorities' priority to improve corporate governance and financial reporting quality, their interests in the firms' taxable profits have a positive impact due to monitoring and tax enforcement. This argument has been empirically supported by Hanlon, Jeffrey, and Nemit (2014) who show a positive association between tax enforcement strength and financial reporting quality, which in turn suggests that tax enforcement is negatively associated with managerial opportunism. Sercu, Vander Bauwhede, and Willekens (2002) find that private firms' efforts to manage taxes affect their reported earnings quality; Lin, Mills, and Zhang (2014) find that compared to public firms, private firms are perceived a significantly higher level of earnings management or earnings deferrals when they expect a reduction in the tax rate in the following year; and Coppens and Peek (2005) argue that private firms' incentives for earnings smoothing may increase in a stringent tax system. As for the context of the current study, according to the European Commission (Vicari 2015), tax regimes across Europe have a stronger influence on SMEs than on large firms, because SMEs are unlikely to utilise international tax planning strategies and suffer from a comparatively higher tax compliance burden. Therefore, we argue that the mitigating effect of stringent tax regimes on earnings management found in previous literature may also hold for SMEs.

Many existing studies have investigated the effects of the regulatory environment, besides tax regulations and stringency, on earnings management for large or publicly listed firms (e.g. Cohen, Dey, and Lys 2008). For example, relevant studies have documented that firms manage discretionary accruals under the heightened external pressure, such as political pressure (Watts and Zimmerman 1986; Jones 1991) and capital regulations (Schrand and Wong 2003) and in response to specific regulatory changes such as the Sarbanes Oxley Act of 2002 in the U.S. (Koh, Matsumoto, and Rajgopal 2008). Berger and Udell (2006) believe that the regulatory environment affects SME credit availability by constraining the financial institution structure through government policies that restrict foreign entry, efficient use of some of the transaction lending technologies and limiting competition. For example, to counter the development of the market environment since the financial crisis of 2007–2008, the European banking sector has tailor-made regulatory policies that lead to a wave of strategic mergers, which in turn, resulted in more concentrated banking markets.[3] Empirical evidence has also suggested that larger-sized banks are more likely to invest in private information acquisition and SME banking relationships to alleviate moral hazard problems and to improve SME credibility (e.g. Petersen and Rajan 1995; Marquez 2002). Therefore,

SMEs may find it less necessary to manage earnings opportunistically. To all these arguments, we propose our last hypothesis.

Hypothesis 4: SME earnings management (financial reporting quality) is less prevalent (higher) in an economy that is subject to more stringent tax enforcement and regulatory systems.

3. Data and variables

3.1. Research sample

This study adopts secondary data to empirically examine the proposed hypotheses. We obtained financial accounting information of 46,340 SMEs across 11 European countries[4] over the period of 2007–2015 from Amadeus database[5] provided by BvD, in which 99% of the samples are private firms. An advantage of using Amadeus is the harmonised international format of financial statements. SMEs are defined according to the European Commission as those firms which have less than 250 employees and less than 50 million euro of turnover (or 43 million euro of total balance sheet items) to ensure the homogeneousness in terms of reporting unit.[6] We also exclude sample firms which do not meet the criteria in some particular ways.[7] Macroeconomic-level data used to capture lending infrastructure soundness following the Berger and Udell (2006) framework is collected from (or calculated based on) the World Bank (Doing Business, Worldwide Governance Indicators, and Global Financial Development databases), Heritage Foundation, and European Social Survey. They are matched with firm-level data by year and country code.

3.2. Earnings management

We estimate the absolute level of earnings management by using performance-based discretionary accruals models.[8] Specifically, the Jones model (Jones 1991) and the modified Jones model (Dechow, Sloan, and Sweeney 1995). These two models are predominantly adopted in the literature, although several critiques have been raised with regard to misspecification problems in estimating discretionary accruals in the literature (e.g. Kothari, Leone, and Weasley 2005). However, existing literature states that no single accrual-based model is free from the model misspecification problem, and the Jones and the modified Jones models exhibit less misspecification than other accrual models (Stubben 2010).

We follow the exact procedures as detailed in Jones (1991) and Dechow, Sloan, and Sweeney (1995). The former designs a model that takes the consideration of sales revenue and fixed assets in the estimation of accruals. Dechow, Sloan, and Sweeney (1995) modify the Jones model by decomposing accruals into current and non-current accruals and adjusting for growth in credit sales, thus increasing the power to capture revenue manipulation. Both models take the influence of operations and external factors into considerations and thus do not assume non-discretionary accruals to be constant. The difference between these two models is that 'changes in revenue' are replaced by 'cash-accompanying revenue' in the modified Jones model. The estimation of earnings management variables is presented in Appendix B.

Table 1 summarises the weighted averaged values of earnings management variables using both Jones and modified Jones models for each country from 2007 to 2015. From the mini trend charts we show that the lowest value (less earnings management and higher earnings quality) for most countries is in the year 2008, amid the Financial Crisis. The absolute level of earnings management reached the peak in 2012 and 2013. One possible explanation could be the European sovereign debt crisis which peaked in 2012. The causes of this debt crisis include the financial crisis of 2007–2008, real estate bubbles and the Great recession of 2008–2012. Since it results in low economic growth, higher tax rates, increased credit costs, and social upheaval, SMEs may have more incentives to manage their earnings.

3.3. Lending infrastructure

We follow the Berger and Udell's (2006) lending infrastructure framework for SMEs at a macroeconomic level and include four components representing major country-level institutional features: the information

Table 1. Weighted averaged (by total assets) mean values of Earnings Management values.

Country	*DACC (Modified Jones)* *DACC2 (Original Jones)*	2007	2008	2009	2010	2011	2012	2013	2014	2015	Trend
Germany		3.69	1.79	2.52	3.61	2.49	3.09	4.51	2.17	3.23	
		3.81	1.88	1.98	3.89	3.40	6.51	4.21	2.06	2.46	
Estonia		5.30	2.18	2.93	5.57	3.49	4.44	5.43	2.78	4.29	
		5.10	2.21	3.09	6.42	4.22	8.02	5.15	2.89	3.19	
Spain		3.44	2.02	2.11	4.17	2.56	3.51	4.64	2.26	3.65	
		3.39	2.13	2.06	4.75	3.17	6.92	4.35	2.19	2.61	
France		3.72	1.37	1.87	3.90	2.29	3.78	4.82	2.15	3.90	
		3.74	1.41	1.93	4.51	3.09	7.86	4.45	2.20	2.87	
UK		2.63	1.70	2.62	3.86	2.95	2.86	5.19	2.44	4.57	
		2.58	1.70	2.09	4.20	4.19	6.89	4.65	2.33	3.32	
Hungary		4.28	1.71	2.64	6.25	3.35	4.48	6.96	2.97	5.18	
		4.13	1.81	2.47	6.96	4.95	9.80	6.42	2.99	3.46	
Ireland		2.29	1.91	2.94	3.66	3.81	4.15	5.06	2.99	2.61	
		2.42	2.00	1.90	4.33	3.81	7.15	4.94	2.87	4.04	
Netherlands		2.30	2.28	2.49	2.94	2.29	2.90	3.52	2.26	3.52	
		2.16	2.36	2.05	3.21	2.63	5.52	3.32	2.18	2.76	
Poland		5.56	1.67	2.44	6.57	3.46	6.12	7.41	3.19	3.39	
		5.61	1.75	2.62	7.77	4.26	10.78	7.10	3.24	2.80	
Portugal		3.61	1.71	2.19	5.03	2.71	3.42	5.65	2.22	4.75	
		3.50	1.76	2.11	5.59	3.81	7.58	5.16	2.21	3.11	
Slovenia		4.26	2.01	2.75	6.37	3.36	4.20	6.76	3.01	5.82	
		4.10	2.25	2.33	7.14	4.31	9.05	6.26	3.10	3.71	

