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Mandatory Governance Reform and Corporate Risk Management

Finance Working Paper N° 552/2018
April 2021

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ECGI Working Paper Series in Finance

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Hege acknowledges funding from the European Research Council, ERC FP7 grant No. 312503-SolSys, and from the ANR, grant no. ANR-17-EURE-0010 (Investissements d'Avenir).

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Keywords: risk management, financial hedging, operational hedging, foreign exchange risk, Sarbanes-Oxley Act, corporate governance reform, board monitoring, risk-taking incentives

JEL Classifications: F31, F23, G34

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forthcoming, Journal of Corporate Finance

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1. Introduction

Do self-interested managers hedge too much or too little relative to the best interest of shareholders? Corporate risk-taking and risk management are a central issue in modern finance, but the fundamental relationship between agency problems and corporate risk policies is not yet well understood. Notably, theory and empirical evidence suggest that this relationship is ambiguous, expressed in two popular but conflicting views. In one view, managers hedge too little due to agency problems such as career concerns leading to short-termism and convex incentives; in this view, firms reduce financial corporate risk when exposed to more stringent governance requirements that safeguard shareholders' interest (Froot, Scharfstein and Stein, 1993; Myers, 1977; Leland, 1998). In the contrasting view, agency models predict the opposite: when managers are imperfectly diversified or overly risk-averse, they may choose hedging policies that suit their own interests and 'overhedge' in the absence of safeguards for shareholders' interests. Stronger governance will then lead to less hedging (Stulz 1984; Smith and Stulz, 1985). There is substantial empirical evidence in support of either view.

Not only is there a strong and unresolved contrast between these views, but knowledge on this issue also suffers from methodological shortcomings: earlier work does not establish causality of the relationship between governance and risk management based on modern methods of identification. Our paper attempts to make headway on this issue by studying a large-scale natural experiment, the adoption of the Sarbanes-Oxley (SOX) Act of 2002 in the U.S. and its sweeping governance changes. No earlier empirical study investigating the impact of governance on hedging uses a quasi-experimental setting.

We find strong evidence that improvements in governance lead to less foreign exchange risk and more foreign exchange derivatives hedging. This finding is robust whether we look at the initial reform shock or the heterogeneous and staggered adoption of the induced governance reforms, whether we focus on exogenously imposed governance reforms, isolate board and compensation as the major transmission channels of the reform, or add voluntary governance improvements.

A major contribution of our paper is that we are the first, to the best of our knowledge, to address concerns about endogeneity in the governance-risk management relationship by using a rigorous identification strategy based on an exogenous governance shock. This approach fills an important gap, in light of longstanding concerns that corporate governance is highly endogenous (see e.g. Himmelberg, Hubbard and Palia (1999) for an early critique of neglected endogeneity in

governance research). We do so by undertaking a systematic difference-in-difference panel analysis around the SOX quasi-experiment and studying its impact on corporate hedging, exploiting the fact that it affected firms differently according to their pre-reform governance practices. In addition, we make two other novel contributions to the literature. First, we argue that firms with a larger ex ante distortion in hedging should respond more strongly to an exogenous governance reform, which allows us to refine our hypotheses by incorporating pre-reform firm heterogeneity. We measure such heterogeneity across firms along two dimensions, their exposure to foreign markets and their CEO incentives and CEO characteristics. For both dimensions, we find evidence consistent our predictions, and hence are able to confirm our main finding with rich cross-sectional evidence. Second, we distinguish between financial and operational hedging strategies, and argue that their deployment should follow different trajectories, with financial hedges being deployed more quickly in the post-reform adjustment and assuming the bulk of the early post-treatment adjustment. Our panel data allow us to study different adjustment speeds, and we present evidence consistent with this prediction. We also present a number of ancillary results, including the finding that the level of adoption of required governance reforms is a stronger predictor of hedging than voluntary governance improvements.

In more detail, we deploy a difference-in-difference approach with firm fixed effects to study the quasi-experiment of the 2002 Sarbanes-Oxley Act, arguably the most sweeping reform of governance mandates in a developed market in the past 30 years. We analyze a broad balanced panel of U.S. corporations drawn from the Russell 1000 index, and differentiate our measures of treatment, the reform impact on governance, in two ways. First, we argue that when firms are assigned to different groups according to their treatment status, it is essential to distinguish between the (regulator's) intention to treat, and firms' compliance with the treatment, in the parlance of the literature on heterogeneous treatment effects (e.g. Angrist and Pischke, 2009), since not all firms adopt the new rules fully and immediately. To account for the intention to treat, we consider the pre-reform governance gap that focuses on the exogenous nature of the quasi-experiment treatment shock by comparing the difference between post- and pre-reform hedging of firms with high treatment intensity (large gap) to the difference of firms with little or no treatment (small gap). We measure compliance with the treatment with the actual reform implementation that focuses on the effective year-by-year policy adoption of the governance measures, and thus accounts for the substantial heterogeneity in compliance across firms.

Second, we address the observation that the Sarbanes-Oxley Act was effective because it triggered broad changes, with firms adopting concomitantly many measures beyond the changes imposed by the reform, under pressure from shareholders and the public. There is a trade-off between a narrow measure that contains only mandated changes and a broader measure that better captures the full scope and heterogeneous adoption of the reform. We resolve this trade-off by using a broad array of five governance indexes, varying along a continuum between exogeneity and representativeness. Our most restrictive index includes only the ten governance attributes that the SOX reform rendered obligatory by 2004 (*REG10*), with a strong focus on board policies. Our second index (*MANDATE-INDUCED*) adds ten governance attributes that were so tightly connected with the SOX law that their simultaneous adoption was highly likely. In an alternative approach, we use two indexes limited to the two main channels of reform, the Board of Directors and executive compensation (*BOARD&*COMP15 contains all mandated/mandate-induced board and compensation measures; *BOARD&COMP22* adds voluntary measures). Finally, we use a comprehensive index of 41 governance measures, *GOV41.*

We refine our main hypotheses by considering the role of cross-sectional variation in pre-reform distortions in risk management. We argue that, the larger the level of distortions prior to the reform, the larger should be the adjustment in hedging triggered by the governance reform. We are interested in exploring how governance changes affects financial and operational hedging, and whether financial hedges are adjusted faster than operational hedges. To address this issue, we deploy a dual measurement of corporate hedging, the use of FX derivatives as a measure of financial hedges, and the exposure to foreign exchange rate movements as a comprehensive measure. Foreign exchange exposure is appealing and widely used as it reflects all of the different instruments of corporate risk management, including financial and operational hedges. The use of derivatives on the other hand isolates intentional risk management and financial hedges.

Our findings are as follows. We find strong evidence that a weak governance environment is associated with insufficient attention to risk management – or 'underhedging' by self-interested managers. The use of foreign exchange derivatives is intensified and foreign exchange exposure is reduced after the reform. The results are the same for initial governance gap or for actual implementation. The effects are highly consistent and significant in 19 out of 20 multivariate tests (for 2 hedging variables, 5 indexes and 2 measures of governance change). Our results are driven by mandated and mandate-induced attributes, as voluntary changes are less significant.

The economic magnitude of the effect of governance changes on risk management in our study is large: according to our estimates, the median increase in *REG10* attributes between 2002 and 2007 leads to a 20.4% decrease in foreign exchange exposure and a 52.2% increase in *Derivatives Mentions*, and the median increase in *MANDATE-INDUCED* (*GOV41*) to a 21.0% (20.4%) decrease in FX exposure and a 31.1% (48.4%) increase in *Derivatives Mentions*.[1]

The next important step is to investigate whether our baseline result are confirmed when we explore the governance-risk management relationship exploiting firm-level heterogeneity. We find that firms with large exposure to foreign markets, i.e. firms that trade globally or have a large foreign input exposure, exhibit a strong reaction of hedging to governance reform and whereas firms with little exposure react significantly less. When we look at differences in managerial incentives, we find that firms where CEOs hold large stock option positions react more strongly to governance reform, and a weaker effect in the opposite direction when CEOs hold large equity stakes, consistent with theoretical predictions on executive compensation. When we deploy a more granular time-trend analysis, we find a noticeable difference in the speed of adjustment between the use of derivatives and FX exposure: whereas governance reform exerts an immediate effect on the use of FX derivatives, consistent with the notion that financial hedges are adjusted quickly, we show that foreign exchange exposure, which comprises operational hedges, is adjusted much more slowly. Also, when sorting firms according to major characteristics, such as governance, size, value/growth, we find that large firms show a stronger hedging reaction to the governance shock than smaller firms, but find little differences for the growth/value dimension or the G-index.

The remainder of the paper is structured as follows. The next section discusses the institutional background, prior literature and hypotheses. Section 3 describes our data and methodology. Section 4 presents summary statistics and univariate findings, and Section 5 discusses the multivariate analysis of our two identification approaches. Section 6 investigates the role of firm heterogeneity. Section 7 explores the different adjustment speeds of financial and operational hedges. Section 8 covers robustness issues, and Section 9 concludes.

[1] The economic effects are similar for the two other indexes: a median increase in *BOARD&COMP15* (*BOARD&COMP22*) leads to 19.8% (24.0%) lower *FX Exposure* and 25.9% (31.2%) more *Derivatives Mentions*.

2. Institutional Background, Literature and Hypotheses Development

2.1 *The Sarbanes-Oxley Act and corporate governance reform*

The Sarbanes-Oxley Act (SOX) of 2002 in the U.S. was an unprecedented overhaul of corporate governance standards in reaction to a wave of fraud and accounting scandals in the early 2000s, the most emblematic ones engulfing Enron and WorldCom. The legislation included a number of stringent provisions, including on board composition, board oversight and compensation, intended to safeguard investors and to mitigate governance problems. The main thrust of the Sarbanes-Oxley mandates and associated revisions to NYSE and NASDAQ listing rules was to strengthen internal governance mechanisms and to better align the incentives of corporate insiders with shareholders' interests. We detail the ten important mandatory rule changes that companies needed to adopt below in our discussion of measures of corporate governance (Section 3.2). The Sarbanes-Oxley Act gave companies until November 2004 to comply with the mandatory policy changes. The reform discussion triggered wider governance reforms and many companies subsequently adopted, over a period of several years, additional voluntary governance changes. We exploit these features for the purposes of our identification strategy.

The literature on the effects of the SOX legislation mostly asks whether the governance shock had a measurable performance impact. On balance, the literature concludes that the answer is positive, and that the SOX mandates enhanced firm value (e.g., Iliev, 2010; Dicks, 2012; Coates and Srinivasan, 2014). Chhaochharia and Grinstein (2007) study the announcement effects of the SOX reform and find positive abnormal returns for firms that were less compliant with the SOX mandates earned, with the effect concentrated in large firms. Aggarwal, Schloetzer, and Williamson (2019) find that firms with a large pre-SOX gap in the ten required governance attributes (our *REG10* index) experienced a post-SOX increase in firm value, and also show that further improvements in "governance culture" through the adoption of non-mandated governance practices (the 31 measures in our *REG10 COMPL.* index) led to larger firm value increases.

There is extensive literature in corporate governance showing that measures affecting the role and functioning of the Board of Directors and of the award of executive compensation affect corporate decision-making (see e.g., Hermalin and Weisbach, 2017, for a recent survey). Considering this literature and the nature of the SOX reform process that is largely centered around strengthening board control, audit and compensation practices, our *BOARD&COMP*

indexes focus on measures relating to the board and to compensation when constructing our indexes that tie down the transmission channels of governance reform.

We add a caveat concerning the external validity of our study: our tests, while based on a far-reaching governance reform, do not allow any inference on the probability that the same outcome would obtain in other governance reforms. We do not explore valuation and corporate performance effects because conventional measures of stock price and accounting performance confound the effects of all corporate decisions affected by the Sarbanes-Oxley reform process, not just the effect on foreign exchange hedging policies on which our study focuses.

2.2 *Hedging, agency problems and corporate governance*

The modern corporation is run by managers, and the impact of improved corporate governance depends on its effect on managerial decisions. We limit our discussion to agency theories that explain how managers would decide when governance is weak relative to the efficient hedging policy.[2] Theoretical arguments and empirical evidence are sharply divided on the question whether managers will hedge too much or too little relative to the best interest of shareholders, and we will briefly lay out the main arguments for the two contrasting views. In the first view, the underhedging hypothesis, managers hedge too little compared with the value-maximizing strategy. From the view point of corporate finance theory, underhedging motives are closely related to managerial risk-taking, starting with the seminal risk-shifting hypothesis of Jensen and Meckling (1976) that is based on managers' and shareholders' limited liability protection. While this effect does not explain a discrepancy in risk-taking between managers and shareholders, there is a number of explanations why managers might tolerate risk beyond the level that is optimal from the point of view of shareholders: even optimal contracts with managers might imply less hedging than preferred by shareholders to preserve managerial incentives (e.g., Holmström and Tirole, 2000); managers could be short-termists and hence neglect the long benefits of hedging in avoiding financial distress risk and facilitating investments, and have career concerns while the benefits of hedging accrue in the long term (Stein, 1988); the explicit

[2] There is also ample corporate finance literature on hedging without managerial bias. Corporate finance theory generally holds that hedging strategies help to increase efficiency by mitigating problems linked to asymmetric information, such as underinvestment and financial distress, financial constraints and corporate opacity (Smith and Stulz, 1985; Myers, 1977; Froot, Scharfstein, and Stein, 1993; Leland, 1998; Manconi, Massa, and Zheng, 2018). There is substantial empirical evidence that financial risk management is value enhancing (Allayannis and Weston, 2001; Carter, Rogers, and Simkins, 2006; MacKay and Moeller, 2007; Disatnik, Duchin, and Schmidt, 2014; Campello et al., 2011; Bartram, Brown and Conrad, 2011).

and implicit compensation structure may reward managers with a disproportionate stake in the upside (via stock options, bonuses and career concerns) (Smith and Stulz, 1985), or they may be overconfident (e.g., Malmendier and Tate, 2005). When managers are inclined to underhedge, then standard agency models lead to the prediction that better corporate governance will lead to an increase in corporate hedging. These arguments lead us to formulate the first hypothesis:

Hypothesis 1A (*Underhedging*): If companies hedge too little compared with the firm optimum prior to corporate governance reform, improved corporate governance will lead to reduced foreign exchange exposure and to more hedging.

In the empirical literature, there is substantial evidence in support of this view, looking specifically at a variety of governance mechanisms. Borokhovich, Brunarski, and Parinno (2004) report a positive relation between the monitoring of outside directors and the firm's use of interest rate derivatives, and Lel (2012) finds that firms with strong corporate governance use derivatives to reduce risk and maximize firm value whereas those with weak governance use derivatives selectively to satisfy managerial self-interest. Allayannis, Lel, and Miller (2012) show that hedging creates more value in firms with strong internal governance (such as those with a large outside blockholder) as well as better external governance. In firms with good governance, managers are less likely to use financial derivatives for speculative purposes (Géczy, Minton, and Schrand, 2007; Bartram, 2019). Hutson and Stevenson (2010) find that firms in countries with weak shareholder and creditor protection have higher exposure than firms in countries with a strong governance environment.

In the second (and conflicting) view, the overhedging hypothesis, managers, when left to their own devices, decide to hedge too much relative to shareholders' interest. The leading explanation is that they are risk averse but underdiversified because of their large exposure to the volatility of the firm value via their compensation package and stock holdings; hence, when hedging is costly, they will tend to hedge more than is optimal from the point of view of diversified shareholders the firm, as demonstrated in the models by Stulz (1984) and Smith and Stulz (1985). Smith and Stulz (1985) discuss that asymmetric information or other hurdles to optimal contracting can explain that overhedging can occur even when shareholders devise second-best incentive contracts. Campbell and Kracaw (1987) show that in a moral-hazard model of hedging under optimal managerial contracts, mangers will hedge more than is optimal for shareholders if their stock holdings are large. Excessive managerial hedging could have other reasons; Breeden

and Viswanathan (2016) propose a signaling explanation where high-ability managers hedge because of reputation or career concerns, since hedging allows markets to detect their talent more easily. When managers hedge excessively, stronger governance that will better align manager's actions with shareholders' interest will lead to less hedging. This leads to the following alternative hypothesis:

Hypothesis 1B (*Overhedging*): If companies overhedge prior to corporate governance reform, improved governance will lead to more foreign exchange exposure and less hedging.

There is also empirical evidence in support of this view. Kumar and Rabinovitch (2013) find that hedging in the oil and gas industry decreases with greater board monitoring (board characteristics include independent directors and board incentives), and increases in measures of CEO power and entrenchment. Knopf, Nam, and Thornton (2002) offer indirect evidence in favor of overhedging by showing that managers tend to hedge more when the sensitivity of their stock and option portfolio to firm value increases. Huang et al. (2013) show that CEOs with large equity exposure hedge less when board independence increases.

