SAME RULES, DIFFERENT ENFORCEMENT: MARKET ABUSE IN EUROPE

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Abstract

We present and analyze a novel set of enforcement data from the European Securities Market Authority during the period following the European Union's harmonized rule setting on securities market abuse. The data show significant differences in the intensity of enforcement across Europe. The empirical tests are highly consistent with the view that the intensity of enforcement is the most statistically robust and economically significant predictor of market abuse detection. In particular, the data identify three important arms of enforcement: the number of supervisors, which enhances detection; formalized cooperation, which facilitates surveillance; and imprisonment, which facilitates deterrence. We discuss research, practitioner implications, and policy implications for securities regulation across several key European countries.

Keywords: Securities Regulation, Enforcement, Law and Finance

JEL Codes: G12, G14, G18, K22

"The Debate Over Wall St. Enforcement

How much enforcement is enough to adequately oversee Wall Street and the major banks? Make regulations too onerous, and firms won't pursue potentially worthwhile investments for fear of huge legal bills if they are accused of violations. Too loose, and banks and brokers will run amok like schoolchildren when the teacher leaves the room, which is what happened in the years leading up to the financial crisis in 2008."

■ New York Times, October 27, 2014.[1]

1. Introduction

It is widely understood that there are important differences in securities laws across countries (La Porta et al., 2006), just as there are important differences in the enforcement of securities laws across countries (Jackson and Roe, 2009). This empirical evidence shows that both the design and enforcement of securities laws have important implications for the success of market activities, such as facilitating new listings and other capital raising activities. However, this evidence on rule design versus rule enforcement highlights the fact that we do not know exactly how important the enforcement of securities laws is in the context of a legal environment that possesses the same set of market abuse rules.

Put differently, in past years what actually constituted market abuse in securities laws has been inconsistently defined across countries, thereby making analyses of what works in detecting market abuse rather intractable. Recently, however, European Union directives have given rise to more harmonized market abuse definitions and rules (Cumming et al., 2011). The recent release of market abuse statistics and enforcement data from ESMA (2012) provides a unique setting in which to analyze the importance of enforcement in detecting market abuse cases. This paper represents a first look at such data.

[1] http://dealbook.nytimes.com/2014/10/27/the-debate-over-wall-st-enforcement/?_r=0

Academic, practitioner, and policy literature are consistent in highlighting the importance of analyzing factors that lead to differential detection of market abuse. There is a comprehensive debate about the effects of insider trading and market abuse on the well-functioning of financial markets (e.g. Manne 1966; Werhane 1989; Moore 1990; Shaw 1990; Leland 1992; Ma and Sun 1998; Snoyenbos and Smith 2000 or Engelen and Liedekerke 2007). While the evidence on the social utility of insider trading is mixed, the conclusions about market abuses are rather obvious: Frauds harm the integrity of financial markets and disrupt the mechanism of efficient allocation of financial resources (La Porta et al., 1997, 1998; Easly and O'Hara 2004; Djankov et al., 2008; Aitken et al., 2014; Dimmock, and Gerken, 2015; Duy Nguyen, Hagendorff, and Eshraghi, 2015). The 2008 to 2010 LIBOR manipulations, for example, established the biggest fraud activity in European financial markets to date. Record sanctions have been imposed and will probably continue in the ongoing process of settling all detected fraudulent acts. Despite the benefits of deterring fraud (Becker 1968; La Porta et al., 2000; Djankov et al., 2003; and Shleifer, 2005), there are costs to enforcement (Jackson and Roe, 2009). By studying a unique setting where rules are harmonized while enforcement is not, we make use of data to ascertain the precise marginal benefit of additional enforcement activity with respect to improved detection.

Our empirical analysis focuses on fraud in European financial markets. We utilize a unique data set provided by the European Security and Markets Authority (ESMA, 2012) on frauds detected by national competent authorities between 2008 and 2010. This data allows us to elaborate on the criteria that affect fraudulent acts and their detection across time and countries. The data reveal several consistencies. First, increasing the resources for supervisory authorities strongly and reliably supports fraud detection. Our conservative estimates show that a 1-standard deviation increase in the number of supervisors (persons who work in the national banking and insurance supervisory authorities) is associated with an increase in detected fraud

cases by 71%. Second, differences in enforcement rules pertaining to surveillance give rise to large differences in fraudulent acts. In particular, the application of formalized cooperation agreements between the supervisory and legal authorities is associated with a reduction in detected fraudulent cases by approximately 59%. We interpret this as a deterring effect caused by the threat of more efficient supervision and quicker reactions to committed infringements. Third, differences in enforcement rules relating to deterrence give rise to large differences in fraud. The data indicate that a one-year increase in the minimum imprisonment sanction reduces detected fraudulent cases by 10%. The legal obligation to publish the sanctions of market manipulators also has a strong effect on fraud deterrence. The economic significance of each of these effects is calculated relative to the average number of cases across countries and years. They are robust to unobserved heterogeneity and different estimation techniques.

In this paper, we examine detected fraud, not actual (unobserved) fraud. There could be differences between detected fraud and actual unobserved fraud across countries due to differences in national culture, for example. We do not find any robust cultural determinants of detected fraud across countries in our sample. Nevertheless, the data do indicate that countries with more capital market activity are more likely to detect market abuse. Similarly, the data highlight that the legal quality in a country, with respect to the protection of shareholders and lenders, mitigates infringement activity. Also, the data suggest that enforcement authorities are more vigorous in detecting and reporting fraud when minimum pecuniary fines are higher.

There are a number of policy implications from our analyses. Legal enforcement of market abuse comes in three primary forms: the direct expenditure on enforcement officers, the quality of surveillance through information sharing and cooperation, and the rules pertaining to deterrence. The ESMA data examined herein show that each of these three mechanisms is extremely important for detecting and deterring fraud. The examined data reveal effective

mechanisms for politicians and regulators to fight fraud in financial markets and to increase investors' confidence in the existence of sound capital markets.

This paper is organized as follows: Section 2 describes the data. Empirical tests are presented in Section 3. We provide robustness checks in Section 4 and conclude our findings with policy implications in the last section.

2. Data

Our primary data source is the ESMA (2012) report on the actual use of sanctioning powers under the Market Abuse Directive (MAD). The review panel of the Committee of European Securities Regulators launched a mapping procedure with reference to the actual use of sanctioning powers in the European Union member states in cases of market abuse. This mapping focused primarily on the actual use of sanctions concerning the two main offences of insider dealing and market manipulation. Article 14 of the MAD obliges the European Union member states to ensure that appropriate administrative measures can be taken or administrative sanctions be imposed against the persons responsible. Member states under the existing directive maintain the right (but do not have an obligation) to also impose criminal sanctions. However, in this respect, there is no harmonization.

While the main focus of the mapping procedure has been on the use of administrative sanctioning powers, national competent authorities collected information on administrative sanctions and, when possible or available, on criminal sanctions. Information was obtained through a questionnaire among the national competent authorities covering data for a three-year period (i.e., 2008, 2009, and 2010). Table 1 lists the 28 countries and their national competent authorities that provided the data used in our analyses.