Note: DACC is the estimated discretionary accruals generated from the modified Jones model (Dechow, Sloan, and Sweeney 1995), DACC2 uses the original Jones model (Jones 1991). See more details of the estimation of the variables in Appendix A, country-level mean values presented in this table are weighted averaged by firm total assets at a country-year level.

environment; the legal, judicial and bankruptcy environment; the social environment; and finally, the tax and regulatory environment.

The information environment includes two aspects: the accounting infrastructure and the sharing of information. In this study, we focus on the sharing of credit information and use the depth of credit information index (DOCII, 0 = low to 8 = high) from the World Bank as a measure. According to the World Bank's definition, the depth of credit information measures rules and practises affecting the coverage, scope, accessibility, and quality of credit information available through either a public or private credit registries. A higher value approaching 8 indicates there is more credit information available, from either a credit registry or a credit bureau, to facilitate lending decisions. The sharing of credit information should be helpful to alleviate information asymmetries between lenders and SMEs and to constrain managers' moral hazard problems.

Legal, judicial, and bankruptcy environments in a country are important determinants of loan contracting. The influence of the legal environment is reflected in business lending activities which consist of the commercial laws that specify the property rights associated with a commercial transaction (Berger and Udell 2006). In order to measure the efficiency of the legal system in a country, we use the property rights index (IEFPR) released by Heritage Foundation, which measures the ability of individuals to accumulate private property, secured by laws that are fully enforced by the government. The higher the value of the index indicates better protection of property rights and a more efficient legal system. The judicial and bankruptcy environments are associated with the enforceability of commercial laws when it comes to disputes and bankruptcy. Therefore, to measure the efficiency of the judicial environment, we use the procedures of contract enforcement (PROCONS), the fewer number of which indicates a more effective judicial system. In this study, we employ the cost of debt recovery to proxy for the bankruptcy environment (COSTRESOLV), which is negatively related to the efficiency of bankruptcy systems.

Berger and Udell (2006) propose that the level of social capital and trust might be influential to the content and enforcement strength of financial contracts, which could in turn, affect SME credit supply. We argue that the positive effect of high social capital on the sticky lending relationship between banks and SMEs could also alter SMEs' incentives in earnings management. Therefore, we follow Guiso, Sapienza, and Zingales (2004) and

use electoral participation from the European Social Survey (VOTE) to measure an economy's social capital. In the survey, section B13 asks if the interviewee voted in the last national election. We code those who answered yes to 1, 0 otherwise, and use the country-year level average as an indicator at macroeconomic-level. A higher value approaching 1 indicates high selectorial participation and social capital.

To proxy the tax environment, we use the total tax and contribution rate (TAXRATE) to measure the tax rate payable by the business as a share of commercial profits. One advantage of this measure is that it considers all taxes and contributions that are paid by a standardised business and reflects the complexity of an economy's tax compliance system. The higher rate of total tax and contribution stands for a heavier burden of taxes for business in this country. Regulatory quality (REGQUALITY) is employed to measure the government's overall regulatory capacity, which proxies the quality of a government's implementation of regulations and policies that permit and promote private sector development; higher values suggest a more regulated environment.

Table 2 displays the summary statistics of the lending infrastructure variables (main independent variables). The mean value of credit depth of information index in the sample is 5.22 (out of 8) with some variations across countries as institutions in Germany and the UK have the highest scores and Slovenia the lowest. Property rights are the lowest in Poland whereas Germany and the Netherlands have the strongest legal protection. As for the judicial efficiency, with regard to procedures to enforce a contract, the Netherlands has the lowest values which indicate the highest efficiency and Poland being the worst in our sample. The cost to recover a debt variable also varies across sample countries, showing differences in the efficiency of bankruptcy protection systems. The stock of social capital is the lowest in Estonia, with electoral participation of around 68%. The mean percentage of sample countries' electoral participation is about 77% and the social cohesion of these sample countries is similarly strong. Regarding the total tax rate, it is not surprising that the rate is the lowest in Ireland and the highest in France. The UK and Netherlands are deemed to have the most established regulatory environment as suggested by our proposed measure, but the least established in Slovenia. In sum, the statistics are close to those of Mc Namara, Murro, and O'Donohoe (2017).

3.4. Other variables

To account for sample heterogeneity and address omitted variable bias, we include other factors that could affect earnings management at both firm and country levels.[9] First, we control for firm performance using profit/loss before taxation to total assets. Previous research commonly hypothesises a negative association between firm performance and incentives for earnings management (e.g. Lee, Li, and Yue 2006). Next, we include a variable to account for the growth opportunity at industry level proxied by moving average sales growth rate (Degryse, de Goeij, and Kappert 2012). We predict firms with greater growth opportunities to strengthen earnings management incentives since their earnings during the reporting period could be more volatile and less sustainable, along with higher external finance demand (Richardson et al. 2005; Nissim and Penman 2001). Finally, we account for firm size[10] by the natural logarithm of firm total assets in US dollars (inflation adjusted) as a proxy for bankruptcy cost (Berger and Udell 1995), bargaining power (Howorth and Moro 2012), and information opaqueness (Wang, Han, and Huang 2020). Hadlock and Pierce (2010) has shown that size is a particularly useful predictor of financial constraints and therefore, managing earnings becomes less necessary for larger firms. At the country-level, we follow Cohen, Dey, and Lys (2008) and employ GDP annual growth rate to capture the general macroeconomic condition / performance. It is expected that borrowers' risk-level would decrease as perceived by banks, which may result in relaxed lending bank lending standards and therefore, earnings management becomes less necessary. The definitions and original sources of variables are presented in Appendix A.

3.5. Baseline model

We employ the following baseline model (Eq. 1) to examine if lending infrastructure characteristics affect SME earnings management (i.e. earnings quality) after controlling for firm and country-level heterogeneities (Hypotheses 1-4). The explained variable *EM* is firm *i*'s absolute level of earnings management in year *t*,

Table 2. Basic descriptive statistics of yearly-averaged Lending infrastructure variables.