2.3 *Differences in foreign exposure and managerial incentives*

We refine our main hypotheses by explicitly addressing firm heterogeneity and its possible impact on the governance-hedging relationship. Even when a governance reform sets uniform new standards, firms will be affected differently, depending on their pre-reform situation and characteristics. First, firms differ in their exposure to insurable risk; notably, some firms have a larger exposure to sales or inputs in foreign markets (or both). Firms with larger foreign exposure have more expansive needs for risk management, so a given distortion in managerial incentives will result in a larger distance between optimal and actual hedging policies; hence governance reform that reduces managerial discretion uniformly across firms should have a larger impact on firms with larger foreign exposure.

Second, managers differ in their incentive structure, with some managers having a deeper inclination or stronger incentives to underhedge (overhedge) than others. There is evidence that CEO characteristics matter. Bodnar et al. (2019) show evidence that idiosyncratic characteristics of CEO traits such as risk attitude, wealth, age, experience and education, matter for hedging choices. There is also empirical literature showing that CEO risk-taking incentives matter; this

evidence confirms the general prediction that hedging should decrease in managers' incentives to take risk. Tufano (1996) shows that in the gold mining industry managers' hedging increases in their holding of company stock, and decreases in their stock option holdings. Francis et al. (2017) measure risk-taking incentives using option metrics of executive compensation and show that CEOs hedging decreases in the sensitivity of CEOs' wealth to the volatility of stock returns (option vega). Thus, both CEO characteristics and CEO contractual incentives are a source of firm heterogeneity. CEO incentives, however, are endogenous, and an important transmission channel for governance reforms is the board's reaction to the reform by adjusting CEOs' risk-taking incentives. Boards acting in the interest of shareholders should adjust risk incentives away from what they perceive as the existing bias in managerial risk-taking incentives (see the discussion e.g. in Gormley, Matsa, Milbourn, 2013; Gormley and Matsa,, 2016; Francis et al., 2017). Thus, in firms where managers face relatively larger ex ante incentive distortions, the impact of the external governance shock should be larger compared with firms with a smaller ex ante bias.[3] We summarize these considerations as follows:

Hypothesis 2 (*Firm heterogeneity*): (A) (*Foreign markets exposure*) The hedging policy of firms that are more exposed to (unhedged) foreign exchange risk should react more strongly to a reduction in managerial discretion via governance reform, irrespective of whether managers are biased towards overhedging or underhedging.
(B) (*Managerial incentives*) The hedging policy of firms with managers that have a stronger incentive bias compared to the first-best policy should improve more after a reform-induced reduction in managerial discretion, irrespective of whether managers are biased towards overhedging or underhedging.

2.4 *Operational and financial risk management and the speed of adjustment*

Companies use not only a range of financial hedges (forwards, options, swaps, and foreign currency debt) but also operational hedges that alter the firm's real operations to reduce their exposure to foreign exchange risk. There is substantial theoretical literature on the use of operational hedges (see Aretz and Bartram, 2010; Bartram and Bodnar, 2007; and Muller and Verschoor, 2006, for reviews), and empirical work confirming that operational hedges are widely

[3] This prediction could be obtained in an optimal contracting model (such as Holmström and Tirole, 2000) where firms differ in the magnitude of moral hazard problems; incentive corrections put in place after a uniform corporate governance shock then have a larger impact on firms with more severe pre-reform agency conflicts.

used and effective in reducing risk (e.g., Allen and Pantzalis, 1996; Pantzalis, Simkins, and Laux, 2001; Carter, Pantzalis, and Simkins, 2003). In light of this duality of hedging strategies, a final objective of our paper is to understand how governance reform translates into the relative adjustment of both financial and operating hedges.

The distinction between financial and operational hedges is of particular interest because of large differences in the cost and speed of adjustment. Financial hedges can typically be quickly deployed when they are available, but they are expensive, with typical fees for currency hedges even between the world's leading currencies often running at several hundred basis points in recent years. For less traded currencies, financial hedging costs can be prohibitive and their use be limited by a lack of liquidity (Hoberg and Moon, 2017). Accordingly, a substantial theoretical and empirical literature shows that operational hedges can be more efficient as they are associated with cost-effective currency diversification when matching the currency of foreign exchange revenues with costs (Bodnar and Marston, 2002; Bodnar, Dumas, and Marston, 2002). They also increase efficiency by enhancing operational flexibility when operations and suppliers are spread out in various parts of the world (Mello, Parsons and Triantis, 1995; Buckley and Casson, 1998; Kogut and Kulatilaka, 1994). Consistent with the notion that optimal operational hedges are more cost-efficient, Hoberg and Moon (2017) present evidence that firms rely more on operational hedges when financial hedging strategies are costly or face problems of illiquidity.

Whereas financial hedges can be implemented without delay, putting operational hedges in place involves real investments, the transfer of production operations and the sourcing of inputs in foreign markets where the firm often has no operational foothold, and can require deep changes in the supply chain. These steps take time, and adjustments in operational hedging take substantially longer than financial hedging policies, as argued by Hoberg and Moon (2017). In sum, often financial hedges are quickly available but expensive, whereas operational hedges promise cost efficiency but their use will require substantial delays. Thus, firms under pressure to quickly tighten their foreign exchange risk are likely to use the two policies sequentially: initially, they may resort to financial hedges even beyond their steady-state level in the dynamic adjustment of their hedging mix, until less expensive operational hedging policies can be put in place and financial hedges can be reduced. This leads to the following hypothesis:

Hypothesis 3 (*Speed of adjustment*): Firms should react to governance reform by adjusting financial hedges more quickly than they adjust operational hedges. The use of financial hedges

might initially exceed the steady state level to accommodate difference in adjustment speeds, and fall back to its new equilibrium level once operational hedges can be put in place.

To distinguish between operational and financial hedges, we deploy two measures of hedging policies: foreign exchange exposure measures the effect of all financial and operational hedges, whereas the intensity in the usage of derivatives only isolates financial hedges. The dual measure allows us to investigate financial hedges separately from the combined impact of all financial and operational hedging policies.

2.5 *The governance-hedging relationship and the Sarbanes-Oxley Act*

No earlier work undertakes a comprehensive difference-in-difference analysis of the effect of the Sarbanes-Oxley Act on corporate hedging policies, but two papers have partially looked at links between Sarbanes-Oxley and hedging. Francis et al. (2017) introduce a post-SOX time dummy that assumes a uniform effect of SOX in the cross-section. Their test does not allow to distinguish the SOX effect from other contemporaneous trends and they do not use difference-in-difference or similar methods. Huang et al. (2013) link corporate hedging to CEO ownership and a single SOX mandate, the required majority of independent directors, and find that firms with above-median CEO equity ownership hedge less when forced to increase the number of independent directors, with no significant effects for other firms. In line with their results, we also find that the effects of our three hedging variables become insignificant when we restrict the analysis to this single governance variable (see Section 8.3), suggesting that only the combined impact of several SOX measures changes risk management practices.

3. Data and methodology

3.1 *Data and measures of corporate hedging*

We start our sample construction from the set of all Russell 1000 firms that were listed for the period 2000-2007. We remove financial firms and REITs (which have unique governance structures), leaving us with 786 remaining firms.[4] Financial information – including stock price and financial statement data – is from Compustat and Datastream, and the governance data are drawn from RiskMetrics (formerly ISS). We match with governance and control variables

[4] We remove financial institutions and intermediaries (firms with two-digit SIC codes from 60 to 67).

sourced from Compustat, Datastream, RiskMetrics and manually from 10-K annual reports, which yields a final sample of 507 firms.

For our first measure of corporate hedging policies, we estimate each firm's annual *FX Exposure,* or foreign exchange exposure, following the two-factor methodology developed by Jorion (1990) that expands the seminal one-factor model of Adler and Dumas (1984). This widely used measure is well-suited for our purposes as it encompasses all unhedged exposure effects of FX movements and at the same time, through its estimation structure, only picks up *net* exposure, after all offsetting effects of hedging tools including operational hedges. We estimate Jorion's (1990) model as follows:

$$r_t^i = \alpha_0^i + \alpha_1^i R_t + \alpha_2^i s_t + e_t^i \ , \qquad (1)$$

where r^i_t is the log difference return on stock i, R_t the return on the benchmark stock index in time period t, s_t the log difference in the exchange rate over the same period, and e^i_t is a random error term. To estimate equation (1), we use the firm's closing stock price, the S&P 500 index, and the USD nominal trade weighted index (an increase in the index implies an appreciating US dollar relative to its trading partners' currencies). We use weekly data to estimate exposure coefficients for each firm i for each year. We transform the exposure coefficients α_2^i by taking their absolute value and then taking their square root. The former is necessary because foreign exchange exposure can be negative or positive, and we need an absolute rather than directional measure of exposure. We then take the square root because taking absolute values imposes truncation bias, which results in non-normal error terms (Dominguez and Tesar, 2006; Hutson and Stevenson, 2010). This leaves the error term normally distributed.

Our second corporate hedging variable, *Derivatives Mentions,* specifically measures financial hedging policies. It is a text-based count variable of the number of mentions of the use of FX derivatives in a company's annual 10-K filings, and hence varies on a yearly basis. This variable is part of the text-based data used in Hoberg and Moon (2017, 2019). We take the data from the Hoberg-Moon data library, and refer to Hoberg and Moon (2017) for details about the variable construction.[5] We check the robustness of this text-based measure of financial hedges in two

[5] The *Derivatives Mentions* variable is available in the Hoberg-Moon data library at Gerard Hoberg's website, http://faculty.marshall.usc.edu/Gerard-Hoberg/HobergMoonDataSite/index.html where it was downloaded in April 2019. We use the original count variable of the HobergMoon_FXHedgeData file whereas Hoberg and Moon (2017) use a dummy version.

ways. First, to verify that our findings do not depend on the use of a text-based variable constructed by algorithms, we construct an alternative financial hedging variable, the dummy variable *Derivatives Use*, by manually extracting the relevant information from annual reports and firms' 10-K filings for mentions of foreign exchange hedging activity using derivatives.[6] Second, we use an alternative specification of Hoberg and Moon's text-based variable, forwards and futures mentions, that specifically counts the number of mentions of forward and future contracts for FX hedging. Our findings are very robust to using any of these alternative hedging variables, as we document in the Internet Appendix.

3.2 *Corporate governance measures*

We gather data on 41 'good' corporate governance practices from Institutional Shareholder Services (ISS) (the *GOV41* index), and then identify, among these 41 governance attributes, the 10 that are mandated by the SOX regulations and included in the related revisions to NYSE and NASDAQ listing standards (*REG10* index). We follow Aggarwal, Schloetzer, and Williamson (2019) for the construction of both *GOV41* and *REG10*.[7] Firms had until their first annual meeting or no later than November 15, 2004 to adopt the 10 regulations included in *REG10*:[8] (1) the Board must consist of majority independent directors; (2) non-management directors must have executive sessions without management; (3) Nominating Committee must have only independent directors; (4) Compensation Committee must have only independent directors; (5) Audit Committee must have only independent directors and a minimum of three members; (6) firms must adopt corporate governance guidelines; (7) performance of the Board is reviewed regularly; (8) board approved succession plan is in place for CEO; (9) stock-incentive plans adopted with shareholder approval; (10) consulting fee paid to auditors is less than audit fee paid to auditors. As a complement to these 10 mandatory governance attributes in *REG10*, we aggregate the remaining 31 governance attributes to create the *REG10 COMPL.* index.

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[6] The dummy variable *Derivatives Use* is equal to one if a firm hedges using foreign currency derivatives and zero otherwise. We create it from manually extracting details about the financial hedges from Item 7A in the 10-K annual reports reports from 2000 to 2007 for all sample firms.

[7] The 41 governance attributes are related to earlier papers, notably Aggarwal, Schloetzer, and Williamson (2019)Detailed definitions of each of the 41 attributes, and the breakdown off all indexes are contained in the Appendix. As discussed by Aggarwal, Schloetzer, and Williamson (2019), a complete one-to-one mapping between the ISS governance criteria and the SOX-related governance mandates is not possible. For instance, the ISS definition of independent director is more stringent than that mandated by regulation. Also, SOX regulations require only that firms adopt the provisions; ISS also requires that they be public.

[8] Non-accelerated filers and foreign private issuers were to comply with the section 404 requirements for their first fiscal year ending on or after July 15, 2005.

We then identify 10 additional governance attributes that, while not expressly made obligatory by the SOX Act, are so intimately tied to at least one of the governance attributes in *REG10* that the adoption of the obligatory SOX mandates leads to the likely simultaneous adoption of these attributes; they are thus expected to be highly correlated with the *REG10* measures. We call the ensuing index *MANDATE-INDUCED.*[9] We define *MANDATE-INDUCED COMPL.* as the complement to *MANDATE-INDUCED*, i.e. it consists of the 21 remaining voluntary attributes in *GOV41*. A correlation analysis of adoption (not reported in tables, but the correlations in Table 2 give a good impression) shows that *MANDATE-INDUCED* is a well chosen index, with the 10 additional components highly correlated with the *REG10* components, but substantially less with the components of *MANDATE-INDUCED COMPL*.

We introduce two additional indexes that focus specifically on the most plausible reform transmission channels on managerial hedging decisions, the powers and functioning of the Board of Directors and the attribution of executive compensation. The narrow index *BOARD&COMP15* consists of the 15 measures in *REG10* and *MANDATE-INDUCED* concerned with boards and compensation (of the measures listed above, these are measures (1) – (7), (10) – (12), (15), (17) – (20)). *BOARD&COMP22* adds 7 more voluntary attributes linked to the Board of Directors and executive compensation.[10]

An important concern when using indexes of corporate governance is construct validity, the concern that a governance index is a construct in which some components may be important to fit its purpose, the measurement of good and bad governance, whereas others might not be (Atanasov and Black, 2016). Our use of an array of nested governance indexes, coupled with the examination of the missing components in the complements indexes *REG10 COMPL*. and *MANDATE-INDUCED COMPL.*, and the use of indexes that isolate the most important transmission channels (*BOARD&COMP15* and *BOARD&COMP22*) and of individual components (Section 8.3) is also motivated by this concern, since dropping and adding index

[9] *MANDATE-INDUCED* adds to the 10 mandates of *REG10* the following 10 closely related attributes: (11) board size is between five and sixteen; (12) governance committee exists and met in the past year; (13) annually elected board (no staggered board); (14) policy exists on outside directorships (four or fewer boards is the limit); (15) board has the express authority to hire its own advisers; (16) auditors ratified at most recent annual meeting; (17) directors are subject to stock ownership requirements; (18) officers are subject to stock ownership guidelines; (19) no interlocks among compensation committee members; (20) directors receive all or a portion of their fees in stock.

[10] The Appendix provides the full list of the governance attributes in each index. As ISS provides consistent data on these attributes only from 2002 onwards, we follow Aggarwal, Schloetzer, and Williamson (2019) in using the 2002 data also for 2000 and 2001. We express all indexes as percentages to make them more easily comparable.

components is a possible strategy to address concerns about construct validity.[11] Obviously, this approach is far from constituting a definite answer to the underlying challenge, but robustness across a series of nested indexes and their complements offers some reassurance.

3.3 *Firm characteristics and control variables*

We control for a wide set of firm characteristics that may influence the governance-risk management relationship and that have been used in prior exchange rate exposure studies as control variables: total assets as measured of firm size (*Assets*), the market-to-book ratio of equity (*M/B ratio*), both expected to load negatively on hedging, the debt-to-assets ratio (*Debt/Assets*), expected to load positively; and the quick ratio (*Quick ratio*) and R&D expenses as a proportion of sales (*R&D*), that have no clear predicted sign. These data are annual. We control for industry using Refinitiv's (formerly Thomson Reuters') economic sector classification codes. In the exposure regressions, we also control for the use of derivatives using *Derivatives Mentions*.

We include measures of firms' exposure to international markets and to exchange rate risk. We add foreign sales as a proportion of total sales (*Foreign sales*),[12] and the multinationality classification system of Aggarwal et al. (2011) (*ABHK*) to control for the international diversification of a firm's operations. *ABHK* divides the world into six regions (Africa, Asia, Europe, North America, South America, and Oceania) and classifies a firm as either domestic (*D*), regional (*R*) if it has activities inside its own region, trans-regional (*T*) if has acitivites in several regions, or 'global' (*G*) if the firm has activities in all six regions. We hand-collect data on subsidiary location from the Directory of Corporate Affiliates via Lexis Nexis.[13] To allow for a nonlinear relation between multinationality and the hedging variables that has been shown before (Hutson and Laing, 2014), we include the square of *ABHK* in all regressions.