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The ESMA notes that several aspects are important for consideration when using their report. Most importantly, the legal framework and the availability of power for the competent authorities to deal with market abuse differ among the European countries. These differences include the relationships between the competent authorities and judicial authorities in implementing the provisions of the MAD. Certain judicial authorities might be the prosecutors in some countries. Moreover, the report relies on information provided by the national competent authorities, but sanctions decisions by judicial authorities might not be easily available to them. Further, administrative and criminal procedures cover the whole chain of market abuse sanctioning. They start with the daily activity of the competent authorities to observe and identify abnormal market moves, through the opening of an investigation to the pronouncing of a sanction. This sanction may be reviewed or appealed, and it can take a substantial amount of time until the process is finally settled. In the end, all of this information might not be directly available for the competent authority.

Additionally, the national competent authorities have different powers with respect to market abuse sanctioning. The major difference is that some of them have administrative and/or criminal proceedings at their disposal and can apply them directly to natural and legal persons, while others don't have these powers and, therefore, only assist the judicial authorities. The practice also differs in terms of publication of administrative and criminal sanction decisions. Finally, in those member states where the competent authorities have direct sanctioning power, the exchange of information may be an obligation for both the competent and judicial authorities. In other cases, the competent authority has an obligation to keep the judicial authorities informed while, in others, it is the judicial authorities that have such an obligation towards the national competent authority.

Since it is not always evident which authority finally has the sanctioning power on market abuse, we collect both the number of natural or legal persons who are either directly sanctioned or discharged for illegal insider dealing or market manipulation by the competent authorities and the cases that have been transferred to a judicial authority. Independent of which authority has the proceedings at its disposal, all these offenses were detected by the competent authority. We use the numbers of direct sanctions and discharges by the competent authorities over the three years of observation (2008, 2009, and 2010) as our main variable, "Detected Offenses." "Cases Transmitted" is the number of cases that have been submitted to a judicial authority.[2] Table 2 presents these two data series for the sample countries over the observation period.

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Table 2 gives rise to some preliminary observations. Germany, as the largest European country, has the highest number of detected offenses, while Sweden, as a medium-size country (in terms of GDP and population) in our sample has the most transmitted cases. We speculate that not the size of the economy or the population but the financial market should affect the data, because only the capital markets provide "room for infringements." We assume that the number of listed companies or the trading volume have a causal effect on the number of actual offenses.

Table 2 also reveals the circumstance that the Swedish competent authority has no option for administrative or criminal sanctions and, therefore, must direct all detected cases to the judicial authorities. This is, similarly, the case for Denmark. Nevertheless, the Danish competent authority cooperates very closely with its judicial authority. Most other competent authorities transfer some of their detected offenses to judicial authorities for prosecution. This might even

[2] Note: "Detected Offenses" is aggregated from the ESMA (2012) report, Tables F.3.2.A, F.3.2.B, F.3.2.C, and F.3.2.D. The source for "Cases Transmitted" is Table G.8 of the same report.

be in addition to already having sanctioned or discharged them. Additionally, several natural or legal persons may be involved in a case which has been transferred to a judicial authority. It is impossible with the available data to identify these cases. Therefore, and to avoid any possibility of double counting individual fraud incidents, we treat both variables consistently separate and focus on the above defined "Detected Offenses," while we use "Transmitted Cases" to assess the robustness of our results.

As argued in the previous section, we assume that our main variable of interest is affected by several socio-economic parameters. The most important factor for an international comparison of fraud detection is probably the direct resources of the competent authorities in terms of budget and staffing. Unfortunately, the ESMA report does not provide such information, and it is, likewise, not publicly available. Therefore, we retrieve the number of total staff of banking and insurance supervisors and regulators from Horáková and Jordan (2013) as a proxy. The national competent authorities are usually subsidiaries of the banking and insurance regulators. This number of total staff may exaggerate the particular information we aim to gather, because large fractions of these institutions' staff are not in charge of detecting insider transactions or market manipulation. Nevertheless, we expect a high correlation and similar ratios across countries between their overall staff and the number of employees who are dedicated, in particular, to financial market supervision. Table 3 reports the "Number of Supervisors" for the respective period.

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If we analyze Tables 2 and 3 jointly, we can observe that the supervisory institutions in Germany or France, for example, detect large numbers of market abuses, but their staffing is

substantial at the same time. This supports the assumption about a causal effect between the resources expended on financial market supervision and the detected infringements.

Alongside the covariate "Number of Supervisors," we collect several auxiliary and control variables for the size and for the capital market activity of our sample countries. Table 4 Panel A presents Population, GDP, and the Police Reported Crime and Panel B Stock Market Trading Volume and the Market Capitalization of Listed Domestic Companies for our sample countries.[3]

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We retrieve most of our independent variables from the ESMA report and enlarge the selection by two legal indicators that measure the quality of relevant financial market legislation and the quality of the legal system in general, the Shareholder Suits and the Rule of Law Index, provided by World Bank. The calculation of the Shareholder Suits Index follows the methodology of Djankov et al. (2008) and measures on a scale of 0 to 10 how well minority investors are protected against misconduct of officers and directors of the firms where they hold shares. A high value means that minority shareholders are well protected against fraudulent acts of managers or directors of public firms. The Rule of Law Index measures the extent to which agents have general confidence in and abide by the rules of society, in particular the quality of

[3] We ran numerous robustness checks with other indicators for capital market activity and for legal quality. Explicitly, we used e.g. number of listed domestic companies, number of IPOs, and issued volumes in absolute figures, logs, and relative to GDP or population. We also used the Legal Rights Index, the Integrity of the Legal System Index, and Property Rights Index. The results are qualitatively equivalent but do not yield the level of statistical significance as we subsequently present for the selected measure Stock Market Trading Volume, Market Capitalization of Listed Domestic Companies, the Shareholder Suits Index or the Rule of Law Index. Therefore, we do not add descriptions of alternative control variables for capital market activity. However, we present several scatter plots in the Appendix to this paper. In these plots we average the 2008, 2009 and 2010 figures and take the logs of the variables for an improved illustration. Further analyses and plots can be provided on request.

contract enforcement, the police, and the courts, as well as the likelihood of crime and violence. The index ranges from -2.5 to 2.5 with higher values corresponding to better governance outcomes.

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Table 5 presents the two legal indicators and five characteristics of the prevailing legislation and particular operational mechanisms of the competent authorities in our sample countries (in the order of their appearance in the subsequent regression tables).

The "Formalized Cooperation" dummy variable indicates the countries in which the cooperation between the competent and the judicial authorities is formalized.[4] For example, legislation may provide a formal context and standardize the relationship between the authorities. We assume that formalized cooperation increases the administrational efficiency to sanction the detected offenses. This might increase the awareness of market participants about the work of the supervising authorities and the sanctioning process and, hence, reduce the preparedness to commit frauds.

"Minimum Imprisonment" measures in months the minimum length of possible jail time for market abuse among the member states.[5] The report does not provide exact information on the potential jail sentences but only broader categories ranging from no jail time, up to 1 year, and between 2 and 5 years.[6] Nevertheless, we learn from the report that the minimum length of imprisonment varies from 15 days for Slovenia to two years for Italy, while the maximum length ranges from 30 days for Greece to 15 years in Slovakia. We assume that potential jail sentences pose a strong threat to market participants and, therefore, deter market abuses.

[4] Source: ESMA (2012) report, Table D.8

[5] Source: ESMA (2012) report, Table G 29.2

[6] Note: For consistency, we always use the upper levels of these distinct groups in our analyses.

"Publication of Decision" is a dummy which equals 1 if administrative or criminal sanction decisions are to be published by law.[7] The publication of charges can be considered a part of the whole sanctioning process, because the information about breaches of law is provided to the general public. The affected individuals and institutions do not only suffer from their penalty but also from media attention and reputational losses. We expect that this effect discourages potential offenders.