	Germany	Estonia	Spain	France	UK	Hungary	Ireland	N'lands	Poland	Portugal	Slovenia
Depth of credit information index (DOCII)											
Mean	6.50	5.50	5.50	4.50	6.50	4.75	5.50	5.50	6.25	5.50	1.63
St.dev.	0.87	0.87	0.87	0.87	0.87	0.43	0.87	0.87	1.09	0.87	1.73
Median	6.00	5.00	5.00	4.00	6.00	5.00	5.00	5.00	6.00	5.00	1.00
Property Rights (IEFPR)											
Mean	90.00	86.11	70.00	76.67	88.89	65.56	89.44	90.00	56.11	70.00	57.78
St.dev.	0.00	4.58	0.00	4.71	2.08	4.97	1.57	0.00	4.58	0.00	4.16
Median	90.00	90.00	70.00	80.00	90.00	65.00	90.00	90.00	60.00	70.00	60.00
Procedures to enforce a contract (PROCONS)											
Mean	31.00	34.67	40.56	29.00	29.89	34.00	21.00	26.00	35.67	35.22	32.00
St.dev.	0.00	0.47	0.68	0.00	0.99	0.00	0.00	0.00	1.89	1.75	0.00
Median	31.00	35.00	40.00	29.00	29.00	34.00	21.00	26.00	37.00	34.00	32.00
Cost to recover a debt (COSTRESOLV)											
Mean	8.00	9.00	12.56	9.00	6.00	14.50	9.00	3.50	15.00	9.00	5.78
St.dev.	0.00	0.00	1.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.99
Median	8.00	9.00	11.00	9.00	6.00	14.50	9.00	3.50	15.00	9.00	4.00
Electoral Participation (VOTE)											
Mean	0.82	0.68	0.80	0.74	0.72	0.75	0.75	0.83	0.71	0.72	0.72
St.dev.	0.01	0.03	0.02	0.04	0.01	0.02	0.03	0.02	0.02	0.02	0.02
Median	0.82	0.69	0.81	0.75	0.72	0.74	0.76	0.84	0.72	0.73	0.73
Total Tax Rate (TAXRATE)											
Mean	47.50	51.90	52.43	66.30	34.58	52.29	25.69	39.58	41.36	42.26	33.54
St.dev.	1.86	5.97	8.25	1.60	1.21	3.34	0.21	1.08	1.71	0.55	2.33
Median	48.80	49.40	55.80	66.10	34.70	52.00	25.60	39.40	40.30	42.30	32.90
Regulatory Quality (REGQUALITY)											
Mean	1.58	1.47	1.03	1.20	1.75	0.99	1.71	1.77	0.95	0.87	0.72
St.dev.	0.06	0.11	0.17	0.07	0.09	0.15	0.12	0.03	0.09	0.15	0.10
Median	1.56	1.42	1.06	1.16	1.77	1.02	1.70	1.77	0.97	0.82	0.69

Note: Variable definitions are presented in Appendix A.

measured by the estimated discretionary accruals using the modified Jones model (or the original Jones model for robustness check, see Appendix B). The main explanatory variables X is a vector of lending infrastructure soundness proxies, and C is control variables at either firm, industry or country level. α_i denotes unobservable individual effects and ϵ_{it} is the remainder disturbance.

$$EM_{it} = \beta_0 + \beta_1 \times X_{ct-1} + \beta_2 \times C_{it(t-1)} + \alpha_i + \varepsilon_{it} \quad (1)$$

The baseline model (Eq.1) is estimated by the within-groups estimator (fixed-effect) following the Hausman test on the validity of the assumption of orthogonality of regressors and errors. The test suggests that between-groups estimators could lead to inconsistent estimates. The basic descriptive statistics of the main variables are presented in Table 3, followed by the correlation matrix table (Table 4) which shows that the only pair of variables that could potentially cause multicollinearity problem (> 0.6) is between the *index of the procedures required to enforce a contract (PROCONS)* and the *index of the cost required to recover a debt (COSTRESOLV)*. However, we argue that the correlation between them (0.63) could be exaggerated as the pairwise correlation coefficient is computed using the full observation dataset that includes duplicates for country-level variables. Nevertheless, it is not of a concern of perfect collinearity[11] as the correlation coefficient between them is less than 0.8.

4. Empirical results

4.1. Baseline results

The primary purpose of the baseline equation (Eq. 1) is to investigate the relationship between lending infrastructure soundness and SME financial reporting quality, which is higher for those SMEs who have a less absolute

Table 3. Descriptive statistics.

Variables	Obs.	Mean	Median	Std.Dev.	P1	P99
DACC	298,543	3.25	1.64	4.21	0.02	20.31
DACC2	298,543	3.74	1.88	4.91	0.02	24.04
DOCII	276,278	5.20	5.00	1.21	3.00	8.00
IEFPR	298,543	72.86	70.00	10.60	40.00	90.00
PROCONS	298,477	34.08	32.00	5.07	29.00	42.00
COSTRESOLV	298,477	10.46	9.00	2.55	4.00	15.00
VOTE	284,195	0.77	0.78	0.05	0.69	0.84
TAXRATE	298,493	54.98	57.10	11.30	20.80	69.00
REGQUALITY	298,543	1.12	1.15	0.27	0.40	1.80
SALESGR	298,543	0.02	0.01	0.28	−0.81	1.01
ROA	297,912	5.47	3.93	11.79	−28.54	42.28
SIZE	298,543	16.47	16.39	1.02	14.24	19.28
GDPGR	298,543	0.35	0.64	2.48	−7.30	5.02

Note: Variable definitions are presented in Appendix A.

Table 4. Correlation matrix of main variables.

Variables	DOCII	PROCONS	COSTRESOLV	VOTE	TAXRATE	REGQUALITY	SALESGR	ROA	SIZE	GDPGR
DOCII	1.000									
PROCONS	0.239	1.000								
COSTRESOLV	0.048	**0.633**	1.000							
VOTE	0.147	0.426	0.201	1.000						
TAXRATE	−0.207	−0.477	−0.164	−0.125	1.000					
REGQUALITY	0.014	−0.457	−0.172	0.273	0.321	1.000				
SALESGR	−0.068	0.004	0.013	0.036	0.015	0.028	1.000			
ROA	−0.026	−0.091	−0.028	−0.012	0.044	0.082	0.130	1.000		
SIZE	0.075	0.084	−0.006	0.026	−0.069	0.016	−0.078	−0.106	1.000	
GDPGR	0.023	−0.175	0.044	−0.053	0.163	0.196	0.105	0.099	−0.048	1.000

Note: Pairwise correlation coefficients using the final firm-country sample, variable definitions are presented in Appendix A.

level of earnings management. Each element of lending infrastructure is represented by at least one variable on information, legal, social and regulatory environments. The baseline results are presented in Table 5. To check the robustness and stability of coefficients of our interested variables (lending infrastructure), our analysis starts from simplified models and gradually includes control variables into the models. Specifically, Model 1 only includes the main explanatory variables[12], and Models 2 and 3 include both firm and industry-level control variables and macroeconomic-level controls. The goodness-of-fit measure (adjusted R-squared) improves along with the addition of control variables. We also check the robustness of our baseline findings by using alternative earnings management measures (modified Jones vs. original Jones models), where models with a prime sign (') has exactly the same specification and estimator as the one without the prime sign except for that DACC is replaced by DACC2 (see Appendix B). The results provide evidence that all components of the lending infrastructure are important determinants of SME financial reporting quality and we elaborate our results in detail as follows.