3.4 *Identification strategy*

Our first measure of treatment, the governance gap, is designed to capture heterogeneous treatment effects in the form of differences in the initial distance (in 2002) between a firm's

[11] Black et al. (2014) propose as a solution in cross-country governance studies the use of country-specific indexes that better fit the local institutional conditions. Our study, however, is limited to a single jurisdiction.
[12] Limitations in reporting make it impossible to further break down foreign sales by country or region.
[13] Category *T* is further subdivided into *T2* (two regions) to *T5* (five regions). Annual reports are more heterogeneous than Lexis Nexis data as firms report their foreign activity differently, and at various levels of granularity. *SFAS 131* gives firms considerable latitude when reporting data on geographic business segments. Some firms are quite specific on the countries in which they operate, others are not.

governance standards and the full implementation of the governance attributes in the index under consideration. We calculate this gap measure for each of our five indexes (plus the two complements) but counting the number of index components where the firm is not in compliance in the year 2002; for example, for a firm that in 2002 is only compliant with 3 out the 10 compenents of the *REG10* index, its value for Reg10 Gap is 7 in all years after 2003. In other words, we measure the initial distance (in 2002) between a firm's governance and the full implementation of the governance attributes in the index under consideration, and then keep the governance gap measured in 2002 constant for all subsequent years, until 2007; the gap measure is zero prior to 2002. The gap measure puts strong emphasis on the exogenous shock of the governance reform, by isolating the initial shock or need for reform.

Our second measure, actual implementation, exploits the fact that the adoption of the governance mandates contained in the Sarbanes-Oxley Act of 2002 is heterogeneous across firms and staggered, a potentially powerful feature of the data. This heterogeneity arises because not all firms comply: even for the 10 mandatory measures, the mean compliance five years after the reform is only 81.2% (see Table 1), and it is even lower for the wider indexes (63% for *GOV41*). It is staggered because, one, the SOX Act of 2002 left companies with a choice during a two-year transition period, until November 2004; and two, a substantial number of companies had not adopted all required measures by the November 2004 deadline but did so in subsequent years, thus allowing to observe staggered adoptions during a longer time window; as one would expect, the adoption of voluntary governance attributes is slower than that of the mandated ones (see Table 1). We use this heterogeneous adoption of the mandatory governance changes as the basis for our second approach to identification. In each regression using a specific governance index as the independent variable of interest in our balanced panel analysis for the 2000-2007 period, we focus on the actual adoption and approval of governance attributes. That is, each change in component *i* in year *t* of the governance index puts the firms with the recorded change in component *i* in year *t* in the treated sample, whereas firms with no change in component *i* in year *t* are in the control sample for that component and year. Thus, the methodology keeps tracks of heterogeneous and time-varying treatment effects of each firm.

In both approaches, we control for firm-level fixed effects by using a deviations from means estimator, a well-established methodology to absorb firm-level fixed effects in panel studies. We study that the results are robust when we use a firm-fixed effects panel estimation (Section 8.1).

The SOX reform constitutes an exogenous shock to corporate governance standards, but it does not allow to identify treated and control sample unambiguously, both when investigating the intention to treat (our first approach) and the compliance with the treatment (our second approach). Both the intention to treat and the compliance are measured by continuous variables, and hence we focus on these continuous variations in treatment and study firms with high treatment intensity (large 2002 governance gap or large compliance) relative to firms with low treatment intensity (small 2002 governance gap or modest compliance).[14] Also, our approach allows for the treatment intensity of each firm to vary across our family of indexes, as we move from narrow to more comprehensive indexes.

4. Summary statistics and univariate analysis

Table 1 presents in Panel A the mean, median and standard deviation by year (2002-2007) for our five indexes and two complements, ordered from the narrowest, purely mandatory *REG10* index to the comprehensive *GOV41* index. There was a significant rise over time in all indexes as firms worked towards compliance, as the *t*-tests (difference in means) and Wilcoxon rank sum test statistics (medians) in column (8) show for the 2007 vs. 2002 difference. *REG10* shows the strongest increase in means, an increase of 140 percent from 3.4 in 2002 to 8.1 in 2007, and medians increase threefold. *MANDATE-INDUCED* doubled in the number of adoptions, both in means and medians, and the increase was almost as strong for the two *BOARD&COMP* indexes. *GOV31* has the smallest increase, by only 71% (mean) to 80% (median). Interestingly, the bulk of the increase in levels in *REG10* and *MANDATE-INDUCED* is accomplished by 2005 (in line with the 2004 deadline imposed by the SOX Act), whereas the adoption of the complementary indexes was slower and continued until 2007.

Panel B presents summary statistics on the year-by-year evolution of sample firms' median absolute *FX Exposure*, with a sample split of firms below and above the median of each index. We find that median levels of *FX Exposure* are generally lower for firms with stronger governance. This difference is strong for *MANDATE-INDUCED* and somewhat weaker for

[14] Using the terminology proposed in Atanasov and Black (2016), we adopt a difference-in-difference continuous design. Similar methodology has recently been developed as the Granular IV by Gabaix and Koijen (2020). Our identifying assumption is that the treatment effect is linear in the governance gap as well as in treatment compliance. Assigning firms to binary samples of treated firms and control firms would require the choice of quite arbitrary cutoff points in the treatment (intention and compliance), and rely on the counterfactual assumption of a homogeneous treatment effects for treated firms, and no treatment effect for firms in the control sample.

REG10. It is significant (at standard levels) for the broader indexes and the board- and compensation-based indexes, and for *REG10* in only three years. In the final columns, we compare the median exposure for small and large firms, and find that the exposure of small firms exceeds that of large firms, in line with earlier findings (Chow, Lee, and Solt, 1997; Bodnar and Wong, 2003; Dominguez and Tesar, 2006).[15]

Panel C tabulates the *Derivatives Mentions* variable, showing that firms with strong compliance with governance mandates – as proxied by above-median index values for our indexes – use financial derivatives significantly more frequently. The usage difference between firms above and below the various governance indexes is significant for most indexes and years, particularly so for the broader and board and governance indexes. When we break down the proportion of firms using derivatives by small v. large firms, we find that small firms are significantly less likely to use currency derivatives than large firms.[16]

In Table 2, Panel A, we present median values for the control variables, with firms sorted in above and below median for all indexes. As anticipated, firms with above-median adoption of governance attributes are larger and have a higher valuation (*M/B* ratios) and higher foreign sales than below-median firms, but no clear pattern exists regarding leverage (variable *D/A*) and the *ABHK* multinationality measures. Low-governance index firms also have significantly higher R&D expense ratios and quick ratios than high-governance firms.

Panel B of Table 2 presents the correlation matrix for the variables of our multivariate analysis.[17] It provides validation for the use of an array of governance indexes: while, unsurprisingly, *GOV41* is strongly correlated with the other six indexes constructed from its components, and *REG10* is almost perfectly correlated with *MANDATE-INDUCED* (ρ=0.93), the correlation is only half as strong with *REG10 COMPL.*; the pattern is similar for *MANDATE-INDUCED COMPL*. As expected, there is a strong and significant positive correlation between firm size and the governance indexes, and between foreign trade exposure (*Foreign Sales* and *ABHK*) and the hedging variables. *FX Exposure* is strongly negatively correlated with all seven indexes, and *Derivatives Mentions* is significantly positively correlated with all index variables except for

[15] When differentiating the adoption of the governance indexes by firm size, we find greater compliance with the SOX mandates for the narrow indexes, consistent with earlier evidence (Linck, Netter and Yang, 2008; Iliev, 2010), but not for the broad indexes (see Table IA.1 in the Internet Appendix).
[16] The summary statistics for Derivatives Use are presented in the Internet Appendix (Table IA.1, Panel B).
[17] Two CEO characteristics, CEO Age and CEO Duality, are relegated to the Internet Appendix for space reasons. They show little correlation with variables other than CEO characteristics.

MANDATE-INDUCED COMPL. The correlation matrix reveals that there is little concern about regarding multicollinearity. All variables have a Variance Inflation Factor (VIF) of less than two.

5. Multivariate panel analysis

5.1 *Analysis of the initial governance reform gap*

A graphical analysis of the parallel trends assumption confirms that our two measures of risk management do not exhibit a pre-trend convergence prior to the SOX reform. Figure 1 shows the graphs for both hedging measures, for the most narrow governance index *REG10* (we plot the top tercile for any of the governance measures against the values of the two remaining terciles). No apparent converging (or diverging) trend is discernible in the three years prior to the SOX reform. In contrast, a trend to convergence can be detected for the three years after the SOX reform. As expressed in Hypothesis 3, for *Derivatives Mentions* the convergence is rapid and the graph implies that some part of the adjustment is transient, whereas the adjustment is slow for the *FX Exposure*. We find a similar pre-trend for the remaining 31 governance measures (Figure A1 in the Internet Appendix). In light of the different adjustment speeds in the post-reform trends of convergence, we perform a formal test in form of a lead-and-lag model where the variable of interest capturing treatment is interacted with yearly dummies for every year before and after the SOX treatment in 2002 (see Table IA.2 in the Internet Appendix). As expected, and confirming our visual inspection of parallel trends, the treatment×year variables are insignificant for all pre-treatment years and significant in the post-treatment years 2003 to 2006, providing a statistical validation of the parallel trends assumption in the pre-treatment period, but not the post-treatment period.

Table 3 presents the regression results for our first measure of treatment, governance gap. We include industry and time fixed effects in our difference equation, and we control for firm-level fixed effects as all variables are differenced relative to their firm-level means. Panel A reports the results for *FX Exposure*, Panel B for *Derivatives Mentions*, both using OLS panel regressions. Each panel presents the five indexes from narrowest (*REG10*) to most comprehensive (*GOV41*), and the two complements *REG10 COMPL.* and *MANDATE-INDUCED COMPL.*

In Panel A, we find that the impact on foreign exchange exposure is significant for *REG10 COMPL., MANDATE-INDUCED*, *BOARD&COMP15*, *BOARD&COMP22*, and for the comprehensive *GOV41* index, at the 5% level. The governance reforms are insignificant only for *REG10*

and *MANDATE-INDUCED COMPL*. These results highlight the role of the highly correlated measures added in *MANDATE-INDUCED* in triggering changes in risk policies, and the smaller role played by the voluntary governance attributes not contained in *MANDATE-INDUCED*. We find consistent results when we include either *REG10* or *MANDATE-INDUCED* and their respective complement index in a joint regression (not reported in tables).

Panel B shows the impact on our principal hedging measure, the *Derivatives Mentions* count, presented in the same format as in Panel A. We find very strong results, with all seven indexes highly significant at the 1%-level. Thus, our text-based measure of the intensity of the use of financial hedges reveals a powerful hedging impact of governance reform. We find almost identical results for Hoberg and Moon's alternative specification of their text-based variables, based on forwards and futures and Derivatives Use (see the Internet Appendix Table IA.3).

Unsurprisingly, given that our regressions control for firm-fixed effects, most of the control variables are not significant, with only the M/B ratio showing strongly significant coefficients. When we run our regressions without controlling for firm-level fixed effects, we find that firms with higher leverage are more exposed to FX risk (but not less likely to use derivatives) whereas firms with a greater proportion of sales abroad are more likely to hedge with foreign exchange derivatives (but do not have larger FX risk exposure).[18]

In conclusion, our results in Table 3 based on pre-reform governance gap offer strong support for Hypothesis 1A, showing that managers tend to underhedge in the pre-reform period. We find that larger governance gaps in 2002 are strongly associated with an expansiaon in the mention and use of derivatives, and a significant reduction in *FX Exposure*.

5.2 *Analysis of actual governance reform implementation*

Table 4 presents the findings for our second measure of treatment, based on actual implementation of governance changes. The regression set-up is exactly the same as for the two panels of Table 3, and the findings are presented in the same format. An (unreported) graphical analysis of parallel trends shows patterns similar to those in Figure 1.

[18] We lose about 15% of observations because of missing values for the ABHK variable. When we repeat all our analyses using the number of foreign subsidiaries as proxy for the extent of operational hedging (rather than ABHK), our findings are essentially unchanged.

In Panel A, we now find that governance quality is strongly correlated with a reduction in foreign exchange exposure, significant at the 1%-level for all governance indexes except for for *REG10* which is significant at the 5%-level.

Panel B shows the findings for *Derivatives Mentions*. We find the same strong results that we reported when using the gap mentions (Table 3), with all seven indexes strongly significant at the 1%-level. Results are similar when using forward and futures mentions and Derivatives Use (see the Internet Appendix Table IA.3)

When we include the narrow indexes *REG10* and *MANDATE-INDUCED* and their complements indexes in joint regressions, it appears that the components in *MANDATE-INDUCED* have a particularly strong impact (see the Internet Appendix Table IA.4).

In conclusion, the regression results for our actual implementation identification approach are strong and again in support of Hypothesis 1A. They show that the mandated or mandate-induced changes (*REG10* and *MANDATE-INDUCED*) significantly reduce foreign exchange exposure and symmetrically increase the use of FX derivatives. We get just as strong results when considering indexes focusing specifically on board- and compensation-related measures. In addition, when we look at the use of financial hedging instruments, there is evidence of a stronger impact of mandated compared with voluntary governance changes.

5.3 *Subsample tests*

We explore whether our results so far are driven by effects that are limited to subsamples. We do so by splitting the sample at the median according to firm size, growth vs. value firms, and the G-index of Gompers, Ishii, Metrick (2003). To illustrate possible subsample issues for the case of firm size, small firms are less likely to hedge because of the high fixed costs associated with effective hedging programs (Bodnar, Hayt and Marston 1996, 1998; Bodnar et al., 1995; Géczy, Minton and Schrand, 1997; Nance, Smith and Smithson, 1993; Allayannis and Ofek, 2001), and, therefore, better governance may not have as strong an effect on risk management for small firms as for large firms. We define large and small firms as firms above and below the median by asset size, respectively, and we do the same for Tobin's Q and the G-index.

Results are reported in Table 5, again for *FX Exposure* (Panel A) and *Derivatives Mentions* (Panel B), and for three indexes, *REG10*, *MANDATE-INDUCED* and *GOV41* (the other indexes

show comparable results, but are not reported to save space; results for *Derivatives Use* are reported in Internet Appendix Table IA.5). We find similar differences for growth firms (firms with high Tobin's Q) and, in a less pronounced manner, for firms with highly entrenched managers (high G-index). Our findings show that the significance level of the impact is, by and large, more mitigated for smaller (high Q, high G) firms, consistent with the views that these categories of firms face higher hedging costs. When we look at individual indexes, we find that small firms react more to the additional measures in the comprehensive *GOV41* and the *MANDATE-INDUCED* index. While it may look surprising that small firms' hedging and risk management appears to be affected by voluntary measures, the findings confirm the importance of using comprehensive indexes and not just a narrow index of clearly exogenous reforms. There is little difference across indexes for firms with high Tobin's Q or high G-index. Our results seem to confirm that our results are not driven by small firms, by differences between growth or value firms, or by differences in the G-index.

5.4 *Pre-reform tests on the direction of managerial hedging bias*

Based on the premise that the SOX reform effectively aligns managers more closely with shareholders' interests, our evidence so far lends support to Hypothesis 1A (underhedging) and appears to reject the alternative view in Hypothesis 1B (overhedging). We undertake an independent consistency test by examining whether the cross-sectional evidence in the pre-reform period also lends support to the underhedging view. While this test is not new compared with existing literature, it appears useful as earlier cross-sectional studies have been carried out for different samples and sample periods, so that the (external) validity cannot be taken for granted (see Section 2.2).

We run cross-sectional regressions for the pre-reform years of our sample period, 2000 to 2002. Our main measure of governance quality is a state-level anti-takeover index, a widely used approach since Bertrand and Mullanaithan (2003) to address concerns about endogeneity when using company-specific measures of governance quality. We use the anti-takeover index of Cain, McKeon, and Davidoff Solomon (2017) (CMD) for the state in which the firm is incorporated. The CMD anti-takeover index is the most comprehensive index of state-level anti-takeover protections that we are aware of; it updates and refines earlier state-level indexes such as the

seminal business combination law index (Bertrand and Mullanaithan, 2003).[19] To check the robustness of the findings, we also use our broad *GOV41* index as a firm-specific governance index. We include the same control variables as in our earlier regressions.