The dummy variable "Cooperation also in Later Stages" has a value of 1 if the cooperation between the competent and the judicial authority is envisaged to be extended to later stages of the procedure.[8] Cooperation among the two authorities may be desirable to ensure proper pursuing of market abuse. Such cooperation may not only exist to initiate legal procedures but also to provide support in a more or less defined framework until the case is settled. Several of the competent authorities do not only cooperate in the beginning of the process, they also provide information, opinions, and other kinds of assistance and work together with the judicial authorities at later stages, which might even impact the outcome of the proceedings. We expect that the improved cooperation between the competent and the judicial authority has an effect similar to the formalized cooperation in principle: It deters fraudulent activity by imposing the threat of a more efficient administrative sanctioning process.

The final dummy variable "Limit on Fines" expresses if the total amount of administrative and financial penalties imposed for the same offense is limited.[9] Unfortunately, the information is only provided by 9 competent authorities. We expect that limitations of penalties have a counterproductive effect on the intention to decrease the number of offenses. If penalties are limited, they might be considered negligible for offenders compared to the potential gains from market abuses.

[7] Source: ESMA (2012) report, Table L.1

[8] Source: ESMA (2012) report, Table D.7

[9] Source: ESMA (2012) report, Table D.10

Table 6 lists and describes all variables and their sources. Table 7 presents their descriptive statistics over 28 sample countries (9 for the "Limit on Fines" variable) and over three years of observation. Table 8 shows the bivariate correlations among the independent variables.[10] The correlation matrix in Table 8 reveals a general low bivariate correlation among the variables. Nevertheless, the correlation between the Police Reported Crime and the Rule of Law Index and with the size of the capital market (Market Capitalization/GDP) is elevated. Additionally, "Limits on Fines" might cause problems of multicollinearity in regression analyses. Therefore, we carefully develop stepwise regressions among the independent variables and verify the results with respect to potentially biasing effects caused by the controls in the subsequent section.

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Insert Tables 6-8 here

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3. Regression Analyses[11]

It is the nature of our research subject that the true number of actual market abuses remains unknown. We only observe a variable which counts the detected incidents but can assume that the measurement error is proportional to the true value. We propose that the detection of frauds depends on two competing effects. The first one is obviously the unobserved actual number of frauds while the second one is the probability of their detection. The actual number of financial market abuses may depend on several country characteristics and on particular deterrence effects. We assume that these characteristics include general law enforcement or criminal behavior in a particular country but also its size of the capital market, providing "room for infringements". Deterrence effects result from direct enforcement, hence, the likelihood of

[10] Note that all variables which enter our primary regressions in logs are also transferred into their logs for the presentation of the correlation matrix.

[11] We owe a special thanks to Jeff Wooldridge for his econometric advice.

being detected, and from the magnitude of the sanctions. The likelihood of being detected is contingent on the ability of a supervisory authority to identify market abuses. Therefore, we propose the following simplified population model of fraud detection

$$Detected\ Offenses = Prob(Detection) \times Number\ of\ Actual\ Frauds$$

and disentangle the two competing effects via logarithmic transformation:

$$\log(Detected\ Offenses) = \log[Prob(Detection)] + \log(Number\ of\ Actual\ Frauds)$$

Taking the log of our dependent variable has two advantages: The first one is that the logarithmic transformation separates the two elements of market abuse detection and makes them assessable via linear regression. The second advantage is that the fraud statistic only reveals a small part of the true story, since we can expect a larger number of actual undetected market abuses. However, Ehrlich (1996) argues that using a logarithmic transformation can mitigate this problem because the measurement error is likely to be proportional to the true value.

We assess the first term on the right hand side of the equation by the ability of a competent authority measured by the log of the given resources to supervise the financial market and the second term via deterrence effects and country characteristics. We begin with linear regressions, where we stepwise introduce individual parameters:

$$\log(DO_{it}) = \alpha + \beta\log(A_{it}) + \boldsymbol{\gamma} I_{kit} + \boldsymbol{\delta} C_{kit} + \varepsilon_i + \zeta_{it}.$$

The left side variable DO_{it} is the number of detected offenses (alternatively of transmitted cases) per country i and observation year t. The regression intercept is denoted by α. The parameter β measures the impact of our ability to measure A_{it} (the given resources for supervision which is "Number of Supervisors" in country i in year t). The dimensions of the parameter row vectors $\boldsymbol{\gamma}$, and $\boldsymbol{\delta}$ correspond with the number of columns (k and l) of the variable matrices I_{kit} and the C_{lit}. Matrix I_{kit} includes up to k, previously presented independent variables from the ESMA report, which we expect to deter market manipulation. Matrix C_{lit} controls for

up to l exogenous country characteristics, such as capital market activity, legal quality, criminal records and year dummies. We expect any unobserved heterogeneity ε_i to be uncorrelated with the explanatory variables in all time periods and the error term ζ_{it} to be independently, identically distributed with a mean value of 0 and a standard deviation of σ, though relaxing these latter assumptions in the course of our analyses.

Our estimations might be subject to concerns about potential endogeneity as e.g., described in Levitt (1997) or Lin (2009). First of all, staffing of the competent authority is driven by policy decisions and could be contingent on perceived market abuses in a particular country. The higher the perception of fraud, the higher the number of staff allocated to the national supervisory authorities. Equivalently, the number of supervisors and their ability to detect frauds should deter market abuses in the first place. This potential simultaneity between the dependent and an independent variable but also among the independent variables themselves might bias the parameter estimates. Furthermore, it is possible that staffing of the supervisory authorities follows a general pattern of creating administrative jobs in the various EU member states. Larger countries, in terms of their economy or their population, could simply employ more administrative staff, regardless of their financial market activity. Therefore, we have another reason to question whether or not our key independent variable, "Number of Supervisors," is exogenous. Finally, we cannot disentangle the effect that staffing or the imposed threats of an efficient administrative sanctioning procedure have on the actual (true) number of market abuses. The true number of infringements remains unknown, and we can only use the detected ones in our analyses. However, there is reason to believe that the true number of committed frauds is affected by the activity of the supervisory institutions. Fraud detection, sanctioning, and announcing should have deterring effects on the preparedness of market participants for abuses in the first place. Therefore, current detection negatively impacts the propensity of a competent authority to detect fraud in the future. This effect counter-

balances various efficiency measures, which we use in our regressions, but especially the "Number of Supervisors." A larger number of supervising staff, a higher efficiency of the administrational procedures, and more or better deterring effects should lower the number of true frauds in the future.

In order to eliminate the problem of simultaneity, we need to find instrumental variables which are correlated with the resources of the competent authorities but not with the regression error terms. Using a lagged value of "Detected Offenses", as e.g. similar in Zimmerman (2014), is impossible, due to the limited observation period of our panel. Therefore, we follow Levitt (1997) or Lin (2009) and instrument our ability measure with appropriate exogenous variables. We also cluster standard errors by country and use a GMM estimate to eventually increase the quality of our parameter estimates. In a final step, we allow for unobserved heterogeneity within the detection of market abuses and use an instrumented panel data estimation technique. All these analyses are subsequently presented followed by robustness checks which provide confidence in our results and discuss any potential shortcoming of the various estimates.