4.1.1. The informational environment

For the analysis on the information environment, the variable included in the regression analysis is DOCII, measuring the availability, depth, and accuracy of credit information to credit bureaus or credit registers in a country. In Table 5, all the DOCII coefficients across models are negatively significant at a 1% level, indicating that SME earnings management (financial reporting quality) is lower (higher) in countries with better credit information sharing, supporting Hypothesis 1. One reason behind this result could be that, as stated in previous literature (e.g. Miller 2003), the availability and the depth of information shared in private and public institutions (e.g. credit bureaus) efficiently stimulates information sharing, reduces information asymmetries, and enhances banks' lending to SMEs. Consequently, due to improved credit availability, SMEs are less incentivised to manage

Table 5. Baseline results.

Outcome variable:	Model 1 DACC	Model 1′ DACC2	Model 2 DACC	Model 2′ DACC2	Model 3 DACC	Model 3′ DACC2
Main regressors						
DOCII	−0.273***	−0.919***	−0.229***	−0.890***	−0.335***	−0.927***
	(0.014)	(0.024)	(0.014)	(0.024)	(0.014)	(0.024)
PROCONS	0.240***	0.022	0.228***	0.011	0.363***	0.059*
	(0.015)	(0.032)	(0.015)	(0.032)	(0.015)	(0.032)
COSTRESOLV	0.374***	0.392***	0.388***	0.408***	0.315***	0.382***
	(0.013)	(0.022)	(0.013)	(0.023)	(0.013)	(0.023)
VOTE	−1.667***	−1.486***	−1.498***	−1.426***	−3.569***	−2.159***
	(0.331)	(0.494)	(0.332)	(0.499)	(0.334)	(0.500)
TAXRATE	−0.092***	−0.174***	−0.094***	−0.176***	−0.057***	−0.163***
	(0.003)	(0.005)	(0.003)	(0.005)	(0.003)	(0.006)
REGQUALITY	−6.966***	−8.111***	−6.969***	−8.190***	−6.875***	−8.156***
	(0.129)	(0.204)	(0.130)	(0.208)	(0.128)	(0.207)
Control variables						
SALESGR			0.601***	0.465***	0.710***	0.504***
			(0.031)	(0.062)	(0.031)	(0.062)
ROA			−0.008***	−0.016***	−0.007***	−0.016***
			(0.001)	(0.003)	(0.001)	(0.003)
SIZE			−0.239***	−0.544***	−0.257***	−0.551***
			(0.039)	(0.081)	(0.039)	(0.081)
GDPGR					−0.197***	−0.070***
					(0.003)	(0.005)
Others and statistics						
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Estimator	F.E.	F.E.	F.E.	F.E.	F.E.	F.E.
No. of observations	287,047	287,047	286,441	286,441	286,441	286,441
No. of firms	46,725	46,725	46,671	46,671	46,671	46,671
R-squared	22.4%	39.0%	22.5%	43.2%	23.6%	43.6%

Note: *, **, *** respectively represents significance at 10%, 5% and 1% level. Robust standard errors are reported in parentheses. F.E. stands for fixed-effect (within-groups) estimator. The adjusted R-squared values for F.E. models account for variations captured by firm fixed-effects. Detailed definitions and data sources of the above variables are presented in Appendix A.

earnings for debt financing. This finding adds supporting evidence to the agency theory (Jensen and Meckling 1976), the information asymmetry theory (Richardson 2000), and the contracting theory (Fama 1985). Another reason could be that in countries with a better credit information sharing system, adverse reputation could be easily available to other potential lenders, resulting in lending avoidance and borrowing discouragement in the future (Padilla and Pagano 2000)

4.1.2. The legal, judicial, and bankruptcy environments

The legal environment is represented by the efficiency of judicial and bankruptcy systems. The variable PROCONS captures the procedures needed to enforce a contract and COSTRESOL reflects the cost to recover a debt in a country. Berger and Udell (2006) argue that a country's efficient legal, judicial, and bankruptcy environments can influence commercial law enforcement which could in turn influence loan contracting between banks and SMEs, thus improving SME credibility. As a result, SMEs' growths are protected and they should have fewer incentives to manage earnings. As expected, the coefficients of PROCONS and COSTRESOLV are significantly positive at least at 10% except for Model 3', where PROCONS is not statistically significant after macroeconomic controls are added. These results support Hypothesis 2 and provide additional evidence to the agency theory and the contracting theory whereby SMEs are more likely to manage earnings in countries with more procedures to enforce a contract and where there are higher costs to recover a debt. Overall, our results suggest that efficient legal systems mitigate firm managers' incentives to manipulate earnings and improve financial reporting quality of SMEs in European countries, consistent with previous studies using samples of public companies (e.g. Bushman and Piotroski 2006; Burgstahler, Hail, and Leuz 2006).

4.1.3. The social environment

Following Guiso, Sapienza, and Zingales (2004), we measure the social environment by social capital using electoral participation. The coefficients of the VOTE variable are significantly negative across all models at 1% level. The finding[13] shows supporting evidence to Hypothesis 3, whereby earnings management is less pervasive in economies with more stock of social capital. The explanation for these results could be that in a country with higher social cohesion, there are more opportunities for financial contracting, relationship lending, and reduced incentives for moral hazards (Ferrary 2003). Banks that maintain a prolonged lending relationship with SMEs may charge lower interest rates (Harhoff and Korting 1998) and have motives for monitoring SMEs (e.g. Han et al. 2014), both of which could lead to reduced incentives in SME earnings management. Specifically, the results add support to studies such as Hasan et al. (2017) that believe social capital works as an environmental pressure and restraining function towards firm managerial opportunism in debt contracting. Besides, Berger and Udell (2006) show that in an environment with more social capital, SME credit availability will be improved and is most likely via relationship lending.