The regression results, presented in Table 6, show that *FX Exposure* decreases, and *Derivatives Mentions* increase as states adopt lower anti-takeover barriers, and as companies exhibit higher governance standards, measured by *GOV41* (the results for *Derivatives Use* are consistent, as reported in Internet Appendix Table IA.6). While these tests are subject to the same concerns about endogeneity as the bulk of the earlier governance-hedging literature, they offer reassuring evidence that corroborates our conclusion that underhedging seems to dominate the reform-induced change in hedging.

We add a word of caution. Establishing a causal relationship between governance reform and corporate hedging cannot rule out the possibility that the SOX reform may not have contributed to a better alignment of managerial actions and shareholder interests. In particular, we cannot completely dismiss the possibility that the reform could have distorted risk management further, even though this hypothetical possibility does not look plausible since it would contradict the bulk of empirical evidence on the value effects of the Sarbanes-Oxley reform (see Section 2.1).

6. The Effect of Firm Heterogeneity

6.1 *Heterogeneous firm exposure to foreign markets*

In this Section, we explore whether the results of our main regressions hold up when we test them against cross-sectional evidence. Firms exhibit different levels of pre-reform exposure to foreign exchange risk and to distortions in managerial incentives, and hence their reaction to a uniform governance shock should not be the same. This offers opportunity to develop additional tests, and to better understand the mechanics and severity in distortions to optimal hedging policies. As we express in Hypothesis 2, firms with more pronounced exposure to sales or inputs in foreign markets and subject to currency risks are likely to have a stronger pre-reform impact of managerial bias, and hence should adjust their hedging more strongly in the wake of the SOX reform. We use four variables for this examination: first, the text-based variable ININ developed

[19] The CMD index of Cain, McKeon, and Davidoff Salomon (2017) also fully covers our sample period, unlike updates of the business combination law index used by Bertrand and Mullanaithan (2003) and others. The index is available on the authors'website. We use the 2000-2002 average of the CMD index.

by Hoberg and Moon (2017) that measures mentions of foreign input exposure minus mentions of foreign operational hedges; second, a hand-collected dummy variable Global Firms vs. Domestic Firms (firms with exposure to foreign sales vs. firms with no exposure). Third, the text-based variable INPUT that measures the firm purchasing inputs from the given nation and fourth, the text-based variable OUTPUT that measures the firm selling goods to the given nation (both based on Hoberg and Moon, 2017).

The results are reported in Table 7. The differences are rather striking for all four measures of foreign exposure in Panel B, where we look at *Derivatives Mentions*. In line with the predictions of Hypothesis 2, we find that Global firms, i.e. firms with exposure to foreign markets reduce their FX Risk exposure as well increase their financinal hedging, and thus exhibit a strong and significant reaction to the SOX reform, whereas firms with only domestic sales show a much weaker, and mostly insignificant reaction. The same relationships hold when we look at our text-based measure of net foreign inputs exposure (variable ININ). When we look at the depth of local INPUT or OUTPUT (the bottom lines of Panel B), we find that the effect is always significant, but the reaction is at least twice as large for firms with high INPUT and high OUTPUT. We perform *F*-Tests for the difference in the coefficients (using pooled regressions) that confirm that the difference between the High and Low subsample is significant for all four measures of exposure to foreign markets. When we look at *FX Exposure* (Panel A) the results are weaker: we find the same significant difference in the effects for Global and Domestic Firms (confirmed by an *F*-Test), but not in the coefficients for the other measures. To conclude, our test for firm heterogeneity concerning foreign market exposure, conducted by splitting sample according to High or Low exposure to foreign markets, shows evidence that is consistent with Hypothesis 2: firms with larger foreign markets exposure adjust their hedging more strongly in the wake of the SOX reform.

6.2 *CEO characteristics and CEO incentives*

The level of pre-reform managerial distortions is the second dimension of the predicted effects of cross-sectional variation. As expressed in our discussion of Hypothesis 2, the effectiveness of corporate governance reform should also depend on ex-ante CEO characteristics and CEO incentives. We investigate, therefore, whether there is evidence showing that there effect of corporate governance reform depends on CEO characteristics and CEO incentives. To address this possibility, we use several variables measuring CEO characteristics, *CEO Tenure, CEO*

Turnover, CEO Duality, and *CEO Age*. *CEO Tenure* and (inversely) *CEO Turnover* in particular are widely used proxies for managerial entrenchment as longer-serving CEOs have greater power over internal governance mechanisms (Berger, Ofek and Yermack, 1997). We add two metrics for CEO incentives, namely *CEO Options* and *CEO Equity. CEO Options* are used to measure manager's appetite for risk taking, in line with e.g. Gormley, Matsa, and Milbourn (2013). *CEO Equity* is viewed as aligning managers with shareholders, and hence should close the gap between managerial actions and shareholder's preferences (e.g., Jensen and Meckling, 1976; Fluck, 1999).

As a first step to check robustness, we include these six CEO variables as controls in the regressions of Tables 3 and 4. We find that their inclusion does not alter our results. Table 8, Panel A, shows the results for the *REG10* and *MANDATE-INDUCED* indexes and for four of the CEO variables. The remaining CEO characteristics, *CEO Age* and *CEO Duality*, and the *GOV41* index show similar results that are documented in the Internet Appendix (Table IA.7), and the unreported governance indexes show consistent results with those reported. While some variables, in particular *CEO Turnover*, *CEO Duality* and the compensation variables, have a significant impact on hedging choices, their inclusion does not alter our finding that governance reforms leads to more hedging, via lower *FX Exposure* and more *Derivatives Mentions*.

We then test the second part of Hypothesis 2 on the impact of firm heterogeneity by examining the variables representing CEO incentives and CEO characteristics. In line with earlier empirical literature showing that CEOs hedge more when they have larger equity holdings and hedge less when they hold more stock options or compensation claims that increase in stock return volatility (e.g., Tufano, 1996; Francis et al., 2017), we investigate the variables *CEO Options* and *CEO Equity* separately. When firms underhedge, then Hypothesis 2 predicts that firms with higher ex ante *CEO Options* stakes should show a stronger pre-reform bias and hence show a stronger reaction to the SOX reform. On the other hand, when CEOs have higher *CEO Equity* stakes, firms should underhedge less and hence show a weaker reaction to the SOX reform than CEOs with lower *CEO Equity* stakes. Opposite effects on hedging for *CEO Options* and *CEO Equity* based on cross-sectional evidence are documented in Tufano (1996). We undertake a median split of the sample, and run our baseline regressions by interacting the governance variables with dummies for the subsamples above and below the median in terms of *CEO Options* and *CEO Equity* exposure. We then report the F-statistics for a Wald test of the difference in the coefficient between firms with High and Low *CEO Options* (*CEO Equity*).

The results are reported in Table 9. In line with the predictions of Hypothesis 2, firms with higher *CEO Options* stakes increase their hedging more following the SOX reform. Panel A looks at the difference in the reduction of *FX Exposure* between firms in the High and Low *CEO Options* group is highly significant for all 7 governance indexes, as the Wald test statistics reveal ($p <$ 0.001 in all cases). When examining the effect on *Derivatives Mentions* in the same regression format (Panel B), we find that firms with CEOs in the High Options group intensify their usage of derivatives significantly more compared with firms in the Low *CEO Options* group. The difference is very strong for the *REG10* index ($p < 0.01$), but rather weak ($p < 0.10$) for all other govrnance indexes except for *REG10 COMPL.* These results are mostly in line with Hypothesis 3. Concerning *CEO Equity* stakes, the results are more mixed. Firms with lower *CEO Equity* indeed show a stronger reduction of *FX Exposure* as predicted (Panel C), but there is only very weak significance, limited to one governance index. We do not report the findings for *Derivatives Mentions* in the table; they are generally insignificant and sometimes show the opposite sign. The weak results for *CEO Equity* should perhaps not come as a surprise given that earlier cross-sectional studies find related results (e.g. Knopf, Nam and Thornton, 2002). Overall, our results, in particular the analysis on *CEO Options*, offer evidence in support of Hypothesis 2.

7. Financial and operational hedges and differences in adjustment speed

Hypothesis 3 postulates that firms will react more rapidly to a governance reform shock with adjustments in their financial hedges compared to their operational hedges. To investigate the speed of reaction and understand the trajectory of firm's reaction to the SOX reform, we use a dynamic difference-and-difference approach and interact our governance indexes with year dummies 2002 to 2006 in Table 10. The first term, the governance index without time interaction term, indicates the time-invariant effect of governance, and the interaction terms capture the year-specific sensitivity of the governance index.

Considering the impact on *FX Exposure*, we find that the time-invariant effect is significant in all years (columns (1) to (3) in Table 10), but the year-specific coefficients unearth a strong dynamic impact that slowly rises to about double the time-invariant impact two years after the adoption of the law, before falling back slightly. All three regressions show that the strongest foreign exchange risk-reduction effect of the mandates occurs around 2004 – the year of the

mandates' deadline – before the interaction term coefficients slowly declines in the long run.[20] Thus, a time-dependent reaction of *FX Exposure* to the governance measures appears to emerge. In line with Hypothesis 3, the impact of better governance on overall *FX Exposure* takes time to deploy and thus is increasing over a number of years, and as is typically expected in difference-in-difference studies, decays in the long-run (see e.g. Roberts and Whited, 2013).

In regressions (4) to (6) of Table 10, where *Derivatives Mentions* is the dependent variable, we find a different time pattern. While we find again a highly significant impact of the time-invariant component for all governance index ($p < 0.01$ always), the time-variant pattern exhibits a much more rapid but short-lived reaction. We find a strong effect of the governance index on the use of derivatives only in the two years during and immediately of the Sarbanes-Oxley Act adoption, and a reversal to a lower sensitivity in all subsequent years. Thus, we find a heightened sensitivity that is temporary in nature, consistent with strategies in which increased FX risk management is initially borne by financial hedges and subsequently replaced by operational hedges. Overall, these findings lend support to Hypothesis 3 of a time-varying mix of financial and operational hedging tools, with financial hedges only initially significant and later being replaced by hedges that are often more cost-efficient. We find similar results for *BOARD&COMP15, BOARD&COMP22, REG10 COMPL.*, *MANDATE-INDUCED COMPL.* (see Table IA.8 in the Internet Appendix).

Our evidence is consistent with a time-varying mix of operational and financial hedges, but we caution that it should not be viewed as an exhaustive test, in particular since our measure of operational hedges is a combined measure of all hedging strategies. Our hypothesis and evidence open an interesting avenue for future research to consider the time-varying adjustment dynamics in the mix of different hedging tools.

8. Robustness and additional tests

8.1 *Firm fixed effect and industry-year fixed effect panel estimations*

We double check the robustness of our results by reestimating our main regressions of Tables 3 and 4 in panel estimations with firm fixed effects in lieu of deviations-from-means. The results are presented in the Internet Appendix (Tables IA.9 and IA.10) and show that our findings are

[20] The weakening of the effect in the long run is not part of Hypothesis 3 but an expected feature in empirical difference-in-difference analyses (cf. Whited and Roberts, 2013), e.g. reflecting general equilibrium adjustments.

indeed robust under this alternative specification.[21] In principle, our main estimator in Tables 3 and 4 using deviations-from-means estimation this estimator is equivalent to a panel estimation with firm fixed effects, but it is reassuring that we find consistent results for both estimators.

To further verify the robustness of our findings, we also rerun our main regressions deploying industry-year fixed effects instead of separate industry and year fixed effects. The outcome is reported in the Internet Appendix, Table IA.11. We find that the results are very robust to this more granular fixed effect panel estimation.

8.2 *Robustness of the FX Exposure estimation*

We estimate the *FX Exposure* variable α^i_1 by using the S&P market-weighted index, and then use the square root of the absolute value (see Section 3.1). Considering that there is some variation and debate in the risk management literature on the best market index (see for instance Dominguez and Tesar, 2006; Bodnar and Wong, 2003), we check the robustness of our variable construction and outcomes by using two different market indexes for the estimation of α_i: the CRSP market-weighted index that is the broadest easily available market index and widely used in the empirical asset pricing literature, as well as the Russell 1000 market-weighted index (the index from which our sample of firms is drawn). The results provide evidence that our findings are robust to these changes in the market index, documented in the Internet Appendix (Tables IA.12 and IA.13) using both the governance gap and actual implementation measures. In unreported robustness checks, we also redo our test by using just the absolute value of α^i_1 instead of the square root, and find consistent results.

8.3 *The role of majority board independence*

Finally, we explore whether our results still hold up when we use only a single SOX measure, the majority of independent directors, as the explanatory variable of interest. When we replicate our analysis for this single SOX measure, we do not find any significant change in either foreign exchange exposure nor in the use of derivatives (see Table IA.14 in the Internet Appendix). This analysis demonstrates that our findings can be reconciled with the analysis of Huang et al. (2013) who also do not find significant results for most firms (but find an exception for firms with high

[21] The use of deviations-from-means estimators can be justified based on the insight that firm FE in panel data may produce problems if used with slow-moving corporate governance indexes (see Atanasov and Black, 2016).

CEO equity ownership). Thus, our analysis shows that the combination of several SOX measures rather than a single measure in isolation affects risk management.

9. Conclusion

Following the corporate governance scandals of the early 2000s, the strong regulatory response in the form of the 2002 Sarbanes-Oxley Act led to a comprehensive reform process that strengthened board supervision and limited managerial discretion. We use this large exogenous shock as a unique, yet unexplored opportunity to advance our understanding of the relationship between corporate governance quality and foreign exchange risk management. Using a large panel of US firms, our strategy is to exploit the rich variation in the reach of the SOX reform recorded in our panel data set: we analyze the initial governance gap, a measure that isolates the exogenous pressure to reform, but also consider the actual timeline of implementation measures at the firm level, and we deploy narrow measures of obligatory governance changes as well as broad indexes that include voluntary reforms and better encompass the comprehensive effect of the rule changes and the manifold transmission channels of better governance.

We obtain strong and robust results showing that improvements in governance lead to a reduction of foreign exchange risk for all governance indexes, consistent with the hypothesis that firms tend to hedge too little on average when managerial discretion is not effectively checked. While our evidence indicates that voluntary changes have a weaker impact than mandated or mandate-induced governance reforms, they are nonetheless important to understand the far-reaching effects of the reform. We find evidence confirming the predictions that firms with larger foreign market exposure and firms with a stronger risk-taking bias in managerial incentives should adjust their risk management more. We also present evidence that firms adjust financial hedges more quickly than operational hedges. While our investigation is limited to a single reform event, the SOX Act is arguably the most far-reaching governance reform in many decades. Overall, we provide new insights on the causal relationship between governance and corporate hedging policies, and open new research avenues, for example concerning the dynamic adjustment in the hedging mix following risk shocks or risk management shocks.

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Appendix: Definition of Variables

Dependent variables

***FX Exposure* (*Square root of the absolute exposure coefficient,* $\sqrt{|\alpha^i_2|}$)**

We take the absolute value of the foreign exchange exposure response coefficient α^i_2 estimated via equation [1], and then, to avoid truncation bias, we take its square root.

Derivatives Mentions

Derivatives Mentions is a text-based count variable of the number of mentions of the use of FX derivatives in a company's annual 10-K filings. The Derivatives mention variables is available in the Hoberg-Moon data library at Gerard Hoberg's website, http://faculty.marshall.usc.edu/Gerard-Hoberg/HobergMoonDataSite/index.html. Hoberg and Moon (2017) use a dummy version of this variable whereas we use the original count variable*(Siznumfxhedge)* of the HobergMoon_FXHedgeData file.

Governance variables

GOV41 is a composite index of the 41 governance attributes drawn from the ISS database, first used by Aggarwal, Erel, Ferreira, and Matos (2011) in developing earlier indexes such as Gompers, Ishii, and Metrick (2003). A value of one is assigned if the firm meets minimally acceptable guidelines on that attribute, and zero otherwise. The index is expressed as a percentage. The 41 attributes in *GOV41* are listed at the end of the discussion of governance variables.

REG10 is a composite index of the following 10 attributes that were mandated in the revised stock exchange listing standards denoted by the asterisk * in the table of *GOV41* attributes below. A value of one is assigned to each attribute if the firm meets minimally acceptable guidelines on that attribute, and zero otherwise. The index is expressed as a percentage.

- Board is controlled by more than 50% independent outside directors
- Compensation committee composed solely of independent outsiders
- Nominating committee composed solely of independent outsiders
- Governance guidelines are publicly disclosed
- Performance of the board is reviewed regularly
- Board-approved succession plan in place for the CEO
- Outside directors meet without CEO and disclose number of times met
- Consulting fees paid to auditors are less than audit fees paid to auditors
- Audit committee composed solely of independent outsiders
- All stock-incentive plans adopted with shareholder approval

REG10 COMPL. is a composite index of the 41 attributes in the table above minus the 10 attributes that comprise *REG10* (as denoted by the asterisk *). A value of one is assigned if the firm meets minimally acceptable guidelines on that attribute, and zero otherwise. The index is expressed as a percentage.