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Table 9 presents the first four OLS regressions. Model (A) regresses log("Detected Offenses"+1) on log("Number of Supervisors") without control variables and additional regressors. We add 1 to the variable "Detected Offenses" to avoid the problems resulting from 0 observations of market abuses. Adding 1 to the dependent variable might be subject to criticism and therefore, we also present regression models using alternative specifications of the dependent variable, e.g. scaled by trading activity or in absolute terms. Model (B) controls for capital market activity (Market Capitalization/GDP), the countries' general legal quality (Rule of Law Index), the countries' criminal activity (Police Reported Crime/Population) and year

fixed effects. Models (C) and (D) add regressors. The first line with respect to every variable of the regression models presents the parameter coefficients and their level of significance. The second line lists the standardized coefficients in squared brackets, i.e. the parameter as if all data was transferred into a z-score prior to the regressions. This reveals the economic significance of the various parameters directly. The third line reports the standard errors of each parameter estimate. The regressions highlight the following points (see also Figures 1-5 for graphical depictions of the data). First, increasing the resources of the supervisory authorities strongly and consistently supports fraud detection. From regression OLS (D) we conclude that, all else being equal, a 1-standard deviation increase (which is 753) in the number of supervisors is associated with an increase of 0.718 times the standard deviation of log("Detected Offenses"+1) relative to the average level across countries and years. The mean of the log ("Detected Offenses"+1) is 2.1 and its standard deviation is 1.3. Hence, the economic effect is $e^{(2.1+0.718*1.3)} - e^{2.1} = 12.6$ in absolute numbers. Relative to the average of detected offenses in absolute numbers (which is 17.7), this is equivalent to a 71% increase across countries and years. Second, differences in enforcement rules pertaining to surveillance give rise to large differences in fraudulent acts.[12] In particular, if a formalized cooperation agreement between the enforcement authorities exists, then this is associated with a reduction of detected offenses. The cooperation agreement reduces the mean of log("Detected Offenses"+1) by 0.883. This converts into a multiple with respect to the absolute number of detected offenses of $e^{-0.883} = 0.41$. This is equivalent to a reduction of the average number of detected offenses by 59% across countries and years.

Third, differences in enforcement rules pertaining to deterrence also give rise to large differences in fraud. Fraud deterrence is stronger if sanction decisions have to be published by

[12] Related evidence shows that surveillance is more effective with information sharing (Cumming and Johan, 2008).

law. The discouraging effect reduces detected market abuses by $e^{(-0.688)} = 0.51$. This is approximately 49% of the average number of detected offenses across all countries and years.

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Insert Table 10 and Figures 1-5 here

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The OLS regressions continue as presented in Table 10, where models (E) adds the number of months of imprisonment (measured in logs) and (F) adds the indicator for investor protection. Model (G) repeats model (F) but without the controls to provide evidence that the results are not driven by multicollinearity among the controls. Model (H) adds the dummy, if there is a limit on fines. Unfortunately, this latter variable is available for only 9 countries over three years. This explains the reduction in observations but also, surprisingly, the increase in the coefficient of determination of regression (H). For the narrowed sample of countries, where the information on limits of fines is provided, the results become even stronger than in the previous regressions. One might argue that several outliers are dropped in the reduced sample. All OLS regressions have relatively high coefficients of determination at increasing levels from (A) to (H). The parameters of the independent variables keep their signs and notable economic magnitude. From Model (F), considering the complete sample and the controls, we can additionally interpret that an increase of one standard deviation of imprisonment (which is 11.8 months ~ 1 year) has an effect of $e^{(2.1-0.199*1.3)} - e^{2.1} = -1.86$ on the average number of detected frauds. This is equivalent to a reduction of 10%. Similarly, an increase of 1 point in the Shareholder Suits Index decreases detected infringements by $e^{-0.246} = 0.78$, which is a 22% decrease on the average across countries and years. By contrast, limiting punishment has the expected strong negative effect on fraud prevention. We realize that, controlling for all other important factors, the amount of detected frauds increases in countries where fines are limited.

We interpret this to be the result of the additional infringements compared to those countries with unlimited fines.

Next, we elaborate on the potential simultaneity issue of our key explanatory variable, "Number of Supervisors." If the variable is indeed endogenous, the previous point estimates will be biased. We contend above that staffing the competent authorities might be a political decision which may or may not be driven by the perception of market abuses and not by the fundamentally underlying objective that the supervision of market players' activities is contingent on the size of the financial markets and trading volumes. One would expect that countries with more financial market activity have a larger number of supervisory staff. However, this is not the case, as will be revealed subsequently. Any measure of financial market activity has no predictive power for the number of supervising staff after the size of a country is controlled for. The size measure can either be GDP or population or both. Recall that there are several rather small European countries in terms of economy or population with relatively large capital market activity. The opposite is also true: Some large countries have less developed financial markets. At the same time, the size of a country (GDP or population) should not have any causal impact on financial market abuses. Only trading activity, not country size, "opens room for infringements." Therefore, the measures for country size seem to be good instruments for "Number of Supervisors," they are not considered to be omitted variables in our main regressions. We test this hypothesis with an augmented regression. First, we regress log("Number of Supervisors") on a country's GDP and on its population (both also in logs) to identify whether or not the two variables are appropriate instruments for the competent authorities' staffing policy. We predict the residuals and then regress our dependent variable, log("Detected Offenses"+1) on log("Number of Supervisors") and the predicted residuals. If the usual test statistics are met, and if the regressors are significant, then our key

variable of interest is correlated with the error term in the regressions presented above, and are, therefore, endogenous.

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Table 11 presents the augmented regressions to test for endogeneity and to verify the proposed instruments at the same time. The first step of the augmented regression Augm. Reg. (A) reveals that GDP and Population highly correlate with the instrumented variable and, therefore, serve as appropriate instruments. The second step confirms the endogeneity of the number of supervisors and reveals the significant impact of the residuals on the dependent variable. All results are qualitatively identical if either GDP or Population is dropped from the regressions. We assume that this is caused by a policy/bureaucratic tendency to create administrational financial market supervision employment relative to country size, rather than relative to the actual size of the financial market.

Table 12 continues our analyses by instrumenting the number of supervisors with their appropriate instruments.

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The first model is a two-stage least-square regression, instrumenting the number of supervisors in the first step, which is not presented, and adding the additional relevant regressors in the second step, which is presented. A Hausman (1978) test strongly rejects the hypothesis that the parameter estimates of this IV regression and of OLS (E) are equal, and a Sargan (1958) test confirms that the selected instruments are appropriately uncorrelated with the disturbance process. Therefore, we should prefer the IV approaches compared to OLS.

Nevertheless, all discussed results remain. Some of them (e.g., the number of supervisors) become statistically and economically even stronger. The importance of others slightly decreases in particular regressions. The second IV model allows that observations within the individual countries may be correlated and calculates cluster-robust estimates. Consequently, the standard errors of the point estimates increase compared to the previous model and, thus, rejecting the null-hypothesis for the legal quality indicator is impossible. The third model controls for the possibility of a violation of the assumption of i.i.d. errors and determines GMM estimates. However, the GMM results remain qualitatively unchanged. In the fourth, we account for the panel structure of our data and apply instrumented random effects regressions to allow for potentially serially-correlated error terms. It could be possible that fraud detection follows a certain pattern over time, eventually driven by new technology. It is also not completely unlikely that any thus far unobserved characteristic biases the parameter estimates. We note that alternative panel data estimation techniques, such as fixed effects or differencing models, are not appropriate in our setting, due to the time-invariant nature of several of our key variables of interest.