4.1.4. The tax and regulatory environments

In Table 5, the total tax and contribution rate (TAXRATE) is negatively and significantly related to earnings management at 1% level in all models, suggesting that a more stringent tax regime limits earnings management behaviours, adding supporting evidence to previous studies that have documented the monitoring effect of a country's tax system in SMEs' managerial opportunism through the government's interests in SMEs' taxable profits (e.g. Desai, Dyck, and Zingales 2007). Furthermore, as expected, the coefficients of REGQUALITY are significantly negative, indicating that earnings management behaviours are more common in a less stringent regulatory environment. The results suggest that higher levels of regulatory quality in the banking industry such as strict capital regulations, bank supervision, and interbank competition regulations may improve SMEs' financing conditions and reduce SMEs' incentives and necessities to manage earnings for credit access. Taken together, the empirical evidence supports Hypothesis 4.

4.2. Additional robustness tests

Apart from using alternative model specifications and earnings management estimates in Table 5, we further test the robustness of the baseline findings by modifying Model 3 (Table 5), which is the full control variable model, in some particular ways.[14] We cluster the standard errors of the baseline model at a country-level to allow for the relatedness in terms of the prevalence of earnings management activities for observations within clusters (i.e. countries). The estimation output (Model 1, Table 6) is consistent with the baseline model except for that the depth of credit information index becomes statistically insignificant, although the sign of coefficient does not alter. In addition, we test in Table 6 if the above findings are driven by a specific group of SMEs with similar attributes by regrouping them according to size (Models 2–4) and country (Models 5 and 6). In a succinct summary, our baseline results are overall robust.

Although all firms in our sample are SMEs, their size varies significantly. We therefore test if the baseline findings are driven by a specific size group of firms by regrouping the sample into three (Models 2–4) as micro firms ($<$ 10 employees), small firms (10-49) and medium-sized firms (50-249). This regrouping is inspired by the early literature which studies the relationship between firm size and financial reporting quality, e.g. Watts and Zimmerman (1986) which show that larger firms are more likely to make income-decreasing accounting method choices under more political scrutiny. Thus, firm size might be associated with firm reputation and potential political costs that affect their accounting choices. However, our results are consistent with the baseline model, suggesting that the impact of social environment on earnings management incentives does not alter across SMEs in different size bands.

Next, the sample is regrouped into two categories, big four countries[15] and others (Models 5 and 6). Despite the differences between the big four and the rest of the countries in terms of the scales of economies, the sign and significance of the coefficients of the elements composing lending infrastructure remain consistent with the baseline model, suggesting that the baseline results are not likely to be driven by a specific group of economies. The control variables also display strong robustness. Furthermore, we respecify baseline Model 3 (Table 5) to

Table 6. Additional robustness tests.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Outcome variable	DACC	DACC (modified Jones, by Dechow, Sloan, and Sweeney 1995)			DACC	
Grouping	**N/A**	**By firm size (employess)**			**By country**	
Sample	Full	Micro (< 10)	Small (10-49)	Medium (50-249)	Big-4	Non big-4
Main regressors						
DOCII	−0.335	−0.699***	−0.675***	−0.203***	−0.748***	−0.056*
	(0.220)	(0.030)	(0.021)	(0.018)	(0.016)	(0.030)
PROCONS	0.363**	0.538***	0.376***	0.351***	0.261***	0.197***
	(0.130)	(0.035)	(0.023)	(0.020)	(0.036)	(0.022)
COSTRESOLV	0.315**	0.336***	0.238***	0.338***	0.686***	0.025
	(0.134)	(0.029)	(0.020)	(0.018)	(0.018)	(0.035)
VOTE	−3.569*	−2.280***	−1.963***	−3.969***	−5.966***	−8.047***
	(1.980)	(0.656)	(0.453)	(0.441)	(0.378)	(0.901)
TAXRATE	−0.057**	−0.008	−0.060***	−0.052***	−0.064***	−0.081***
	(0.022)	(0.005)	(0.004)	(0.004)	(0.003)	(0.013)
REGQUALITY	−6.875**	−7.819***	−8.251***	−7.523***	−12.870***	−2.242***
	(2.896)	(0.248)	(0.182)	(0.169)	(0.175)	(0.212)
Control variables						
SALESGR	0.710***	0.632***	0.776***	0.632***	0.501***	1.009***
	(0.128)	(0.051)	(0.047)	(0.048)	(0.034)	(0.079)
ROA	−0.007	−0.006**	−0.011***	−0.007***	−0.007***	−0.003
	(0.005)	(0.003)	(0.002)	(0.002)	(0.001)	(0.003)
SIZE	−0.257	−0.365***	0.032	−0.008	−0.521***	−0.195***
	(0.200)	(0.081)	(0.058)	(0.055)	(0.042)	(0.048)
GDPGR	−0.197***	−0.054***	−0.167***	−0.242***	−0.133***	−0.252***
	(0.036)	(0.007)	(0.005)	(0.005)	(0.004)	(0.008)
Others and statistics						
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Estimator	F.E.	F.E.	F.E.	F.E.	F.E.	F.E.
No. of observations	286,441	77,601	144,436	170,613	233,394	53,047
No. of firms	46,671	22,937	31,089	35,138	36,622	10,049
R-squared	23.6%	26.7%	25.3%	23.7%	25.8%	22.5%

Note: *, **, *** respectively represents significance at 10%, 5% and 1% level. Standard errors are clustered at a country level for Model 1, and robust standard errors are reported in parentheses for Models 2-6. F.E. stands for fixed-effect (within-groups) estimator. The adjusted R-squared values for F.E. models account for variations captured by firm fixed-effects. Detailed definitions and data sources of the above variables are presented in Appendix A. For Models 5 and 6, Big-4 countries in our sample are Germany, France, Spain and the UK.

include the main explanatory variables - lending infrastructure proxies, individually in the regression analysis with full control variables, results remain unchanged.[16]

4.3. Heterogeneity tests

The favourable effects of a sound lending infrastructure on fostering better financial reporting quality (i.e. suppressing earnings management activities) concluded above may vary over certain firm features. In this section, we report the results of testing the sensitivity and heterogeneity of lending infrastructure soundness by respecifying the baseline Model 3 (Table 5) to include interaction terms. Specifically, we test if the baseline effect could be heterogeneous across SMEs with different liquidity ratio (internal funds), access to bank finance ratio (financial constraints), and leverage (financial risk), respectively in panels A, B and C (Table 7). For all the interaction term models, the tested elements are included in the regression analysis as well to ensure the validity of the interpretations on the proposed interaction terms. This is because if an endogenous relation exists, it is more likely to appear in such variables, instead of the interaction terms (Dittmar and Mahrt-Smith 2007).

In Panel A, we interact firmï£¡ï£¡s current ratio with the lending infrastructure proxies. Current ratio is an indicator of a firm's liquidity, which measures a firm's ability to meet its short-term debt obligations. Previous studies such as Lafond, Lang, and Skaife (2007) find that firms that have liquidity concerns are more incentivised to manage earnings. The positively significant coefficient of interaction variable DOCII*LIQUIDITY shows that

Table 7. Heterogeneity tests.