MANDATE-INDUCED is a composite index of the 20 attributes denoted by the † symbol in the table of *GOV41* attributes below. These 20 attributes include the 10 mandatory attributes in *REG10* plus 10 more that are so closely associated with the legal requirements in *REG10* that a joint introduction is likely, as the very high correlation with *REG10* shows. A value of one is assigned to each attribute if the firm meets

minimally acceptable guidelines on that attribute, and zero otherwise. The index is expressed as a percentage. In addition to the 10 attributes of the *REG10* index, the 10 following attributes are included:

- Board size is at greater than five but less than sixteen
- Governance committee exists and met in the past year
- Annually elected board (no staggered board)
- Policy exists on outside directorships (four or fewer boards is the limit)
- Board has the express authority to hire its own advisers
- Auditors ratified at most recent annual meeting
- Directors are subject to stock ownership requirements
- Officers are subject to stock ownership guidelines
- No interlocks among compensation committee members
- Directors receive all or a portion of their fees in stock

MANDATE-INDUCED COMPL. is a composite index of the 41 attributes in the table above minus the 20 attributes that comprise the *MANDATE-INDUCED* index (as denoted by the † symbol) in the table above. A value of one is assigned to each attribute if the firm meets minimally acceptable guidelines on that attribute, and zero otherwise. The index is expressed as a percentage.

BOARD&COMP15 is a composite index of 15 mandated or mandate-induced attributes that are contained in *MANDATE-INDUCED* and that are all related to changes in the Board of Directors or the award of executive compensation. They are denoted by the [1] symbol in the table of *GOV41* attributes below. A value of one is assigned if the firm meets minimally acceptable guidelines on that attribute, and zero otherwise. The index is expressed as a percentage. *BOARD&COMP15* consists of the following 15 measures:

- Board is controlled by more than 50% independent outside directors
- Board size is at greater than five but less than sixteen
- Compensation committee composed solely of independent outsiders
- Nominating committee composed solely of independent outsiders
- Governance committee exists and met in the past year
- Governance guidelines are publicly disclosed
- Board has the express authority to hire its own advisers
- Performance of the board is reviewed regularly
- Board-approved succession plan in place for the CEO
- Outside directors meet without CEO and disclose number of times met
- Directors are subject to stock ownership requirements
- Officers are subject to stock ownership guidelines
- No interlocks among compensation committee members
- Directors receive all or a portion of their fees in stock
- All stock-incentive plans adopted with shareholder approval

BOARD&COMP22 is a composite index of 22 governance attributes that are all related to changes in the board of Directors or the award of executive compensation. They are denoted by the [2] symbol in the table of *GOV41* attributes below. A value of one is assigned if the firm meets minimally acceptable guidelines on that attribute, and zero otherwise. The index is expressed as a percentage. In addition to the 15 attributes contained in *BOARD&COMP15*, it contains the following 7 voluntary measures:

- CEO is not listed as having a related-party transaction
- Chairman and CEO positions are separated, or there is a lead director
- Does not ignore shareholder proposal

– Qualifies for proxy contest defenses combination points
– Options grants align with company performance and reasonable burn rate
– Officers' and directors' stock ownership is at least 1% but not over 30% of total shares outstanding
– Repricing prohibited

***GOV41* Components list**

Aggarwal, Schloetzer and Williamson (2019) identify the following 41 firm-level 'good' governance attributes, under four categories, relating to *board*, *audit*, *anti-takeover provisions*, and *compensation and ownership.*

* denotes attributes that are included in the *REG10* index.
† denotes attributes that are included in the *MANDATE-INDUCED* index.
[1] denotes attributes that are included in the *BOARD&COMP15* index.
[2] denotes attributes that are included in the *BOARD&COMP22* index.

Board
1. All directors attended 75% of board meetings or had a valid excuse
2. CEO serves on the boards of two or fewer public companies
3. Board is controlled by more than 50% independent outside directors * † [1] [2]
4. Board size is at greater than five but less than sixteen † [1]
5. CEO is not listed as having a related-party transaction
6. Compensation committee composed solely of independent outsiders *† [1] [2]
7. Chairman and CEO positions are separated, or there is a lead director
8. Nominating committee composed solely of independent outsiders *† [1] [2]
9. Governance committee exists and met in the past year † [1] [2]
10. Shareholders vote on directors selected to fill vacancies
11. Governance guidelines are publicly disclosed *† [1] [2]
12. Annually elected board (no staggered board) †
13. Policy exists on outside directorships (four or fewer boards is the limit) †
14. Shareholders have cumulative voting rights
15. Shareholder approval is required to increase/decrease board size
16. Majority vote requirement to amend charter/bylaws (not supermajority)
17. Board has the express authority to hire its own advisers † [1] [2]
18. Performance of the board is reviewed regularly *† [1] [2]
19. Board-approved succession plan in place for the CEO *† [1] [2]
20. Outside directors meet without CEO and disclose number of times met *† [1] [2]
21. Directors are required to submit resignation upon a change in job
22. Board cannot amend bylaws without shareholder approval or can do so under limited circumstances
23. Does not ignore shareholder proposal
24. Qualifies for proxy contest defenses combination points
Audit committee
25. Consulting fees paid to auditors are less than audit fees paid to auditors *†
26. Audit committee composed solely of independent outsiders *†
27. Auditors ratified at most recent annual meeting †
Anti-Takeover provisions
28. Single class, common
29. Majority vote requirement to approve mergers (not supermajority)
30. Shareholders may call special meetings
31. Shareholders may act by written consent
32. Company either has no poison pill or a pill that is shareholder approved.
33. Company is not authorized to issue blank check preferred stock

Compensation and ownership
34. Directors are subject to stock ownership requirements † [1] [2]
35. Officers are subject to stock ownership guidelines † [1] [2]
36. No interlocks among compensation committee members † [1] [2]
37. Directors receive all or a portion of their fees in stock † [1] [2]
38. All stock-incentive plans adopted with shareholder approval *† [1] [2]
39. Options grants align with company performance and reasonable burn rate
40. Officers' and directors' stock ownership is at least 1% but not over 30% of total shares outstanding
41. Repricing prohibited

GOVERNANCE GAP (for example, *REG10 GAP*) is calculated for each governance index as the theoretical index value under full compliance with all index components minus the actual index value of the governance index in year 2002.

Δ *GOVERNANCE GAP* (for example, Δ*REG10 GAP*) is calculated for each governance variable as the *GOVERNANCE GAP* value of year *t* minus the mean *GOVERNANCE GAP* for the 2000-2007 period (Δ *GOVERNANCE GAP* is used as the variable of interest in the difference estimations in Table 3).

Δ *VALUE*
Δ *VALUE* for any control or dependent variable *VALUE* is calculated as the variable *VALUE* in year *t* minus the mean variable of *VALUE* for the 2000-2007 period (Δ values are used in the difference estimations in Tables 3 and 4).

Control variables

Antitakeover-Index
Comprehensive index of state-level changes in antitakeover laws, see Cain, McKeon, and Solomon, 2017, for details on the index construction and data.

Assets
Total assets is the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets.

CEO Options
The fair value (in thousands of dollars) of options awarded during the year. Before 2006, Execucomp calculated options value using the Black-Scholes model.

CEO Equity
Shares owned (in thousands of dollars) by the executive, excluding options that are exercisable or will become exercisable within 60 days.

CEO Tenure
The number of years the current CEO has held the position in the firm.

CEO Duality
The binary variable takes a value of 1 if the CEO also holds the position of the chairman.

CEO Turnover
The binary variable takes a value of 1 if the CEO changed during the year**CEO Age**
The age of the executive as reported in the annual proxy statement.

Debt/Assets
Debt-to-assets ratio is long-term total debt divided by total assets.

Domestic vs. Foreign firm
Dummy variable of firms according to their Multinationality measure: domestic firms belong to the Mutinationality index score D, global firms to index score G.

Foreign sales
Foreign sales is the International Sales / Net Sales or Revenues * 100.

Industry
Using the two-digit standard industry classification codes we create industry dummies that take the value of 1 if the firm is in an industry category and 0 otherwise. We removed financial, insurance and real estate firms that which had two digit codes in the range 60 to 67.

ININ
Text-based measure of the number of mentions of the firm purchasing inputs from the given nation when the firm does also mention owning assets in that nation (Hoberg and Moon, 2017).

INPUT
Text-based measure of the number of mentions of the firm purchasing inputs from a given nation (based on Hoberg and Moon, 2017)

Multinationality: the ABHK Scheme
The ABHK multinationality classification system divides the world into six regions based on the inhabited continents: Africa, Asia, Europe, North America (including Central America), South America, and Oceania (Australia, New Zealand and the Pacific islands). A firm is considered to have a presence in a particular region if it has at least one subsidiary there. The ABHK scheme index ranges in value from one to seven. A firm with activities entirely within the United States is defined as domestic (*D*) and is assigned a value of one in the index. A firm with activities in the region of North and Central America is classified as regional (*R*), and is assigned a value of two in the index. If a firm has activities in two regions (*T2),* it is assigned a value of three, three regions (*T3)* is assigned a value of four, four regions (*T4*) is assigned a value of five and five regions (*T5*) is assigned a value of six. A firm is classified as 'global' (*G*) if it has activities in all six regions and is assigned a value of seven in the index. The data were collected from the Directory of Corporate Affiliates via Lexis Nexis.

M/B ratio
Market-to-book value ratio is defined as the market value of the ordinary (common) equity divided by the balance sheet value of the ordinary (common) equity.

OUTPUT
Text-based measure of the number of mentions of the firm selling goods to the given nation (based on Hoberg and Moon, 2017)

Quick ratio
Quick ratio (also referred to as the liquidity ratio) is defined as (Cash & Equivalents + Receivables (Net)) / Current Liabilities-Total.

R&D
R&D expense is research and development expenses / net sales or revenues * 100.

Internet Appendix available at: https://www.tse-fr.eu/fr/people/ulrich-hege

Figure 1: Graphical analysis of the parallel trends assumption (REG10 governance index)

The graphs show the evolution of the mean *Derivatives Mentions* (Figure 1A) and mean absolute *FX Exposure* (Figure 1B), the top tercile of firms according to the initial gap in the REG10 governance index (blue dashed line) and the two remaining terciles of firms (red solid line), in the period prior and after the year of SOX implementation (between 2002 and 2003).

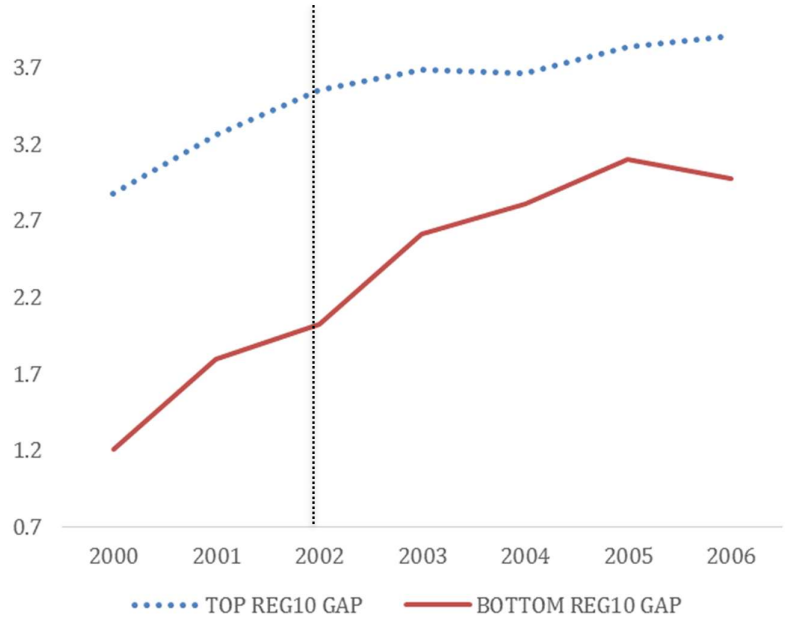

Figure 1A: *Derivatives Mentions*, by *REG10* gap

Figure 1B: *FX Exposure,* by *REG10* gap

Table 1 Summary statistics: Corporate governance and risk management

Panel A: Governance indexes over time		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		2002	2003	2004	2005	2006	2007	% change, 2007- 2002	Rank sum/ *t*-test, 2007-2002
REG10	Mean	3.38	4.38	4.77	7.79	8.07	8.12	140	52.80 (0.00)*
	Median	3.00	5.00	5.00	8.00	9.00	9.00	200	27.02 (0.00)*
	Standard deviation	1.51	1.54	1.56	1.71	1.53	1.43		
REG10 COMPL.	Mean	10.34	14.54	15.97	16.65	16.18	17.69	71	47.35 (0.00)*
	Median	10.00	15.00	16.00	17.00	16.00	18.00	80	27.26 (0.00)*
	Standard deviation	1.92	3.02	2.80	2.95	2.98	3.03		
BOARD&COMP15	Mean	5.71	7.10	9.00	10.75	10.52	10.76	89	34.94 (0.00)*
	Median	6.00	7.00	10.00	12.00	11.00	11.00	83	23.94 (0.00)*
	Standard deviation	2.41	2.59	2.36	3.00	2.58	2.39		
BOARD&COMP22	Mean	8.04	10.48	12.6	14.77	14.56	15.16	89	40.44 (0.00)*
	Median	8.00	11.00	13.00	16.00	15.00	16.00	100	25.75 (0.00)*
	Standard deviation	2.97	3.16	2.82	3.61	3.1	2.88		
MANDATE-IND	Mean	7.53	10.21	11.76	14.77	14.47	14.63	94	45.29 (0.00)*
	Median	8.00	10.00	12.00	15.00	15.00	15.00	88	26.64 (0.00)*
	Standard deviation	2.74	2.39	2.41	2.78	2.51	2.46		
MANDATE-IND COMPL	Mean	5.52	8.70	8.98	9.68	9.79	11.18	103	45.66 (0.00)*
	Median	6.00	9.00	9.00	10.00	10.00	11.00	83	27.77 (0.00)*
	Standard deviation	1.98	2.11	2.01	2.08	2.16	2.14		
GOV41	Mean	13.05	18.91	20.74	24.45	24.25	25.81	98	54.56 (0.00)*
	Median	13.00	19.00	21.00	25.00	25.00	26.00	100	28.27 (0.00)*
	Standard deviation	4.01	3.58	3.55	3.86	3.79	3.76		

Panel B: FX Exposure by governance index over time

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Year	Low REG10	High REG10	*Z* (*p*)	Low REG10 COMPL.	High REG10 COMPL.	*Z* (*p*)	Low BOARD& COMP15	High BOARD& COMP15	*Z* (*p*)	Low BOARD& COMP22	High BOARD& COMP22	*Z* (*p*)		
2000	1.396	1.294	0.95 (0.34)	1.343	2.161	-1.30 (0.19)	1.464	1.261	2.08 (0.03)†	1.462	1.267	1.84 (0.06) ǂ		
2001	1.488	1.223	1.13 (0.25)	1.457	1.637	-0.31 (0.75)	1.542	1.210	1.78 (0.07)ǂ	1.540	1.196	1.32 (0.18)		
2002	1.106	0.747	1.97 (0.04)†	1.085	1.068	1.36 (0.17)	1.125	0.756	2.15 (0.03)†	1.119	0.793	1.91 (0.06)ǂ		
2003	0.834	0.651	1.29 (0.19)	0.819	0.749	2.14 (0.03)†	0.862	0.709	3.09 (0.00)*	0.933	0.746	3.24 (0.00)*		
2004	0.715	0.675	1.32 (0.18)	0.806	0.654	2.74 (0.00)*	0.90	0.657	3.60 (0.00)*	0.886	0.670	2.72 (0.00)*		
2005	0.937	0.693	2.66 (0.00)*	1.029	0.685	2.30 (0.02)†	0.983	0.696	2.39 (0.02)ǂ	0.954	0.703	1.67 (0.09)ǂ		
2006	1.048	0.891	0.24 (0.81)	0.905	0.891	0.24 (0.81)	0.937	0.891	-0.04 (0.96)	0.762	0.899	-0.39 (0.69)		
2007	1.248	0.978	1.86 (0.06) ǂ	1.405	0.952	2.87 (0.00)*	1.187	0.995	1.76 (0.08)ǂ	1.248	0.985	2.15 (0.03)†		
Year	Low MAND-IND	High MAND-IND	*Z* (*p*)	Low MAND-IND COMPL.	High MAND-IND COMPL.	*Z* (*p*)	Low GOV41	High GOV41	*Z* (*p*)	All firms	Prop. Sig	Small firms	Large firms	*Z* (*p*)
2000	1.400	1.179	2.10 (0.04)†	1.398	1.055	1.06 (0.29)	1.350	1.497	0.80 (0.42)	1.394	0.05	1.678	1.211	3.18 (0.00)*
2001	1.497	1.217	1.24 (0.21)	1.457	1.605	0.54 (0.58)	1.478	1.227	0.54 (0.59)	1.458	0.07	1.668	1.225	3.39 (0.00)*
2002	1.109	0.625	2.35 (0.02)†	1.101	0.709	0.87 (0.39)	1.107	0.612	1.94 (0.05)ǂ	1.085	0.08	1.201	0.992	2.64 (0.00)*
2003	0.847	0.678	2.11 (0.04)†	0.81	0.782	1.49 (0.14)	0.837	0.713	2.59 (0.00)*	0.803	0.09	0.966	0.688	3.29 (0.00)*
2004	0.741	0.670	2.37 (0.02)†	0.758	0.670	1.95 (0.05)ǂ	0.828	0.637	3.37 (0.00)*	0.694	0.10	0.789	0.624	3.29 (0.00)*
2005	1.058	0.700	2.52 (0.01)†	0.832	0.700	1.92 (0.05)ǂ	1.118	0.702	2.34 (0.02)†	0.720	0.07	0.922	0.659	3.03 (0.00)*
2006	0.864	0.893	-0.6 (0.54)	0.853	0.905	-0.25 (0.80)	0.767	0.893	-0.36 (0.72)	0.891	0.10	1.008	0.801	3.08 (0.00)*
2007	1.226	0.978	2.15 (0.03)†	1.293	0.985	1.34 (0.18)	1.248	0.985	1.85 (0.06) ǂ	1.017	0.11	1.305	0.896	4.73 (0.00)*