Summarizing, we note that even if we control for simultaneity and potential unobserved heterogeneity, the initial OLS results but especially the finding on the number of supervisors as key determinant of fraud detection are qualitatively unchanged but receive additional support by the more advanced econometric techniques.

4. Robustness Checks

There are several concerns that require verification of the results in additional analyses. First of all, it can be argued that our dependent variable should be scaled by trading activity and not enter into the model after a logarithmic transformation. Second, we recall, that our dependent variable is a count variable. It takes small values in many observations, including zero

infringements. Count variables are non-negative and typically follow a Poisson distribution. Therefore, a Poisson or Negative Binomial Regression might be a preferable estimation method. We therefore repeat the previous analyses with different estimation techniques and alternative variable definitions. Subsequently we rerun the OLS and IV Regressions but scale "Detected Offenses" with trading activity. This is followed by Poisson and Negative Binomial Regressions where all variables enter the models in absolute terms.

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Insert Tables 13 and 14 here

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The regressions presented in Tables 13 and 14 repeat OLS (A) to (H) from Tables 9 and 10 but use a scaled dependent variable defined as "Detected Offenses"/log("Stock Market Trading Volume"). Hence, the new left-side variable can be interpreted as a ratio of market abuses relative to the trading activity in a country. The robustness checks confirm our results. We also find an additional deterrence effect in OLS (P), the dummy variable for cooperation between the competent and the judicial authorities in later stages of the prosecution. Eventually, this poses a stronger threat on market participants via an improved efficiency of the sanctioning process and thus, further deters manipulations.

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Insert Table 15 here

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Table 15 repeats the instrumental variable regressions of Table 12 but uses the scaled variable "Detected Offenses"/log("Stock Market Trading Volume") as regressand. It reveals that all previous results qualitatively remain.

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Insert Tables 16 and 17 here

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Tables 16 introduces Poisson Regressions analogue to OLS (A) to (D) in Table 9. The analyses clearly support our line of argumentation. Taking into account the characteristics of a non-normally distributed dependent variable substantially decreases the standard errors of the regression parameters. All of our revealed drivers of detected infringements become significant at a 1% level. Table17 introduces additional independent variables to the Poisson Regressions, analogue to OLS (E) and (F) in Table 10 and then presents in model NBREG (G) a Negative Binomial Regression model on the set of parameters of PR(F). The final model PR(H) switches to Poisson Regressions again and adds the two dummies for cooperation in later stages of the prosecution and for limited fines. All these analyses reveal that our results are consistent with respect to the fact that our dependent variable is a count variable and to the choice of the estimation technique.

A further motivation for robustness checks is the skewness of the joint distribution of the main variables of interest. The significance of the regression results might be driven by the jointly high numbers of detected offenses and the number of supervisors, e.g. for Germany and France, or by relatively low or even zero values for Iceland, Ireland or Sweden at the same time. Therefore, we winsorize the number of detected offences and the number of supervisors and repeat OLS (E).[13] The result is presented in the first column of Table 15. Further, we consider the differences in the economic meaning of the 28 European countries and weigh our regressions. It could be argued that, due to the size of their populations (equivalently for GDP), the observed effects of, for example, France or Germany are more important in deriving conclusions for Europe than those of, Iceland or Luxembourg. We, therefore, use population

[13] Note that both, the detected offenses and the number of supervisors enter in absolute terms and not in logs into this model.

and GDP as alternative weights for the regressions presented in columns three and four of Table 18. Table 18 reveals that all of our primary results hold in the various robustness analyses.

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Insert Table 18 here

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In a final set of robustness checks, we use the cases transmitted to the judicial authorities over trading activity as the alternative dependent variable. We realize that the observations of transmitted cases for Sweden might be flawed relative to any measure of its capital market activity. We emphasize that Sweden transmitted, for example, five times the number of detected frauds of Germany and 15 times the number of France to its judicial authority in 2008. On the other hand, the Swedish competent authority has no autonomy to proceed and sanction infringements independently and is required to transfer all cases to the courts. Denmark and Poland also stand out with their numbers of transmitted cases. However, ESMA (2012) notes that these numbers rather reflect the diversity existing in the national legal systems for the transmission of information to the judicial authorities. For example, in some countries every observation of potential misconduct might trigger a transmission of the case, while in other countries, the competent authorities might collect sufficient proof first, prior to transferring the observation of an incident. In any case, we consider Sweden an outlier with respect to its number of transmitted cases. Without Sweden, the variance of the variable "Cases Transmitted" shrinks substantially. Additionally, there are many observations with zero or relatively small values of transmitted cases. Hence, the detection of significant covariates should be less likely for the alternative dependent variable. This presumption is revealed in the results presented in Table 16.

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Insert Table 19 here

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Table 16 shows the results of four robustness checks. We rerun OLS (A) to (D) from Table 9 using the alternative dependent variable "Cases Transmitted"/log("Stock Market Trading Volume") and dropping Sweden from the sample. As presumed, e.g. the dummy variable for "Formalized Cooperation", can no longer be considered significant.

We conclude from all of the robustness checks that our general results hold, with respect to the non-normality of the dependent variable, the consideration of different economic meanings of the 28 European Union member states, and the consideration of differences in the legalities related to the transfer of incidences to the judicial authorities.

5. Conclusions

In this paper, we present and analyze enforcement data from the European Securities Market Authority. Prior to the European Union's harmonized rule setting on securities market abuse, there was no consistent definition of what actually constituted market abuse across countries. In this new era of harmonized market abuse definitions and rules across countries, it is possible to ascertain factors that materially affect market abuse across countries.

The empirical tests are highly consistent with the view that the intensity of enforcement is the most statistically robust and economically significant predictor of market abuse detections. In particular, the data identify three important arms of enforcement. First, the number of supervisors is an important mechanism to facilitate detection of market abuse. The data indicate that this direct expenditure on supervisors is most statistically and economically tied to detecting market abuse. Second, formalized cooperation is an important tool through which securities market authorities can effectively engage in surveillance of market abuse.

Finally, the data highlight the importance of imprisonment to deter would-be market manipulators.

As additional years of data become available, further research could examine the stability of our findings in different market conditions. Further research could also examine case-specific data, as they become available, regarding the severity and types of market abuse. These and related studies would shed further light on international differences in securities fraud and appropriate mechanisms to detect and deter such market manipulation.

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Table 1. European Union Member States and their Security Market Authorities

The Table lists the European Union Member States and their national Competent Authorities considered in our analyses. Malta which is also included in the ESMA (2012) survey has been dropped from our sample due to the lack of availability of the required other data series that we use in the course of our analyses.