Dependent variable:	Model 1s	Model 2s	Models 3s	Models 4s	Models 5s	Models 6s
	DACC (Modified Jones, by Dechow, Sloan, and Sweeney 1995)					
(Panel A) Interaction term: LIQUIDITY						
DOCII	−0.360***	−0.337***	−0.336***	−0.337***	−0.337***	−0.338***
PROCONS	0.364***	0.365***	0.363***	0.363***	0.363***	0.362***
COSTRESOLV	0.317***	0.313***	0.309***	0.313***	0.313***	0.309***
VOTE	−3.547***	−3.473***	−3.497***	−3.799***	−3.493***	−3.480***
TAXRATE	−0.058***	−0.058***	−0.058***	−0.058***	−0.064***	−0.057***
REGQUALITY	−6.896***	−6.886***	−6.890***	−6.889***	−6.877***	−7.072***
DOCII∗LIQUIDITY	0.011***					
PROCONS∗LIQUIDITY		−0.002***				
COSTRESOLV∗LIQUIDITY			0.002**			
VOTE∗LIQUIDITY				0.150**		
TAXRATE∗LIQUIDITY					0.002***	
REGQUALITY∗LIQUIDITY						0.085***
LIQUIDITY	−0.067***	0.056***	−0.024**	−0.123**	−0.132***	−0.105***
(Panel B) Interaction term: ATFRATIO						
DOCII	−0.304***	−0.343***	−0.346***	−0.350***	−0.346***	−0.354***
PROCONS	0.366***	0.398***	0.371***	0.369***	0.371***	0.351***
COSTRESOLV	0.309***	0.326***	0.333***	0.319***	0.324***	0.311***
VOTE	−3.094***	−3.207***	−3.196***	−3.987***	−3.197***	−3.198***
TAXRATE	−0.058***	−0.060***	−0.060***	−0.060***	−0.064***	−0.059***
REGQUALITY	−7.362***	−7.349***	−7.370***	−7.383***	−7.380***	−7.952***
DOCII∗ATFRATIO	−0.265***					
PROCONS∗ATFRATIO		−0.103***				
COSTRESOLV∗ATFRATIO			−0.038			
VOTE∗ATFRATIO				4.791***		
TAXRATE∗ATFRATIO					0.011	
REGQUALITY∗ATFRATIO						3.056***
ATFRATIO	1.493***	3.687***	0.553*	−3.566***	−0.698	−3.399***
(Panel C) Interaction term: LEVERAGE						
DOCII	−0.239***	−0.341***	−0.343***	−0.348***	−0.345***	−0.347***
PROCONS	0.365***	0.402***	0.370***	0.368***	0.369***	0.362***
COSTRESOLV	0.304***	0.326***	0.353***	0.317***	0.322***	0.320***
VOTE	−3.257***	−3.389***	−3.363***	−4.706***	−3.335***	−3.326***
TAXRATE	−0.058***	−0.061***	−0.061***	−0.061***	−0.059***	−0.061***
REGQUALITY	−7.354***	−7.334***	−7.348***	−7.364***	−7.355***	−7.639***
DOCII∗LEVERAGE	−0.408***					
PROCONS∗LEVERAGE		−0.081***				
COSTRESOLV∗LEVERAGE			−0.085***			
VOTE∗LEVERAGE				5.099***		
TAXRATE∗LEVERAGE					−0.005	
REGQUALITY∗LEVERAGE						0.971***
LEVERAGE	2.281***	2.983***	1.138***	−3.665***	0.577*	−0.869**

Note: ∗, ∗∗, ∗∗∗ respectively represents significance at 10%, 5% and 1% level. All models are estimated by within-groups estimators with robust standard errors (not reported). We also do not report constants, control variables and other statistics for space reason but they are available from the authors on request. Panels A, B and C respectively present regression output of interaction term models using liquidity ratio (LIQUIDITY, current assets to current liabilities), access to finance ratio (ATFRATIO, total bank finance divided by total assets) and leverage ratio (LEVERAGE, non-current liabilities to shareholders funds).

the effect of the information environment on firm earnings management is more pronounced for firms with a higher current ratio. In theory, a higher current ratio should indicate a firm's better capability of paying its creditors back. Thus, the result suggests that the sharing of credit information available in a country mitigates SME earnings management, especially for borrowing firms with higher credibility. Regarding the legal environment, although both efficient judicial and bankruptcy systems restrain earnings management behaviours, the effects are stronger for less creditworthy firms in the judicial system and more creditworthy firms in the bankruptcy system. For the social, tax, and regulatory environments, the favourable effects of reducing earnings management are more pronounced for firms that are in a better liquidity position.

The above results indicate that the desirable influence of sound lending infrastructure on mitigating SME earnings management generally is stronger for firms with higher liquidity, except for the bankruptcy environment. One explanation for this is that the efficiency of the bankruptcy system is less effective in mitigating earnings management for less creditworthy SMEs since they might have stronger incentives to manipulate accruals when approaching short-term debt default.

In Panel B, access to finance ratio reflects the ability to obtain credit services that are key to innovation, growth and performance. Higher access to finance ratio (measured by bank debt financing ratio) is an indication of a firm's better capability in financing (i.e. less likely to be financially constrained). The reasons for SMEs' lack of access to finance can be their poor quality of management, inefficient regulatory development, credit supply contractions, etc. In addition, SMEs' financing conditions could possibly alter the associations between macro-level factors on earnings management behaviours. The results show that for the information, judicial and bankruptcy environments, the effects on SME earnings management in the sample countries are stronger for firms with limited access to finance, presumably more likely to be financially constrained. These findings add support to the previous studies which emphasise the importance of credit information sharing and legal protection for the financial reporting quality of underbanked firms (e.g. Leuz, Nanda, and Wysocki 2003). The negative effect of the tax environment on earnings management is not sensitive to firms' bank credit conditions while the social and regulatory environments are less influential on firms' earnings management for those who are less likely to be financially constrained.

High leverage (gearing) can increase the level of financial risk of a firm (Andrade and Kaplan 1998) and it can generate either a positive or negative impact on the return on equity. The studies on the effects of leverage on earnings management find mixed evidence (e.g. Chamberlain, Butt, and Sarkar 2014). According to the agency theory of Jensen and Meckling (1976) and the free cash flow theory of Jensen (1986), leverage can be utilised as a disciplinary mechanism in avoiding managers' excessive discretionary activities since leverage plays an efficient role in limiting the amount of free cash flow available to managers. In Panel C, we find that the coefficients of interaction terms show mixed evidence on their impacts on earnings management. The interaction term between information and leverage is significantly negative, indicating that such an effect on earnings management could be more sensitive for leveraged firms. On the contrary, judicial and bankruptcy, and social and regulatory environments are more impactful for less-leveraged SMEs.