Panel C: Derivatives Mentions by governance index over time

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Year	Low REG10	High REG10	*t*-test	Low REG10 COMPL.	High REG10 COMPL.	*t*-test	Low BOARD& COMP15	High BOARD& COMP15	*t*-test	Low BOARD& COMP22	High BOARD& COMP22	*t*-test	
2000	2.16	5.34	-5.90 (0.00)*	2.40	2.31	0.10 (0.92)	1.93	5.09	-8.10 (0.00)*	1.99	5.19	-7.67 (0.00)*	
2001	2.65	5.19	-4.19 (0.00)*	2.88	1.54	1.26 (0.21)	2.43	5.22	-6.26 (0.00)*	2.48	5.37	-6.10 (0.00)*	
2002	2.91	5.62	-4.16 (0.00)*	3.15	2.00	0.99 (0.32)	2.65	5.76	-6.54 (0.00)*	2.73	5.75	-5.95 (0.00)*	
2003	3.24	3.97	-1.59 (0.11)	2.65	4.12	-4.04 (0.00)*	2.36	4.81	-6.90 (0.00)*	2.40	4.33	-5.43 (0.00)*	
2004	3.36	3.49	-0.34 (0.74)	2.94	3.62	-1.63 (0.11)	2.26	3.81	-3.51 (0.00)*	2.16	3.78	-3.53 (0.00)*	
2005	2.68	3.75	-1.76 (0.08)ǂ	2.64	3.95	-2.92 (0.00)*	2.26	3.85	-2.93 (0.00)*	1.84	3.84	-3.25 (0.00)*	
2006	2.42	3.75	-1.89 (0.06)ǂ	2.77	4.01	-2.96 (0.00)*	2.3	3.81	-2.54 (0.01)†	2.55	3.76	-1.86 (0.06)ǂ	
2007	1.58	3.81	-2.99 (0.00)*	2.49	3.87	-2.67 (0.00)*	1.65	3.85	-3.39 (0.00)*	1.58	3.81	-3.08 (0.00)*	
Year	Low MAND-IND	High MAND-IND	*t*-test	Low MAND-IND COMPL.	High MAND-IND COMPL	*t*-stat.	Low GOV41	High GOV41	*t*-test	All firms	Small firms	Large firms	*t*-test
2000	2.06	5.71	-7.62 (0.00)*	2.27	3.19	-2.23 (0.02)†	2.21	5.29	-5.21 (0.00)*	2.4	1.36	3.81	-8.80 (0.00)*
2001	2.56	5.62	-5.64 (0.00)*	2.73	3.5	-1.66 (0.09)ǂ	2.73	4.54	-2.73 (0.00)*	2.85	1.73	4.26	-8.11 (0.00)*
2002	2.78	6.29	-6.03 (0.00)*	3.09	3.31	-0.45 (0.65)	2.99	5.00	-2.82 (0.00)*	3.12	1.94	4.54	-7.75 (0.00)*
2003	2.51	4.47	-5.40 (0.00)*	3.11	3.5	-0.96 (0.33)	2.51	4.17	-4.54 (0.00)*	3.38	2.16	4.74	-7.41 (0.00)*
2004	2.28	3.84	-3.62 (0.00)*	2.97	3.57	-1.38 (0.16)	2.23	3.81	-3.59 (0.00)*	3.42	2.11	4.76	-7.18 (0.00)*
2005	1.78	3.83	-3.12 (0.00)*	3.57	3.65	-0.15 (0.88)	1.98	3.78	-2.53 (0.01)†	3.63	2.23	4.86	-7.24 (0.00)*
2006	2.37	3.77	-2.04 (0.04)†	3.25	3.71	-0.86 (0.38)	2.33	3.75	-1.96 (0.05)ǂ	3.64	2.21	4.77	-6.95 (0.00)*
2007	1.58	3.81	-2.99 (0.00)*	3.00	3.68	-0.58 (0.56)	2.50	3.71	-1.28 (0.20)	3.66	2.25	4.66	-6.63 (0.00)*

Notes: Panel A of this table presents the annual mean, median and standard deviation for each of the governance indices for 2002-2007. Column (7) shows the percentage change in the governance indexes in 2007 relative to 2002. Column (8) presents the t-statistic and Wilcoxon rank sum z-statistic for the test of difference between mean and median values of the governance indices in 2007 relative to 2002. Panel B presents the median absolute foreign exchange rate exposure coefficients (α^i_2) as estimated in equation [1] for firms in high and low governance groups. Panel B also presents the overall median exposure coefficients for the full sample and the proportion of the firms with significant exposure (at the 5 percent level or better). Panel C presents the mean number of mentions of the firm using foreign currency derivatives for firms in high and low governance groups. Low and high *REG10, REG10 COMPLEMENT, BOARD&COMP15, BOARD&COMP22, MANDATE-INDUCED, MANDATE-INDUCED COMPLEMENT* and *GOV41* governance groups are defined as having values less than or equal to (greater than) the overall median index values of 5, 15,8,11,11, 8 and 22 respectively. Small (large) firms are defined as having total assets less (greater) than the overall median value of $1,374.2 million for the period 2000 to 2007. The rank sum *Z* (*t*-test) statistic presents the significance tests for the difference in median (mean) values. *p*-values are reported in parentheses. The governance variables are defined in the Appendix. *, † and ǂ indicate significance at the 1, 5 and 10 percent levels respectively.

Table 2 Summary statistics of control variables

Panel A: Control variables by governance index

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All firms					REG10		
	Mean	Median			Low	High	(6)-(5)	Z
Assets	58643.32	1374.23			955.18	2223.79	1268.61	-13.90 (0.00)*
R&D	1.54	0.01			0.06	0.03	-0.03	5.29 (0.00)*
Quick ratio	2.49	1.41			1.55	1.30	-0.25	7.78 (0.00)*
M/B ratio	2.37	1.74			1.69	1.81	0.11	-2.23 (0.03)†
Leverage	0.23	0.21			0.19	0.21	0.02	-2.35 (0.02)†
Foreign sales	24.41	16.69			13.37	24.59	11.22	-4.56 (0.00)*
ABHK	4.08	4.00			4.00	4.00	0.00	-3.73 (0.00)*
		REG10 COMPL.				BOARD&COMP15		
	Low	High	(2)-(1)	*Z* (*p*)	Low	High	(6)-(5)	*Z* (*p*)
Assets	904.68	2323.52	1418.85	-14.49 (0.00)*	748.17	2471.07	1722.90	-22.41 (0.00)*
R&D	0.05	0.04	-0.01	-0.97 (0.33)	0.06	0.04	-0.02	4.81 (0.00)*
Quick ratio	1.52	1.36	-0.16	4.78 (0.00)*	1.60	1.28	-0.32	9.86 (0.00)*
M/B ratio	1.65	1.83	0.18	-5.76 (0.00)*	1.71	1.78	0.06	-1.05 (0.29)
Leverage	0.20	0.21	0.01	-0.24 (0.80)	0.20	0.22	0.02	-2.10 (0.04)†
Foreign sales	13.68	21.90	8.22	-4.86 (0.00)*	9.85	24.00	14.15	-9.38 (0.00)*
ABHK	4.00	4.00	0.00	-1.56 (0.12)	4.00	4.00	0.00	-3.48 (0.00)*
		BOARD&COMP22				MANDATE-INDUCED		
	Low	High	(2)-(1)	*Z* (*p*)	Low	High	(6)-(5)	*Z* (*p*)
Assets	762.59	2353.19	1590.61	-20.43 (0.00)*	838.64	2407.33	1568.69	-18.71 (0.00)*
R&D	0.06	0.04	-0.02	4.02 (0.00)*	0.06	0.04	-0.01	3.78 (0.00)*
Quick ratio	1.58	1.30	-0.29	8.06 (0.00)*	1.54	1.29	-0.24	7.75 (0.00)*
M/B ratio	1.71	1.78	0.07	-1.26 (0.20)	1.71	1.8	0.09	-2.00 (0.04)†
Leverage	0.20	0.22	0.02	-1.06 (0.29)	0.21	0.22	0.01	-1.33 (0.18)
Foreign sales	9.95	23.73	13.78	-9.25 (0.00)*	11.81	23.82	12.01	-8.12 (0.00)*
ABHK	4.00	4.00	0.00	-1.96 (0.05)ǂ	4.00	4.00	0.00	-1.46 (0.14)
		MANDATE-INDUCED COMPL				GOV41		
	Low	High	(2)-(1)	*Z* (*p*)	Low	High	(6)-(5)	*Z* (*p*)
Assets	1023.19	2078.04	1054.84	-12.37 (0.00)*	890.48	2225.08	1334.6	-16.60 (0.00)*
R&D	0.05	0.04	-0.01	0.86 (0.38)	0.06	0.04	-0.02	3.74 (0.00)*
Quick	1.44	1.38	-0.05	1.77 (0.08)†	1.51	1.32	-0.2	5.82 (0.00)*
Mtbv	1.69	1.82	0.13	-3.68 (0.00)*	1.69	1.81	0.12	-2.91 (0.00)*
Leverage	0.22	0.21	-0.01	1.34 (0.18)	0.21	0.21	0.00	-0.02 (0.98)
Foreign sales	15.09	18.73	3.64	-3.73 (0.00)*	13.09	21.79	8.7	-6.52 (0.00)*
ABHK	4.00	4.00	0.00	5.03 (0.00)*	4.00	4.00	0.00	1.29 (0.20)

Panel B: Spearman rank correlation matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	FX Exposure	1.00																			
2	Assets	-0.15*	1.00																		
3	R&D	0.10*	-0.14*	1.00																	
4	Quick ratio	0.15*	-0.45*	0.43*	1.00																
5	M/B ratio	0.05*	-0.09*	0.35*	0.27*	1.00															
6	Leverage	-0.06*	0.27*	-0.29*	-0.45*	-0.38*	1.00														
7	Foreign sales	0.03	0.11*	0.40*	0.15*	0.13*	-0.13*	1.00													
8	ABHK	-0.03	0.28*	0.25*	-0.05*	0.09*	-0.05*	0.61*	1.00												
9	Derivatives Mentions	-0.04	0.32*	0.25*	-0.12*	0.05*	0.03	0.58*	0.54*	1.00											
10	Derivatives Use	-0.04	0.22*	0.22*	-0.07*	0.01	-0.01	0.49*	0.46*	0.69*	1.00										
11	REG10	-0.13*	0.25*	-0.06*	-0.13*	0.04	0.01	0.01	0.02	0.07*	0.04	1.00									
12	REG10 COMPL.	-0.18*	0.28*	0.00	-0.07*	0.07*	-0.04	0.03	-0.01	0.08*	0.08*	0.63*	1.00								
13	BOARD&COMP15	-0.18*	0.38*	-0.05*	-0.21*	0.04	0.04	0.05*	0.10*	0.16*	0.11*	0.89*	0.72*	1.00							
14	BOARD&COMP22	-0.18*	0.35*	-0.03	-0.17*	0.05*	0.01	0.05*	0.07*	0.14*	0.10*	0.88*	0.80*	0.96*	1.00						
15	MAN.-IND.	-0.17*	0.31*	-0.02	-0.14*	0.05*	0.00	0.04	0.04	0.12*	0.08*	0.93*	0.79*	0.95*	0.95*	1.00					
16	MAN.-IND. COMPL.	-0.15*	0.21*	-0.02	-0.03	0.06*	-0.04*	-0.01	-0.05*	0.02	0.03	0.57*	0.93*	0.58*	0.68*	0.63*	1.00				
17	GOV41	-0.17*	0.29*	-0.03	-0.10*	0.06*	-0.02	0.02	0.01	0.09*	0.06*	0.86*	0.94*	0.87*	0.92*	0.93*	0.87*	1.00			
18	CEO tenure	0.02	-0.09*	-0.03	0.05	0.06	-0.02	-0.04	-0.12*	-0.08*	-0.06*	0.00	-0.02	-0.06*	-0.08*	-0.02	0.00	-0.01	1.00		
19	CEO equity	0.03	0.19*	-0.01	0.01	0.13*	-0.01	-0.01	0.01	0.02	0.01	0.00	0.01	0.00	-0.02	0.01	-0.01	0.01	0.40*	1.00	
20	CEO options	0.01	0.28*	0.23*	0.01	0.20*	-0.10*	0.18*	0.23*	0.23*	0.19*	-0.11*	0.00	0.00	-0.02	-0.05	-0.03	-0.05	-0.11*	-0.01	1.00
21	CEO duality	-0.03	0.07*	-0.05	-0.05	0.00	0.01	0.07*	0.08*	0.01	0.03	0.04	0.00	0.06*	0.07*	0.06*	-0.05	0.01	-0.04	0.01	0.04

Notes: Panel A of this table reports the median values for the control variables for all firms and low/high governance groups. Low and high *REG10, REG10 COMPLEMENT, BOARD&COMP15, BOARD&COMP22, MANDATE-INDUCED, MANDATE-INDUCED COMPLEMENT* and *GOV41* governance groups are defined as having values less than or equal to (greater than) the overall median index values of 5, 15, 8, 11, 11, 8 and 22 respectively. The '*Z*-statistic' reports the results of a Wilcoxon rank sum test of the difference in medians. Panel B presents the Spearman rank correlation matrix (n = 3774; the sample size for correlation matrix for the CEO characteristic variables (including tenure, equity, options and duality) is n = 1908). The absolute foreign exchange exposure estimates α_i^2, are estimated via eq. (1). Detailed information on the variables can be found in the Appendix. The governance and control variables are defined in the Appendix. *, † and ǂ indicate significance at the 1, 5 and 10 percent levels respectively.