EU Member State	National Competent Authority
Austria	Financial Market Authority
Belgium	Financial Services and Markets Authority
Bulgaria	Financial Supervision Commission
Cyprus	Cyprus Securities and Exchanges Commission
Czech Republic	Czech National Bank
Denmark	Finanstilsynet Finanstilsynet
Estonia	Estonian Financial Supervision Authority
Finland	Finanssivalvonta
France	Autorité des Marchés Financiers
Germany	Bundesanstalt für Finanzdienstleistungsaufsicht
Greece	Capital Market Commission
Hungary	Hungarian Financial Supervisory Authority
Iceland	Financial Supervisory Authority
Ireland	Central Bank of Ireland
Italy	Commissione Nazionale per le Società e la Borsa
Latvia	Financial and Capital Markets Commission
Lithuania	Lietuvos Bankas
Luxembourg	Commission de Surveillance du Secteur Financier
Netherlands	Autoriteit Financiële Markten
Norway	Finanstilsynet
Poland	Polish Financial Supervision Authority
Portugal	Comissão do Mercado de Valores Mobiliários
Romania	Romanian National Securities Commission
Slovakia	National Bank of Slovakia
Slovenia	Securities Market Agency
Spain	Comision Nacional del Mercado de Valores
Sweden	Finansinspektionen
United Kingdom	Financial Services Authority

Table 2. Market abuse cases across countries

This Table presents the main variables of interest "Detected Offenses" and "Transmitted Cases" (Data source is ESMA, 2012). The review panel of the Committee of European Securities Regulators launched a mapping procedure with regard to the actual use of sanctioning powers in the European Union member states in cases of market abuse. The individual national competent authorities provided the number of natural or legal persons who are either directly sanctioned or discharged for insider dealing or market manipulation by the competent authorities and the cases that have been transferred to a judicial authority for the years 2008 to 2010. We refer to "Detected Offenses" for the directly sanctioned or discharged cases. The "Cases Transmitted" are those which have been transferred to the national judicial authority.

	Detected Offenses			Cases Transmitted		
Country:	2008	2009	2010	2008	2009	2010
Austria	22	23	36	1	4	1
Belgium	7	9	9	1	6	2
Bulgaria	5	9	9	0	0	0
Cyprus	5	11	10	0	1	3
Czech Republic	0	3	5	1	0	1
Denmark	32	22	9	34	35	66
Estonia	20	21	25	1	4	1
Finland	4	20	7	5	0	2
France	100	85	66	20	16	16
Germany	128	98	140	59	88	72
Greece	27	81	65	2	1	10
Hungary	18	6	11	1	0	0
Iceland	0	0	1	0	13	6
Ireland	0	0	0	0	0	0
Italy	6	23	23	6	7	8
Latvia	1	0	1	1	2	2
Lithuania	8	14	1	0	2	0
Luxembourg	2	3	13	0	0	3
Netherlands	5	5	13	11	4	3
Norway	14	17	12	6	7	5
Poland	27	12	16	24	26	12
Portugal	5	15	12	4	3	4
Romania	4	1	4	0	2	2
Slovakia	1	1	0	0	0	0
Slovenia	0	3	9	1	2	2
Spain	6	2	19	1	0	10
Sweden	0	0	0	304	262	249
United Kingdom	7	10	21	0	0	0
Total	454	494	537	483	485	480

Table 3. Number of supervisors across countries

This table presents our variable "Number of Supervisors" (Data source is Horáková and Jordan, 2013) which is the number of total staff employed in the national banking and insurance regulating institutions. The national competent authorities are usually subsidiaries of the banking and insurance regulators. However, their particular staff is unknown. Nevertheless, we use these numbers as proxy for the employees who are dedicated to financial market supervision, assuming a similar ratio of total staff to supervisory staff across countries.

	Number of Supervisors		
Country:	2008	2009	2010
Austria	219	275	282
Belgium	205	220	235
Bulgaria	330	330	301
Cyprus	104	109	118
Czech Republic	229	233	240
Denmark	200	212	220
Estonia	68	69	69
Finland	219	211	209
France	1525	1533	1553
Germany	2666	2829	3023
Greece	302	306	322
Hungary	478	461	475
Iceland	67	73	83
Ireland	398	453	507
Italy	1956	1981	1981
Latvia	104	107	109
Lithuania	69	71	71
Luxembourg	305	322	363
Netherlands	820	822	824
Norway	235	246	260
Poland	827	891	898
Portugal	585	635	659
Romania	795	791	779
Slovakia	185	185	184
Slovenia	140	142	140
Spain	1234	1211	1235
Sweden	224	232	240
United Kingdom	2650	2700	2750
Total	17139	17650	18130

Table 4, Panel A: Size measures and police reported crime across countries

Panel A of Table 4 presents the population (in million people), the GDP (in billion USD) and the Police Reported Crime of our sample countries for the years 2008, 2009 and 2010. The data are used to scale other variables, as controls, and as instruments in two-stage regressions.

	Population [million]			GDP [billion USD]			Police Reported Crime		
Country:	2008	2009	2010	2008	2009	2010	2008	2009	2010
Austria	8.3	8.4	8.4	414	384	379	572695	591597	535745
Belgium	10.7	10.8	10.8	507	474	472	1043628	1067295	1072011
Bulgaria	7.6	7.5	7.4	52	49	48	126673	138105	147025
Cyprus	1.1	1.1	1.1	25	23	23	7341	7104	8393
Czech Republic	10.4	10.4	10.5	225	196	198	343799	332829	313387
Denmark	5.5	5.5	5.5	344	311	312	476953	491792	471088
Estonia	1.3	1.3	1.3	24	19	19	50977	48359	48340
Finland	5.3	5.3	5.4	272	239	237	440711	441416	431623
France	62.1	62.5	62.8	2829	2620	2566	3589293	3558329	3521256
Germany	82.2	82	81.8	3620	3300	3306	6114128	6054330	5933278
Greece	11.2	11.3	11.3	341	322	301	417391	386893	333988
Hungary	10	10	10	154	127	129	408407	394034	447186
Iceland	0.3	0.3	0.3	17	12	13	14578	15966	14911
Ireland	4.4	4.5	4.5	262	224	207	99244	102206	103178
Italy	59.6	60	60.3	2305	2112	2057	2709888	2629831	2621019
Latvia	2.2	2.1	2.1	33	26	24	57475	56748	51108
Lithuania	3.4	3.3	3.3	47	37	37	71972	76291	70618
Luxembourg	0.5	0.5	0.5	55	50	53	28210	32378	30532
Netherlands	16.4	16.5	16.6	870	797	780	1277775	1254480	1194030
Norway	4.7	4.8	4.9	454	375	417	264199	277121	270656
Poland	38.1	38.1	38.2	529	431	470	1082057	1129577	1151157
Portugal	10.6	10.6	10.6	252	234	229	430486	426040	422587
Romania	21.5	21.5	21.5	204	164	164	289331	299889	292682
Slovakia	5.4	5.4	5.4	98	87	87	104758	104905	95252
Slovenia	2	2	2	55	49	47	81917	87465	89489
Spain	45.3	45.8	46	1592	1456	1389	2396890	2339203	2297484
Sweden	9.2	9.3	9.3	486	406	463	1377854	1405626	1370399
United Kingdom	61.2	61.6	62	2641	2186	2265	5190224	4785558	4579203
Total	500.5	502.4	503.8	18708	16710	16690	29068854	28535367	27917625

Table 4, Panel B: Capital market activity measures across countries

Panel B of Table 4 presents data on the size of the capital markets of our sample countries for the years 2008, 2009, and 2010. The stock market trading volume measures the volume of all traded shares at all stock exchanges in a country within a year and the market capitalization of listed domestic countries is the number of shares outstanding of all domestic companies multiplied by their year-end share prices for the particular countries and years. The stock market trading volume serves as control and auxiliary variable in various regressions. To smooth the skewness of the distribution, we refer to its logs. The countries' market capitalizations are used to determine the control variable Relative Capital Market Size (= Market Capitalization of Listed Domestic Companies/GDP).