5. Conclusion and discussion

Previous literature has provided evidence on the influence of country-level factors on firms' incentives to manage earnings. Much of the research has investigated only a few of the country-level factors and mainly focused on large, publicly listed firms in the U.S. However, the effects of country-level factors on SMEs in the EU countries are rarely studied under a comprehensive and established framework. The current study bridges the research gap and examines lending infrastructure effects on financial reporting quality (i.e. earnings management) using an unbalanced panel consisting of 46,340 SMEs across 11 EU countries from 2007 to 2015. The study does so by combining firm-level data with the macroeconomic-level characteristics of the 11 EU countries. These macroeconomic-level characteristics are grouped into four major elements following the institutional framework proposed by Berger and Udell (2006): informational, legal, social, and regulatory environments.

Specifically, this research hypothesises that the informational, legal, judicial, bankruptcy, social, tax, and regulatory environments in a country are important determinants of SME managers' incentive of engaging in earnings management activities. Taken as a whole, the results show supporting evidence to the hypotheses that the elements of lending infrastructure are influential determinants of SME earnings management. Be more specific, first, EU SMEs in our sample's financial reporting quality is better (as reflected by less earnings management) in countries that are subject to better credit information sharing between lenders and credit reporting services providers, because banks in general have better access to trusted hard information in countries with high quality and sufficient credit information. Second, sample SMEs engage less earnings management in countries with better judicial and bankruptcy protection systems, as in such an environment, banks are more confident in initiating financial contracts and more willing to engage in SME lending when there is less cost of enforcing laws in commercial disputes and bankruptcy resolutions. As a result, SMEs are less financially constrained

and managers find earnings management to be less necessary. Third, we find that SMEs engage in less earnings management in countries with a higher stock of social capital and this is because SME improve their borrowing capacity through relationship-based lending and the enforcement of financial contracts facilitated by a higher level of social capital (Berger and Udell 2006). Finally, we show that stringent tax and regulatory systems can foster better financial reporting quality, as earnings management may be less necessary and effective where banks with greater market power (after consolidation) are found to rely greatly on soft (private) information acquisition and building relationships with SMEs to mitigate agency problems (Petersen and Rajan 1995). Our results are in general robust, and apart from the above, we also find that several firm-level attributes, including liquidity, financial constraints and financial risk could vary the main findings.

Our study is the first cross-country empirical work based on the lending infrastructure theoretical framework established by Berger and Udell (2006) examining lending infrastructure impacts on SME financial reporting quality in the EU. The findings could be important to policymakers for tackling SME earnings management activities and the practical implications are, first, policymakers may encourage more transparent and well-regulated credit sharing mechanisms to reduce information asymmetries, moral hazard and managerial opportunism, along with appropriate penalty systems. Second, the efficiencies of legal systems can be improved by governments to promote financial contracting, such as ensuring fewer unnecessary procedures to enforce a contract and lower costs to recover a debt, helping protect both banks' rights and SMEs' growth, and in turn, reducing managers' incentives to manipulate discretions. Third, to mitigate SME earnings management behaviours, the influence of culture and social cohesion in a country can be taken into considerations in the process of policymaking.

One of the limitations of this research is the coverage of only 11 EU countries due to data availability. Future work may find it useful to adopt a larger sample for a broader and clearer conclusion. We also propose that another potential research area would be to examine the lending technology channel through which macroeconomic factors affect firm earnings management behaviours.

Notes

1. Please see https://www.treasurers.org/hub/treasurer-magazine/big-four-banks-still-dominate-sme-business-account-market
2. Example hard information includes credit history, delinquency information, risk rating, high quality accounting and transaction data.
3. According to the credit institutions statistics of the European Central Bank, the number of European banks decreased from 6,127 to 4,600 between 2007 and 2008.
4. They are Germany, Estonia, Spain, France, United Kingdom, Hungary, Ireland, Netherlands, Poland, Portugal and Slovenia.
5. Due to the low quality of SME accounting information, such as abnormal values, missing values, etc., in the full Amadeus subscription that include virtually all private firms in Europe, we use the sub-subscription of Amadeus that contains a representative sample of the whole population. However, we acknowledge that our sample could underrepresent micro firms (i.e., less than 10 employees and less than 2 million euros of turnover).
6. Estimation is used when such information is not available by running basic regressions and multipliers amongst turnover, total assets and employees by two-digit NACE1 and UK SIC 07 industry code.
7. We screen the firms by their trading address and registered address (e.g., exclude overseas territories, crown dependencies), industries (e.g., exclude public authorities, financial institutions), legal form and status. Details are available from the authors on request.
8. The activities of real earnings management are difficult to detect and more costly than accrual-based earnings management. Firms, especially financially constrained firms such as SMEs are more likely to engage in accrual-based earnings management first (Zang 2012).
9. We only include those key factors as micro/small businesses' financial data are prone to missing value problems.
10. We do not include a control for firm age as it is criticised in the literature that age variable in nature is not an ideal control in fixed-effect panel data setting as it rises with the same increment along with time moving forward across all the cross-sections (e.g., Wang, Han, and Huang 2020).
11. We run additional tests for the baseline models by excluding two variables at once, and our results do not change.
12. After initial tests, we decide to exclude 'Property right index (MIEFPR)' into our regressions as the variable has limited variation across countries and years. Such a near time and cross-sectional invariant regressor may not provide useful information.
13. We test the robustness of the Social Capital element by using an alternative measure that is proposed in Mc Namara, O'Donohoe, and Murro (2020). Such a variable is derived from the European Social Survey on 'trust'. We adopt its median value for each country in every two years. These two measures of 'social capital' are strongly correlated ($\rho = 0.502***$), and results are robust and not subject to how 'social capital' is measured. We thank an anonymous referee for suggesting this alternative measure.

14. We thank an anonymous referee for suggestions on the robustness check approaches.
15. Big four countries in this sample are France, Germany, UK and Spain, according to their size of economies and contribution rates to the full sample.
16. Regression output is not reported for space reason but available from the authors on request.

Data availability statement

The firm-level financial statement data used in this study can be obtained from a commercial database Amadeus, provided by Bureau van Dijk. Macroeconomic level data can be obtained from online open sources The World Bank, European Social Survey and Heritage Foundation.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Notes on contributors

Dr. Xing Huang is a Senior Lecturer in Accounting and Financial Management at the Faculty of Business and Law, University of Portsmouth, UK. She received her PhD degree from University of Reading and her MSc in Economics from University of Surrey. Her research interests lie in small business finance, earnings quality, female entrepreneurship, cryptocurrency, and empirical banking. Her previous work has been published at top-tier peer-reviewed finance journals such as The European Journal of Finance, Journal of International Financial Markets, Institutions and Money, and International Review of Financial Analysis.

Dr. Xiaodong Wang is a Research Fellow at the Faculty of Business and Law, University of Portsmouth, and a committee member of the Centre for Innovative and Sustainable Finance, Portsmouth, UK. He gained a PhD in Accounting and Financial management from University of Reading, and an MSc in Economics from University of Surrey. His research interests are in the areas of intellectual property in corporate finance, environmentally friendly innovation, sustainable finance, e-business growth, small business economics, and the economic impacts of financial intermediation to the society. He has published several research articles in leading peer-reviewed journals in the areas of Finance and General Management, such as International Review of Financial Analysis and European Journal of Finance, and has presented multiple research papers in notable research conferences in the UK.