Table 3 Multivariate analysis: Initial governance gap (intention to treat)

Panel A:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. variable FX Exposure							
Assets	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*
	(0.09)	(0.09)	(0.09)	(0.09)	(0.08)	(0.09)	(0.09)
R&D	0.001*	0.001*	0.001*	0.001*	0.001*	0.001*	0.001*
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Quick	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
	(0.74)	(0.77)	(0.72)	(0.75)	(0.75)	(0.76)	(0.76)
M/B ratio	0.034***	0.035***	0.034***	0.034***	0.034***	0.035***	0.035***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Leverage	0.024	0.016	0.024	0.023	0.023	0.016	0.019
	(0.80)	(0.87)	(0.80)	(0.81)	(0.81)	(0.86)	(0.84)
Foreign sales	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.96)	(0.99)	(0.94)	(0.95)	(0.95)	(1.00)	(0.97)
ABHK	0.054	0.051	0.051	0.051	0.052	0.054	0.052
	(0.33)	(0.35)	(0.35)	(0.36)	(0.35)	(0.33)	(0.34)
$ABHK^2$	-0.006	-0.005	-0.005	-0.005	-0.005	-0.006	-0.005
	(0.38)	(0.42)	(0.42)	(0.43)	(0.41)	(0.39)	(0.42)
Derivatives Mentions	0.006	0.006	0.006	0.006	0.006	0.006	0.006
	(0.28)	(0.26)	(0.25)	(0.26)	(0.26)	(0.28)	(0.25)
REG10	-0.166						
	(0.17)						
REG10 COMPL.		-0.464**					
		(0.04)					
BOARD&COMP15			-0.289**				
			(0.02)				
BOARD&COMP22				-0.325**			
				(0.03)			
MANDATE-INDUCED					-0.293**		
					(0.05)		
MANDATE-INDUCED COMPL.						-0.316	
						(0.16)	
GOV41							-0.435**
							(0.04)
Constant	-0.156***	-0.088	-0.135***	-0.126***	-0.133***	-0.116*	-0.095*
	(0.00)	(0.11)	(0.00)	(0.00)	(0.00)	(0.05)	(0.07)
Observations	2,547	2,547	2,547	2,547	2,547	2,547	2,547
R-squared	0.118	0.119	0.119	0.119	0.119	0.118	0.119

Table 3 (*continued*) Multivariate analysis: Initial governance gap (intention to treat)

Panel B: **Dep. variable Derivatives Mentions**	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Assets	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.115)	(0.123)	(0.116)	(0.115)	(0.109)	(0.138)	(0.124)
R&D	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.985)	(0.963)	(0.944)	(0.932)	(0.976)	(0.955)	(0.981)
Quick ratio	0.009	0.007	0.009	0.008	0.008	0.007	0.007
	(0.668)	(0.746)	(0.658)	(0.702)	(0.710)	(0.731)	(0.727)
M/B ratio	-0.124***	-0.130***	-0.122***	-0.126***	-0.124***	-0.133***	-0.130***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Leverage	0.669*	0.757**	0.695*	0.705*	0.700*	0.770**	0.729**
	(0.070)	(0.040)	(0.060)	(0.057)	(0.058)	(0.037)	(0.048)
Foreign sales	0.021***	0.020***	0.021***	0.021***	0.021***	0.020***	0.020***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ABHK	-0.229	-0.207	-0.207	-0.203	-0.209	-0.223	-0.212
	(0.284)	(0.332)	(0.332)	(0.343)	(0.327)	(0.296)	(0.320)
ABHK ^{2}	0.060**	0.058**	0.058**	0.057**	0.058**	0.059**	0.057**
	(0.018)	(0.023)	(0.023)	(0.024)	(0.022)	(0.019)	(0.024)
REG10	2.283***						
	(0.000)						
REG10 COMPL.		3.472***					
		(0.000)					
BOARD&COMP15			2.040***				
			(0.000)				
BOARD&COMP22				2.252***			
				(0.000)			
MANDATE-INDUCED					2.332***		
					(0.000)		
MANDATE-INDUCED COMPL.						3.756***	
						(0.000)	
GOV41							4.004***
							(0.000)
Constant	-0.350***	-0.625***	-0.254*	-0.309**	-0.318**	-0.760***	-0.743***
	(0.010)	(0.003)	(0.051)	(0.037)	(0.028)	(0.001)	(0.000)
Observations	2,547	2,547	2,547	2,547	2,547	2,547	2,547
R-squared	0.129	0.127	0.127	0.127	0.127	0.128	0.130

Notes: This table presents the results for the panel regression analysis using deviations from means. All variables are expressed as differences from the firm's means and thus absorb firm fixed effects. Panel A presents the results where the dependent variable is *FX Exposure*, operationalized as the square root of the absolute exposure coefficient $|\ ^{i}{}_{2}|$, with $\alpha^{i}{}_{2}$, estimated in eq. (1). Panel B presents the results where the dependent variable is *Derivatives Mentions*. The estimation equation is specified as follows:

$$y_{it} = \beta_0 + f_t + f_i + \beta_1\, GOV.\ INDEX\ GAP_i \times \mathrm{D}(POST\ SOX) + \beta_2\, \mathrm{X}_{it} + \varepsilon_{it},$$

where y_{it} is the outcome variable (e.g. *FX EXPOSURE*), f_t and f_i are time and firm fixed effects, *GOV. INDEX GAP*$_i$ measure the treatment intensity of firm *i* (gap) (replacing the standard *TREATED* dummy), D(*POST SOX*) is a dummy for the Post-SOX period (after 2003), and X_{it} are the control variables. The firm-specific but time-invariant variable *GOV. INDEX GAP*$_i$ years is omitted for the pre-SOX and hence absorbed by the firm fixed effect. Industry and time dummies are included in the analysis. The governance and control variables are defined in the Appendix. *p*-values are reported in parentheses below the coefficients. ***, ** and * indicates significance at the 1, 5 and 10 percent level respectively.

Table 4 Multivariate analysis: Actual governance implementation (compliance measure)

Panel A: Dep. variable FX Exposure	(1)	(2)	(3)	(4)	(5)	(6)	(7)
REG10	-0.160**						
	(0.022)						
REG10 COMPL.		-0.771***					
		(0.000)					
BOARD&COMP15			-0.293***				
			(0.000)				
BOARD&COMP22				-0.417***			
				(0.000)			
MANDATE-INDUCED					-0.495***		
					(0.000)		
MANDATE-INDUCED COMPL.						-0.605***	
						(0.000)	
GOV41							-0.731***
							(0.000)
Constant	-0.197***	-0.136***	-0.172***	-0.167***	-0.171***	-0.164***	-0.161***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Control variables	Y	Y	Y	Y	Y	Y	Y
Observations	3,325	3,325	3,325	3,325	3,325	3,325	3,325
R-squared	0.055	0.067	0.057	0.059	0.062	0.062	0.065

Panel B: Dep. variable Derivatives mentions	(1)	(2)	(3)	(4)	(5)	(6)	(7)
REG10	0.995***						
	(0.000)						
REG10 COMPL.		1.635***					
		(0.000)					
BOARD&COMP15			1.087***				
			(0.000)				
BOARD&COMP22				1.192***			
				(0.001)			
MANDATE-INDUCED					1.435***		
					(0.000)		
MANDATE-INDUCED COMPL.						1.499***	
						(0.000)	
GOV41							1.977***
							(0.000)
Constant	0.210**	0.040	0.091	0.092	0.101	0.092	0.078
	(0.014)	(0.654)	(0.290)	(0.287)	(0.233)	(0.283)	(0.363)
Control variables	Y	Y	Y	Y	Y	Y	Y
Observations	3,325	3,325	3,325	3,325	3,325	3,325	3,325
R-squared	0.084	0.084	0.083	0.083	0.085	0.083	0.086

Notes: This table presents the results for the panel regression analysis using deviations from means. All variables are expressed as differences from the firm's means and thus absorb firm fixed effects. Panel A presents the results where the dependent variable is *FX Exposure*, operationalized as the square root of the absolute exposure coefficient $\sqrt{|\alpha^i_2|}$, with α^i_2, estimated in equation (1). Panel B presents the results for *Derivatives Mentions* as the dependent variable. The estimation equation is specified as follows:

$$y_{it} = \beta_0 + f_t + f_i + \beta_1 \, GOV.\,INDEX_{it} + \beta_2 \, X_{it} + \varepsilon_{it},$$

where y_{it} is the outcome variable (e.g. *FX EXPOSURE*), f_t and f_i are time and firm fixed effects, $GOV.\,INDEX_{it}$ measures the treatment intensity of firm i in year t (replacing the standard *TREATED×POST* and *TREATED* dummies), and X_{it} are the control variables. Industry and time dummies are included in the analysis. *p*-values are reported in parentheses below the coefficients. The governance and control variables are defined in the Appendix. ***, ** and * indicates significance at the 1, 5 and 10 percent level respectively.

Table 5 Multivariate analysis of governance implementation: FX Exposure and Derivatives by firm size, pre-reform Q, and G-index

	Panel A: Dep. var. FX Exposure						Panel B: Dep. var. Derivatives Mentions					
By Firm Size	(1) Large	(2) Small	(3) Large	(4) Small	(5) Large	(6) Small	(7) Large	(8) Small	(9) Large	(10) Small	(11) Large	(12) Small
REG10	-0.081	-0.240**					1.452***	0.564*				
	(0.380)	(0.023)					(0.000)	(0.071)				
MANDATE-INDUCED			-0.415***	-0.578***					1.652***	1.232***		
			(0.000)	(0.000)					(0.001)	(0.003)		
GOV41					-0.621***	-0.865***					2.136***	1.893***
					(0.000)	(0.000)					(0.001)	(0.000)
Constant	-0.161***	-0.234***	-0.142***	-0.200***	-0.133***	-0.189***	0.330**	0.102	0.191	0.024	0.166	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.011)	(0.346)	(0.139)	(0.821)	(0.201)	(0.998)
Control Variables	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1,823	1,502	1,823	1,502	1,823	1,502	1,823	1,502	1,823	1,502	1,823	1,502
R-squared	0.056	0.061	0.062	0.069	0.064	0.073	0.078	0.105	0.077	0.109	0.077	0.111
By Tobins'Q	(1) High Q	(2) Low Q	(3) High Q	(4) Low Q	(5) High Q	(6) Low Q	(7) High Q	(8) Low Q	(9) High Q	(10) Low Q	(11) High Q	(12) Low Q
REG10	-0.012	-0.270***					-0.075	1.407***				
	(0.932)	(0.002)					(0.867)	(0.000)				
MANDATE-INDUCED			-0.495***	-0.514***					0.515	1.845***		
			(0.010)	(0.000)					(0.387)	(0.000)		
GOV41					-0.902***	-0.676***					1.611**	2.217***
					(0.000)	(0.000)					(0.043)	(0.000)
Constant	-0.231***	-0.172***	-0.221***	-0.138***	-0.206***	-0.132***	0.083	0.203*	0.081	0.060	0.047	0.047
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.567)	(0.067)	(0.566)	(0.586)	(0.739)	(0.676)
Control Variables	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	900	2,107	900	2,107	900	2,107	900	2,107	900	2,107	900	2,107
R-squared	0.113	0.035	0.120	0.041	0.125	0.042	0.167	0.062	0.168	0.063	0.171	0.062
By G-Index	(1) High G-index	(2) Low G-index	(3) High G-index	(4) Low G-index	(5) High G-index	(6) Low G-index	(7) High G-index	(8) Low G-index	(9) High G-index	(10) Low G-index	(11) High G-index	(12) Low G-index
REG10	-0.178*	-0.197*					1.141***	0.758*				
	(0.075)	(0.084)					(0.005)	(0.069)				
MANDATE-INDUCED			-0.516***	-0.612***					1.663***	1.159**		
			(0.000)	(0.000)					(0.001)	(0.033)		
GOV41					-0.828***	-0.907***					2.518***	1.446**
					(0.000)	(0.000)					(0.000)	(0.039)
Constant	-0.154***	-0.240***	-0.129***	-0.206***	-0.116***	-0.193***	0.091	0.418***	-0.021	0.327**	-0.057	0.314**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.479)	(0.002)	(0.867)	(0.014)	(0.659)	(0.020)
Control Variables												
Observations	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
R-squared	1,580	1,391	1,580	1,391	1,580	1,391	1,580	1,391	1,580	1,391	1,580	1,391
	0.047	0.080	0.055	0.089	0.061	0.093	0.070	0.095	0.071	0.095	0.074	0.095

Notes: This table presents the results for the panel regression analysis using deviations from means. All variables are expressed as differences from the firm's means and thus absorb firm fixed effects. Panel A presents the results regression where the dependent variable is *FX Exposure*, operationalized as the square root of the absolute exposure coefficient $|\ ^{i}{}_{2}|$, with $\alpha^{i}{}_{2}$, estimated in equation (1). Panel B presents the results where the dependent variable is *Derivatives Mentions*. Results are presented for small and large firm, high and low growth firms and firms with high and low pre-reform G-index values (Gompers, Ishi, and Metrick, 2003). Small (large) firms are defined as having total assets less (greater) than the overall median value of $1,374.2 million for the period 2000 to 2007. Low (high) growth firms are defined as having a Tobin's *Q* value less (greater) than the overall median value of 2.43 for the pre-reform period of 2000 to 2002. Low (high) entrenched firms are defined as having a *G*-index value less (greater) than the overall median value of 8.64 for the pre-reform period of 2000 to 2002. Industry and time dummies are included in the analysis. *p*-values are reported in parentheses below the coefficients. The governance and control variables are defined in the Appendix. ***, ** and * indicates significance at the 1, 5 and 10 percent level respectively.

Table 6 Cross-sectional test on the pre-reform managerial bias

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Mean anti-takeover index		**Panel B: Anti-takeover index**		**Panel C: GOV41**	
Assets	0.004	0.458***	0.000	0.378***	-0.004	0.418***
	(0.826)	(0.000)	(0.997)	(0.000)	(0.804)	(0.000)
R&D	0.048	0.252	0.056	0.210	0.058	0.239
	(0.660)	(0.619)	(0.611)	(0.684)	(0.593)	(0.641)
Quick ratio	0.113**	-0.440**	0.094*	-0.425*	0.141***	-0.545**
	(0.021)	(0.049)	(0.056)	(0.058)	(0.004)	(0.014)
M/B ratio	0.090*	0.247	0.115**	0.346	0.101**	0.172
	(0.065)	(0.344)	(0.020)	(0.173)	(0.038)	(0.501)
Leverage	0.003	0.912	-0.008	0.885	0.041	0.925
	(0.983)	(0.175)	(0.944)	(0.193)	(0.725)	(0.159)
Foreign sales	0.001	0.042***	0.001	0.044***	0.001	0.043***
	(0.168)	(0.000)	(0.301)	(0.000)	(0.256)	(0.000)
ABHK	0.028	0.405	0.005	0.356	0.019	0.473
	(0.704)	(0.313)	(0.945)	(0.391)	(0.798)	(0.241)
$ABHK^2$	-0.004	-0.003	-0.002	-0.002	-0.003	-0.012
	(0.600)	(0.944)	(0.803)	(0.965)	(0.706)	(0.799)
Derivatives Mentions	0.001		-0.001		0.001	
	(0.904)		(0.841)		(0.917)	
Mean anti-takeover index	-0.918***	2.880*				
	(0.000)	(0.056)				
Anti-takeover index			-0.867***	4.817***		
			(0.001)	(0.004)		
GOV41					-0.395**	4.244***
					(0.037)	(0.001)
Constant	1.174***	-3.632***	1.258***	-3.239***	1.221***	-4.339***
	(0.000)	(0.002)	(0.000)	(0.006)	(0.000)	(0.000)
Observations	1,018	1,018	1,018	1,018	1,018	1,018
R-squared	0.098	0.278	0.111	0.280	0.090	0.284

Notes: This table presents the results for fixed effects regression analysis. Panels A and B include the mean and original value of the anti-takeover index of Cain, McKeon, and Davidoff Solomon (2017) for the pre-reform period of 2000-2002, respectively. Panel C includes the mean *GOV41* index value for the pre-reform period of 2000-2002. The dependent variable is: *FX Exposure* in columns (1), (3) and (5) and *Derivatives Mentions* in columns (2), (4) and (6). Industry and time dummies are included in the analysis. Robust *p*-values are reported in parentheses below the coefficients. The governance and control variables are defined in the Appendix. ***, ** and * indicates significance at the 1, 5 and 10 percent level respectively.