	Stock Market Trading Volume [billion USD]			Market Capitalization of Listed Domestic Companies [billion USD]		
Country:	2008	2009	2010	2008	2009	2010
Austria	5028	2176	5411	72.4	53.6	68.2
Belgium	12830	15520	11380	167.7	260.4	271.0
Bulgaria	96	36	37	8.9	7.1	7.3
Cyprus	95	73	73	7.9	5.0	6.8
Czech Republic	3451	2134	1266	49.0	52.6	43.0
Denmark	13720	17440	15960	131.9	187.2	231.0
Estonia	38	43	30	1.9	2.6	2.3
Finland	23090	6771	11510	154.8	91.1	118.2
France	227300	154800	146300	1484.0	1963.0	1943.0
Germany	214600	139600	149800	1110.0	1303.0	1454.0
Greece	2446	3900	4951	90.2	54.7	73.1
Hungary	1728	3131	2621	18.6	28.3	27.7
Iceland	368	14	19	5.5	1.1	2.0
Ireland	1886	1002	945	49.0	30.0	34.2
Italy	43590	34890	54530	519.2	318.1	321.3
Latvia	3	2	2	1.6	1.8	1.3
Lithuania	26	34	33	3.6	4.5	5.7
Luxembourg	90	32	17	62.9	101.7	100.7
Netherlands	66060	70880	65580	388.5	545.8	666.6
Norway	19120	31760	22720	125.5	226.4	250.2
Poland	4121	6658	9090	90.2	134.6	191.0
Portugal	5658	5401	2849	68.9	98.7	82.5
Romania	230	232	178	20.3	31.0	32.9
Slovakia	2	17	16	5.1	4.7	4.1
Slovenia	81	103	24	11.7	11.9	9.5
Spain	168100	185700	130000	946.0	1303.0	1179.0
Sweden	37500	49430	50780	252.7	433.7	585.4
United Kingdom	420000	411900	319900	1849.0	2814.0	3141.0
Total	1271257	1143679	1006022	7697.1	10069.6	10853.0

Table 5. Securities enforcement characteristics across countries

This table illustrates the characteristics of securities enforcement among our sample countries. The order of the indicators is according to their appearance in the subsequent regression tables. Data source for all data series but the Shareholder Suits and the Rule of Law Index is ESMA (2012). These two indicators are taken from the website of World Bank. Our variable "Formalized Cooperation" is a dummy indicating the countries in which the cooperation between the competent and the judicial authorities is formalized. "Minimum Imprisonment" measures the minimum length of possible jail time for market abuse among the member states in months. "Publication of Decision" is a dummy which equals 1 if administrative or criminal sanction decisions are to be published by law. The Shareholder Suits Index measures on a scale from 0 to 10 how well minority investors are protected against misconduct of officers and directors of the firms they hold shares of. A high value means that minority shareholders are well protected against fraudulent acts of managers or directors of public firms. The dummy variable "Cooperation also in Later Stages" takes the value of 1 if the cooperation between the competent and the judicial authority is envisaged to be extended to later stages of the procedure. Cooperation among the two authorities may be desirable to ensure proper pursuing of market abuse. The final dummy variable "Limit on Fines" takes a value of 1 if the total amount of administrative and financial penalties imposed for the same offense is limited. Unfortunately, only 9 competent authorities provide information if fines are limited or not. The Rule of Law Index measures the extent to which agents have general confidence in and abide by the rules of society. It serves as a general measure for legal protection against criminal behavior in a country. It ranges between -2.5 and 2.5 with higher values indicating better protection.

Country	Formalized Cooperation (D)	Minimum Imprisonment [months]	Publication of Decision (D)	Shareholder Suits Index (max 2008-10)	Coop. also in Later Stages (D)	Limit on Fines (D)	Rule of Law Index (max 2008-10)
Austria	0	0	0	5	0		1.9
Belgium	0	0-12	1	7	1	1	1.4
Bulgaria	0	0	0	7	0		-0.1
Cyprus	0	0	0	7	1	0	1.2
Czech Republic	0	0-12	1	8	0		1.0
Denmark	0	0-12	0	7	1		2.0
Estonia	1	0	0	6	1		1.2
Finland	0	0	1	7	1		2.0
France	0	0	1	5	1	1	1.5
Germany	1	0-12	0	5	1		1.7
Greece	0	0	0	5	1		0.8
Hungary	0	0	1	7	0	0	0.8
Iceland	1	0	0	6	0		1.9
Ireland	1	0	1	9	1		1.8
Italy	1	24-60	1	7	0	0	0.4
Latvia	0	0	0	8	0		0.8
Lithuania	0	0	1	6	0		0.8
Luxembourg	0	0-12	0	3	0		1.8
Netherlands	1	0	1	6	0		1.8
Norway	1	0	1	7	0		2.0
Poland	1	0-12	0	9	0	0	0.7
Portugal	1	0	1	7	1	1	1.0
Romania	1	0-12	1	4	1		0.1
Slovakia	1	0-12	1	7	0	1	0.6
Slovenia	0	0-12	0	8	0		1.1
Spain	0	0-12	1	4	1		1.2
Sweden	1	0-12	0	7	0		2.0
United Kingdom	1	0	1	7	1	0	1.8

Table 6. Descriptions and sources of all variables

This table lists the sources of all dependent, independent, auxiliary, and control variables that have been introduced in the previous tables.

Panel A: *Dependent Variables*	*Description*	*Source*
Detected Offenses	Number of natural or legal persons who are either sanctioned or discharged for insider dealing or market manipulation by the competent authorities	ESMA (2012) report, Tables F.3.2.A, F.3.2.B, F.3.2.C, and F.3.2.D.
Cases Transmitted	Number of cases transmitted	ESMA (20120) report, Table G.8
Panel B: *Independent Variables*	*Description*	*Source*
Number of Supervisors	Number of total staff of banking and insurance supervisors and regulators	Horáková and Jordan (2013)
Formalized Cooperation	Dummy variable which indicates the countries where the cooperation between the competent and the judicial authorities is formalized	ESMA (2012) report, Table D.8
Minimum Imprisonment	Measures the minimum length of possible jail time for market abuse in months	ESMA (2012) report, Table G 29.2
Publication of Decision	Dummy which indicates if administrative or criminal sanction decisions are to be published by law	ESMA (2012) report, Table L.1
Shareholder Suits Index	Indicates between 0 and 10 how well minority shareholders are protected against misconduct of officers and directors of public companies, with high values indicating better protection	Worldbank
Coop. also in Later Stages	Dummy variable which indicates if the cooperation between the competent and the judicial authority is envisaged to be extended to later stages of the procedure	ESMA (2012) report, Table D.7
Limit on Fines	Dummy variable which indicates if the total amount of administrative and financial penalties imposed for the same offense is limited	ESMA (2012) report, Table D.10
Panel C: *Auxilliary and* *Control Variables*	*Description*	*Source*
Stock Market Trading Volume	Trading volume of stocks at all stock exchanges in a particular country	Worldbank
Market Capitalization of Listed Domestic Companies	The market capitalization of the domestic listed companies in a country	Worldbank

Rule of Law Index	"Rule of Law" measures the extent to which agents have general confidence in and abide by the rules of society, in particular the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence. The index ranges from -2.5 to 2.5 with higher values corresponding to better governance outcomes.	Worldbank
Police Reported Crime	Offences recorded by police in EU Member States and some other European countries. The data includes violent crime, homicide, robbery, property crime, and drug offences.	EUROSTAT
Population	A country's population	Euromonitor International
GDP	A country' Gross Domestic Product	Euromonitor International

Table 7. Summary statistics

This table presents descriptive statistics (mean averages, medians, the standard deviation, the minimum and maximum values as well as the number of observations) for the variables introduced in the previous tables.