Liang Han is a Professor in Accounting and Finance at Henley Business School, University of Reading and a consulting editor for International Small Business Journal. Liang gained a PhD from University of Warwick and has research interests in the areas of entrepreneurial finance, corporate finance, banking market and entrepreneurship. Liang has published academic papers in journals such as Journal of Banking & Finance, Entrepreneurship Theory and Practice, Journal of Business Finance and Accounting.

Prof Laker is a Professor of Leadership and Postgraduate Research Director at Henley Business School, University of Reading. His research, which considers ways to advance economic, environmental and social prosperity, informs law, public policy and government inquiry. Prof Laker contributes to the Financial Times, Harvard Business Review and MIT Sloan Management Review. His articles are widely read and frequently cited by BBC Newsnight, The Economist, Forbes, The New York Times, The Wall Street Journal and The Washington Post.

ORCID

Liang Han http://orcid.org/0000-0002-2778-3338

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Appendices

Appendix A: definition and sources of main variables

Variable	Definition	Source
Outcome variables		
DACC	Measure of discretionary accruals based on the modified Jones model (Dechow, Sloan, and Sweeney 1995), see Section 3.2 and Appendix B	BvD Amadues (own estimate)
DACC2	Measure of discretionary accruals based on the Jones model (Jones 1991). See Section 3.2 and Appendix B	BvD Amadues (own estimate)
Lending infrastructure soundness indicators		
DOCII	The depth of credit information index - measures rules and practices affecting the coverage, scope and accessibility of credit information available through either a credit bureau or a credit registry. This index ranges from 0 (low depth) to 8 (high depth)	World Bank (WB) - Doing Business
IEFPR	Property rights index - measures the 'the ability of individuals to accumulate private property, secured by clear laws that are fully enforced by the state'. This index ranges from 0, where property right is minimum, e.g. private property is outlawed; to 100, where property right is maximum, e.g. private property is guaranteed by the government. The court system enforces contracts efficiently and quickly. For a full explanation on this index, please see *2021 Index of Economic Freendom - Property Rights (Heritage Foundation 2021)*	Heritage Foundation
PROCONS	Index of the procedures required to enforce a contract, including any interaction between the parties in a commercial dispute, or between them and the judge or court officer, steps to file and serve the case, steps for trial and judgment and steps to enforce the judgment, it measures the efficiency of judicial system in a country, the higher the value, lower the efficiency	WB - Doing Business
COSTRESOLV	The cost required to recover a debt include court fees and government levies; fees of insolvency, administrators, auctioneers, assessors and lawyers; and all other fees and costs. The cost of the proceedings is recorded as a percentage of the value of the debtor's estate, ranges from 2 (2%, low cost) to 75 (75%, high cost).	WB - Doing Business
VOTE	Electoral participation index which is derived from the following question: '*Some people don't vote nowadays for one reason or another. Did you vote in the last [country] national14 election in [month/year]?*'. This index ranges from 0 (low electorial participation) to 1 (high electorial participation), which is a measure of social capital.	European Social Survey
TAXRATE	Measuring the tax rate payable by the business (% of commercial profits) in a country.	WB - Doing Business
REGQUALITY	Measures the goverment's overall regulatory capacity in a country, it captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. This index ranges from −2.5 (low quality) to 2.5 (high quality), the higher the value, the better the regulated environment	WB - Worldwide Governance Indicators
Control variables		
SALESGR	Indicator of growth opportunity, firm sales growth rate index calculated using the following method: (Salest - Salest-1) / (0.5 × Salest - 0.5 × Salest-1)	BvD Amadeus (own calculation)
ROA	Firm performance index measured as: (Profit or loss before taxation / Total Assets) × 100	BvD Amadues
SIZE	Natural logarithm of firm's total assets in US dollars (inflation adjusted)	BvD Amadeus (own calculation)
GDPGR	Proxy of economic condition - Annual growth rate of GDP	WB - World Development Indicator

Appendix B: the construction of earnings management variables

Appendix B1: modified Jones model (Dechow, Sloan, and Sweeney 1995)

First, we calculate the total accruals from firm i in year t using Eq. B1 as follows:

$$TACC_{it} = \Delta CA_{it} - \Delta Cash_{it} - \Delta CL_{it} + \Delta DCL_{it} - DEP_{it} \tag{B1}$$

Where:

$TACC_{it}$ = Total accruals in year t.
ΔCA_{it} = Change in current assets in year t, compared to t-1
$\Delta Cash_{it}$ = Change in cash and cash equivalents in year t, compared to t-1
ΔCL_{it} = Change in current liabilities in year t, compared to t-1
ΔDCL_{it} = Change in short-term debt included in current liabilities in year t, compared to t-1
DEP_{it} = Depreciation and amortisation expenses in year t
For each industry-year, we then estimate coefficients from Eq. B2

$$TACC_{it}/A_{it-1} = \alpha_1(1/A_{it-1}) + \alpha_2[(\Delta REV_{it} - \Delta REC_{it})/A_{it-1}] + \alpha_3(PPE_{it}/A_{it-1}) + \varepsilon_t \tag{B2}$$

Where:

ΔREV_{it} = Revenues in year t less revenues in year t-1
ΔREC_{it} = Net receivables in year t less net receivables in year t-1
PPE_{it} = Gross property plant and equipment in year t
A_{it-1} = Total assets in year t-1
α_1, α_2 and α_3 = Parameters to be estimated, namely alphas
ϵ_t = Residuals in year t
Using the coefficients (α_1, α_2 and α_3) from the regression in Eq. B2, the non-discretionary accruals (or normal accruals) can be then calculated with the next step (Eq. B3).

$$NADCC_{it} = \hat{\alpha}_1(1/A_{it-1}) + \hat{\alpha}_2[(\Delta REV_{it} - \Delta REC_{it})/A_{it-1}] + \hat{\alpha}_3(PPE_{it}/A_{it-1}) \tag{B3}$$

Where:

$NADCC_{it}$ = Non-discretionary accruals in year t
$\hat{\alpha}_1, \hat{\alpha}_2$ and $\hat{\alpha}_3$ = Estimated parameters from Eq. B2 (OLS)
Finally, the discretionary accruals are the difference between total accruals and fitted normal accruals:

$$DACC_{it} = (TACC_{it}/A_{it-1}) - NDACC_{it} \tag{B4}$$

Appendix B2: Jones model (Jones 1991)

The Jones model can be constructed by following the exact steps as illustrated in Appendix B1, except for that under equation Eq. B2, we do not subtract the change in Net Receivables variable (ΔREC) from the non-discretionary accruals formula.