Table 7 Heterogeneous firm exposure to foreign markets

Panel A: Dep. variable FX Exposure	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Low ININ			**High ININ**			**Domestic firms**			**Global Firms**		
REG10	-0.181*			-0.135			-0.126			0.069		
	(0.094)			(0.144)			(0.503)			(0.663)		
MANDATE-INDUCED		-0.625***			-0.397***			-0.239			-0.402**	
		(0.000)			(0.000)			(0.341)			(0.036)	
GOV41			-0.990***			-0.579***			-0.168			-0.758***
			(0.000)			(0.000)			(0.648)			(0.002)
Constant	-0.190***	-0.160***	-0.145***	-0.202***	-0.180***	-0.172***	-0.162***	-0.146***	-0.147***	-0.172***	-0.167***	-0.151***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.004)	(0.005)	(0.001)	(0.001)	(0.003)
Control variables	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1,368	1,368	1,368	1,957	1,957	1,957	344	344	344	572	572	572
R-squared	0.071	0.082	0.088	0.053	0.058	0.060	0.079	0.080	0.078	0.080	0.088	0.096

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Low INPUT			**High INPUT**			**Low OUTPUT**			**High OUTPUT**		
REG10	-0.174			-0.139			-0.199*			-0.129		
	(0.107)			(0.132)			(0.051)			(0.177)		
MANDATE-INDUCED		-0.597***			-0.416***			-0.549***			-0.453***	
		(0.000)			(0.000)			(0.000)			(0.000)	
GOV41			-0.902***			-0.621***			-0.860***			-0.622***
			(0.000)			(0.000)			(0.000)			(0.000)
Constant	-0.190***	-0.162***	-0.150***	-0.201***	-0.177***	-0.169***	-0.155***	-0.124***	-0.111***	-0.226***	-0.203***	-0.196***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Control variables	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1,419	1,419	1,419	1,906	1,906	1,906	1,467	1,467	1,467	1,858	1,858	1,858
R-squared	0.073	0.082	0.086	0.052	0.058	0.060	0.057	0.065	0.070	0.061	0.068	0.069

Panel B: Dep. variable Derivatives Mentions	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Low ININ			**High ININ**			**Domestic firms**			**Global Firms**		
REG10	0.286			1.546***			0.830**			1.541*		
	(0.302)			(0.000)			(0.022)			(0.055)		
MANDATE-INDUCED		0.597			1.986***			0.359			2.248**	
		(0.109)			(0.000)			(0.463)			(0.020)	
GOV41			0.665			2.787***			-0.510			2.983**
			(0.177)			(0.000)			(0.478)			(0.025)
Constant	0.025	-0.010	-0.016	0.360***	0.197	0.164	-0.079	-0.139	-0.099	0.394	0.228	0.182
	(0.777)	(0.907)	(0.863)	(0.007)	(0.137)	(0.217)	(0.419)	(0.157)	(0.331)	(0.131)	(0.370)	(0.519)
Control variables	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1,368	1,368	1,368	1,957	1,957	1,957	344	344	344	572	572	572
R-squared	0.113	0.114	0.113	0.088	0.089	0.091	0.043	0.029	0.029	0.066	0.069	0.070
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Low INPUT			**High INPUT**			**Low OUTPUT**			**High OUTPUT**		
REG10	0.444*			1.469***			0.562**			1.415***		
	(0.090)			(0.000)			(0.031)			(0.000)		
MANDATE-INDUCED		0.873**			1.889***			0.903**			1.755***	
		(0.015)			(0.000)			(0.013)			(0.000)	
GOV41			0.990**			2.716***			1.165**			2.441***
			(0.047)			(0.000)			(0.022)			(0.000)
Constant	0.133**	0.079	0.072	0.271*	0.117	0.081	-0.116	-0.178**	-0.190**	0.482***	0.334**	0.305**
	(0.046)	(0.230)	(0.287)	(0.073)	(0.428)	(0.585)	(0.107)	(0.015)	(0.010)	(0.001)	(0.019)	(0.033)
Control variables	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1,419	1,419	1,419	1,906	1,906	1,906	1,467	1,467	1,467	1,858	1,858	1,858
R-squared	0.132	0.134	0.133	0.080	0.080	0.082	0.089	0.090	0.090	0.097	0.097	0.098

Notes: This table replicates the panel regression analysis presented in Table 4 to examine the heterogeneous firm exposure to foreign markets. All variables are expressed as differences from the firm's means and thus absorb firm fixed effects. The change in the governance and control variables is defined in the Appendix. Panel A presents the results regression where the dependent variable is *FX Exposure*, operationalized as the square root of the absolute exposure coefficient $\sqrt{|\alpha^{i}_{2}|}$, with α^{i}_{2}, estimated in equation (1). Panel B presents the results where the dependent variable is *Derivatives Mentions.* Low (high) ININ groups are based on Hoberg and Moon's (2017) text-based measure of net foreign inputs exposure and defined as having a median ININ number of less than or equal to 10 (greater than 10). Low (high) INPUT groups are based on Hoberg and Moon's (2017) text-based measure of the firm purchasing inputs from the given nation and defined as having a median INPUT number of less than or equal to 17 (greater than 17). Low (high) OUTPUT groups are based on Hoberg and Moon's (2017) text-based measure of the firm selling goods to the given nation and defined as having a median OUTPUT number of less than or equal to 23 (greater than 23). Domestic firms are defined as having as having zero foreign sales and an ABHK equal to 1. Global firms are defined as having foreign sales > 0 and an ABHK equal to 7. Industry and time dummies are included in the analysis. *p*-values are reported in parentheses below the coefficients. The governance and control variables are defined in the Appendix. ***, ** and * indicates significance at the 1, 5 and 10 percent level respectively.

Table 8 CEO characteristics and incentives

Panel A: Dep. var. FX Exposure	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
REG10	-0.141*	-0.139*	-0.128	-0.118	-0.096					
	(0.067)	(0.071)	(0.116)	(0.148)	(0.250)					
MANDATE-INDUCED						-0.484***	-0.481***	-0.497***	-0.502***	-0.484***
						(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CEO Tenure	0.000				0.002	-0.000				0.002
	(0.945)				(0.401)	(0.970)				(0.494)
CEO Turnover		0.096***			0.090***		0.095***			0.090***
		(0.002)			(0.007)		(0.002)			(0.006)
CEO Equity			0.000		0.000			0.000		0.000
			(0.681)		(0.769)			(0.703)		(0.783)
CEO Options				0.008**	0.008**				0.008**	0.007**
				(0.028)	(0.038)				(0.033)	(0.048)
Constant	-0.193***	-0.193***	-0.195***	-0.191***	-0.196***	-0.167***	-0.167***	-0.171***	-0.167***	-0.174***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Control variables	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	2,829	2,829	2,589	2,556	2,483	2,829	2,829	2,589	2,556	2,483
R-squared	0.059	0.062	0.061	0.062	0.065	0.066	0.069	0.070	0.070	0.073
Panel B: Dep. var. Derivatives Mentions	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
REG10	1.045***	1.019***	0.957***	0.985***	1.060***					
	(0.001)	(0.001)	(0.003)	(0.002)	(0.001)					
MANDATE-INDUCED						1.424***	1.393***	1.236***	1.234***	1.341***
						(0.000)	(0.000)	(0.003)	(0.003)	(0.001)
CEO Tenure	0.022**				0.025***	0.022**				0.025***
	(0.011)				(0.009)	(0.010)				(0.009)
CEO Turnover		-0.054			0.072		-0.055			0.069
		(0.653)			(0.581)		(0.650)			(0.596)
CEO Equity			-0.000		-0.000			-0.000		-0.000
			(0.863)		(0.522)			(0.828)		(0.493)
CEO Options				0.021	0.028*				0.021	0.027*
				(0.152)	(0.065)				(0.157)	(0.069)
Constant	0.257***	0.262***	0.293***	0.285***	0.293***	0.146	0.154	0.194*	0.184*	0.185*
	(0.008)	(0.007)	(0.004)	(0.006)	(0.005)	(0.131)	(0.111)	(0.056)	(0.070)	(0.072)
Control variables	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	2,829	2,829	2,589	2,556	2,483	2,829	2,829	2,589	2,556	2,483
R-squared	0.087	0.085	0.083	0.082	0.084	0.088	0.086	0.083	0.082	0.084

Notes: This table replicates the panel regression analysis presented in Table 4 and includes control for CEO characteristics and incentives. Results are presented for the regression estimation analysis using deviations from means. All variables are expressed as differences from the firm's means and thus absorb firm fixed effects. Panel A presents the results regression where the dependent variable is *FX Exposure*, operationalized as the square root of the absolute exposure coefficient $|\ ^{i}{}_{2}|$, with $\alpha^{i}{}_{2}$, estimated in equation (1). Panel B presents the results where the dependent variable is *Derivatives Mentions*. Industry and time dummies are included in the analysis. *p*-values are reported in parentheses below the coefficients. The governance and control variables are defined in the Appendix. ***, ** and * indicates significance at the 1, 5 and 10 percent level respectively.

Table 9: The role of CEO contract and ownership incentives

Panel A: CEO Options	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent var. FX Exposure							
REG10*HIGH OPTIONS	-0.259***						
	(0.005)						
REG10*LOW OPTIONS	-0.007						
	(0.937)						
REG10 COMPL. *HIGH OPTIONS		-1.060***					
		(0.000)					
REG10 COMPL. *LOW OPTIONS		-0.506***					
		(0.001)					
BOARD&COMP 15*HIGH OPTIONS			-0.445***				
			(0.000)				
BOARD&COMP 15*LOW OPTIONS			-0.099				
			(0.347)				
BOARD&COMP 22*HIGH OPTIONS				-0.585***			
				(0.000)			
BOARD&COMP 22*LOW OPTIONS				-0.171			
				(0.163)			
MANDATORY*HIGH OPTIONS					-0.699***		
					(0.000)		
MANDATORY*LOW OPTIONS					-0.313***		
					(0.007)		
MANDATORY COMPL. *HIGH OPTIONS						-0.885***	
						(0.000)	
MANDATORY COMPL. *LOW OPTIONS						-0.307**	
						(0.046)	
GOV41*HIGH OPTIONS							-1.006***
							(0.000)
GOV41*LOW OPTIONS							-0.491***
							(0.001)
Constant	-0.195***	-0.130***	-0.170***	-0.167***	-0.168***	-0.160***	-0.157***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Control variables	Y	Y	Y	Y	Y	Y	Y
Wald test F- statistic	10.16	11.96	10.97	12.14	12.81	12.31	14.00
Prob > F	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Observations	2,556	2,556	2,556	2,556	2,556	2,556	2,556
R-squared	0.064	0.079	0.067	0.068	0.073	0.073	0.076

Table 9 (*continued*): The role of CEO contract and ownership incentives

Panel B: CEO Options	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent var. Derivatives Mentions							
REG10*HIGH OPTIONS	1.243***						
	(0.001)						
REG10*LOW OPTIONS	0.736**						
	(0.038)						
REG10 COMPL. *HIGH OPTIONS		1.739***					
		(0.003)					
REG10 COMPL. *LOW OPTIONS		0.674					
		(0.273)					
BOARD&COMP 15*HIGH OPTIONS			1.457***				
			(0.000)				
BOARD&COMP 15*LOW OPTIONS			0.695*				
			(0.097)				
BOARD&COMP 22*HIGH OPTIONS				1.617***			
				(0.001)			
BOARD&COMP 22*LOW OPTIONS				0.730			
				(0.135)			
MANDATORY*HIGH OPTIONS					1.549***		
					(0.001)		
MANDATORY*LOW OPTIONS					0.886*		
					(0.056)		
MANDATORY COMPL. *HIGH OPTIONS						1.812***	
						(0.002)	
MANDATORY COMPL. *LOW OPTIONS						0.576	
						(0.348)	
GOV41*HIGH OPTIONS							2.149***
							(0.000)
GOV41*LOW OPTIONS							1.181**
							(0.049)
Constant	0.293***	0.143	0.172*	0.174*	0.189*	0.179*	0.169*
	(0.004)	(0.176)	(0.094)	(0.092)	(0.063)	(0.080)	(0.100)
Control variables	Y	Y	Y	Y	Y	Y	Y
Wald test F- statistic	2.60	2.75	3.35	3.53	2.37	3.54	3.10
Prob >F	0.10	0.09	0.07	0.06	0.12	0.06	0.08
Observations	2,556	2,556	2,556	2,556	2,556	2,556	2,556
R-squared	0.082	0.081	0.082	0.082	0.082	0.081	0.083

Table 9 (*continued*): The role of CEO contract and ownership incentives

Panel C: CEO Equity **Dependent var. FX Exposure**	(1)	(2)	(3)	(4)	(5)	(6)	(7)
REG10*HIGH EQUITY	0.003						
	(0.983)						
REG10*LOW EQUITY	-0.142*						
	(0.084)						
REG10*COMPL. HIGH EQUITY		-0.418					
		(0.167)					
REG10*COMPL. LOW EQUITY		-0.822***					
		(0.000)					
BOARD&COMP 15*HIGH EQUITY			-0.106				
			(0.610)				
BOARD&COMP 15*LOW EQUITY			-0.291***				
			(0.002)				
BOARD&COMP 22*HIGH EQUITY				-0.112			
				(0.642)			
BOARD&COMP 22*LOW EQUITY				-0.397***			
				(0.000)			
MANDATORY*HIGH EQUITY					-0.326		
					(0.116)		
MANDATORY*LOW EQUITY					-0.511***		
					(0.000)		
MANDATORY COMPL. *HIGH EQUITY						-0.127	
						(0.684)	
MANDATORY COMPL. *LOW EQUITY						-0.645***	
						(0.000)	
GOV41*HIGH EQUITY							-0.460*
							(0.092)
GOV41*LOW EQUITY							-0.766***
							(0.000)
Constant	-0.195***	-0.135***	-0.172***	-0.169***	-0.171***	-0.164***	-0.161***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Control variables	Y	Y	Y	Y	Y	Y	Y
Wald test F- statistic	1.12	1.86	0.90	1.59	0.93	2.84	1.46
Prob >F	0.29	0.17	0.34	0.21	0.34	0.09	0.23
Observations	2,589	2,589	2,589	2,589	2,589	2,589	2,589
R-squared	0.058	0.072	0.061	0.062	0.066	0.067	0.069

Notes: This table replicates the panel fixed effects regression analysis presented in Table 4 and examines the effect of CEO incentives. Results are presented for the estimation analysis using deviations from means. All variables are expressed as differences from the firm's means and thus absorb firm fixed effects. Panels A and C presents the results regression where the dependent variable is *FX Exposure*, operationalized as the square root of the absolute exposure coefficient $\sqrt{|\alpha^i_2|}$, with α^i_2, estimated in equation (1). Panel B presents the results where the dependent variable is *Derivatives Mentions*. High *(Low)* CEO options firms are, respectively, defined as having a median value greater or equal to *(less than)* $89,988,000. High *(Low)* CEO equity firms are, respectively, defined as having a median value greater or equal to *(less than)* $372,985,000. Industry and time dummies are included in the analysis. *p*-values are reported in parentheses below the coefficients. The governance and control variables are defined in the Appendix. ***, ** and * indicates significance at the 1, 5 and 10 percent level respectively.

Table 10 Time trend analysis of governance implementation

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: FX Exposure			**Panel B: Derivatives Mentions**		
REG10	-0.125***			0.512*		
	(0.007)			(0.057)		
REG10×2002	-0.212**			1.321**		
	(0.012)			(0.019)		
REG10×2003	-0.559***			1.095***		
	(0.000)			(0.002)		
REG10×2004	-0.572***			0.498		
	(0.000)			(0.174)		
REG10×2005	-0.251***			0.272		
	(0.000)			(0.259)		
REG10×2006	-0.164***			0.167		
	(0.000)			(0.482)		
MANDATE-INDUCED		-0.250***			1.198***	
		(0.000)			(0.002)	
MANDATE-INDUCED×02		-0.274***			1.316**	
		(0.001)			(0.018)	
MANDATE-INDUCED×03		-0.510***			0.884**	
		(0.000)			(0.016)	
MANDATE-INDUCED×04		-0.495***			0.420	
		(0.000)			(0.223)	
MANDATE-INDUCED×05		-0.263***			0.281	
		(0.000)			(0.333)	
MANDATE-INDUCED×06		-0.191***			0.175	
		(0.000)			(0.549)	
GOV41			-0.364***			0.929*
			(0.000)			(0.065)
GOV41×2002			-0.360***			1.301*
			(0.000)			(0.058)
GOV41×2003			-0.567***			0.864**
			(0.000)			(0.037)
GOV41×2004			-0.585***			0.491
			(0.000)			(0.229)
GOV41×2005			-0.339***			0.524
			(0.000)			(0.136)
GOV41×2006			-0.232***			0.348
			(0.000)			(0.321)
Constant	1.288***	1.220***	1.255***	-3.981***	-3.211***	-3.057***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Control variables	Y	Y	Y	Y	Y	Y
Observations	3,325	3,325	3,325	3,325	3,325	3,325
R-squared	0.160	0.122	0.124	0.477	0.357	0.355

Notes: Panel A of this table presents the results for the fixed effects panel regression analysis where the dependent variable is *FX Exposure*, in columns (1) – (3), operationalized as the square root of the absolute exposure coefficient $\sqrt{|\alpha^{i}_{2}|}$, with α^{i}_{2}, estimated in equation (1). Panel B of this table presents the results for the fixed effects panel regression analysis where the dependent variable is *Derivatives Mentions* in columns (4) – (6). We include the time trend interaction terms, whereby the *REG10, BOARD&COMP15, MANDATE-INDUCED and GOV41* indexes are interacted with year dummies. Industry dummy controls are included in the analysis. *p*-values are reported in parentheses below the coefficients. The governance and control variables are defined in the Appendix. ***, **and * indicates significance at the 1, 5 and 10 percent level respectively.

Internet Appendix available at: https://www.tse-fr.eu/fr/people/ulrich-hege

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