Variable	Mean	Median	Std.Dev.	Min.	Max.	Obs.
Detected Offenses	17.7	9	27.9	0	140	84
Log(Detected Offenses + 1)	2.1	2.3	1.3	0	4.9	84
Detected Offenses over Trading Activity	0.6	0.3	0.9	0	4.3	84
Cases Transmitted	17.2	2	52.0	0	304	84
Number of Supervisors	630.0	292	752.8	67	3,023	84
Formalized Cooperation (D)	0.5	0	0.5	0	1	84
Minimum Imprisonment [months]	6.9	0	11.8	0	60	84
Publication of Decision (D)	0.5	1	0.5	0	1	84
Shareholder Suits Index	6.5	7	1.4	3	9	84
Coop. also in Later Stages (D)	0.5	0	0.5	0	1	84
Limit on Fines (D)	0.4	0	0.5	0	1	27
Stock Mkt. Trad. Vol. [billion USD]	40,725.7	3,131	83,633.5	2	420,000	84
Market Capitalization [billion USD]	341.2	72.8	629.3	1.1	3141	84
Rule of Law Index	1.2	1.2	0.6	-0.2	2	84
Police Reported Crime [thousand]	1018	401	1516	7.1	6114	84
Population [million]	17.9	8.8	22.7	0.3	82.2	84
GDP [billion USD]	620.3	246	905.1	12	3,620	84

Table 8. Correlation matrix

This table presents the correlations between all the independent and control variables that we include in our regressions. We find the highest correlations for Limit on Fines and among the control variables Rule of Law Index, Police Reported Crime/Population and Market Capitalization/GDP. We therefore show that our results are unaffected by potential multicollinearity in a robustness check where we drop the controls.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	Number of Supervisors [log #]	1.00								
(2)	Formalized Cooperation (D)	0.31	1.00							
(3)	Publication of Decision (D)	0.35	0.15	1.00						
(4)	Min. Imprisonment [log months]	0.27	0.10	-0.02	1.00					
(5)	Shareholder Suits Index #	-0.20	0.15	0.05	-0.06	1.00				
(6)	Coop. also in Later Stages (D)	0.27	-0.01	0.15	-0.11	-0.20	1.00			
(7)	Limit on Fines (D)	-0.25	-0.10	0.48	-0.02	-0.47	0.35	1.00		
(8)	Rule of Law Index #	-0.02	0.07	-0.07	-0.18	-0.08	0.16	0.20	1.00	
(9)	Police Reported Crime/Population	0.16	0.08	-0.06	0.20	-0.10	0.06	0.25	0.68	1.00
(10)	Market Capitalization/GDP	0.32	-0.04	0.00	0.17	-0.39	0.09	-0.03	0.51	0.54

Table 9: OLS regressions, part I

This table presents the first four of our OLS regressions. Dependent variable is always log("Detected Offenses" + 1). The independent and control variables have been introduced in Tables 3 to 6. In column (A) we regresses log("Detected Offenses"+1) on log("Number of Supervisors") and a constant without any additional controls. In columns (B) to (D) we add the control variables "Market Capitalization/GDP", "Rule of Law Index", "Police Reported Crime/Population" and year dummies. We further add the independent variables "Formalized Cooperation" and "Publication of Decision". The first line with respect to every variable of the regression model presents the parameter coefficients and their level of significance. The second line presents the standardized coefficients in squared brackets, i.e. the parameter as if all data was transferred into a z-score prior to the regressions. The third line reports the standard errors of each parameter estimate.

	OLS (A) β [std.β] (SE)	OLS (B) β [std.β] (SE)	OLS (C) β [std.β] (SE)	OLS (D) β [std.β] (SE)
Number of Supervisors [log #]	0.51855*** [0.418] (0.12462)	0.59488*** [0.479] (0.13758)	0.76508*** [0.616] (0.13894)	0.89180*** [0.718] (0.14199)
Formalized Cooperation (D)			-0.90464*** [-0.345] (0.27042)	-0.88327*** [-0.337] (0.26040)
Publication of Decision (D)				-0.68841*** [-0.263] (0.25937)
Constant	-0.91608 (0.74346)	-1.71226* (0.88945)	-2.38797*** (0.85992)	-2.72070*** (0.83708)
Controls:				
Market Capitalization/GDP	no	yes	yes	yes
Rule of Law Index	no	yes	yes	yes
Police Reported Crime/Population	no	yes	yes	yes
Year Fixed Effects	no	yes	yes	yes
N	84	84	84	84
adj. R^2 in %	16.43	14.73	24.70	30.24

* p<0.1, ** p<0.05, *** p<0.01
Standardized parameter coefficients in squared brackets […]
Standard errors in parentheses (…)

Table 10: OLS regressions, part II

This table continues the stepwise regressions of Table 9. The dependent variable is log("Detected Offenses" + 1). We add the independent variables "Minimum Imprisonment" and "Shareholder Suits" index in OLS (E) and (F). OLS (G) repeats OLS (F) without the controls to reveal that the results are not affected by potential multicolinearity of the controls. OLS (H) introduces the additional independent variable "Limit on Fines". However, this reduces the number of observations to 27 because only 9 European Union member states provide this information.

	OLS (E) β [std.β] (SE)	OLS (F) β [std.β] (SE)	OLS (G) β [std.β] (SE)	OLS (H) β [std.β] (SE)
Number of Supervisors [log #]	0.92480*** [0.745] (0.14034)	0.87039*** [0.701] (0.13587)	0.75824*** [0.611] (0.13325)	1.09734*** [1.130] (0.12775)
Formalized Cooperation (D)	-0.83414*** [-0.318] (0.25674)	-0.72833*** [-0.278] (0.24891)	-0.60374** [-0.230] (0.25215)	-1.43984*** [-0.698] (0.28626)
Publication of Decision (D)	-0.73779*** [-0.282] (0.25575)	-0.66752*** [-0.255] (0.24631)	-0.66155** [-0.253] (0.25379)	-1.39231*** [-0.564] (0.32634)
Minimum Imprisonment [log months]	-0.20162* [-0.210] (0.10228)	-0.19053* [-0.199] (0.09806)	-0.23521** [-0.245] (0.08973)	0.00859 [0.013] (0.06933)
Shareholder Suits Index [#]		-0.24612*** [-0.269] (0.08905)	-0.15129* [-0.165] (0.08622)	-0.02546 [-0.023] (0.18070)
Limit on Fines (D)				0.76457*** [0.370] (0.26775)
Constant	-2.60088*** (0.82367)	-0.77966 (1.02800)	-0.43946 (0.99799)	-2.81527 (1.76048)
Controls:				
Market Capitalization/GDP	yes	yes	no	no
Rule of Law Index	yes	yes	no	no
Police Reported Crime/Population	yes	yes	no	no
Year Fixed Effects	yes	yes	no	no
N	84	84	84	27
adj. R^2 in %	32.83	38.36	33.88	79.41

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

Standardized parameter coefficients in squared brackets […]

Standard errors in parentheses (…)

Table 11: Augmented regressions

This table motivates the instrumental variable regression approach carried out in Table 12. In the first step of the augmented regression (A) we regress "Number of Supervisors" on GDP and population and save the residuals. Both variables are (even if used simultaneously) good predictors for "Number of Supervisors". In the second step of the augmented regression (A) we regress log("Detected Offenses"+1) on "Number of Supervisors" and on the saved residuals. The estimation reveals a highly significant parameter for the residuals indicating that the "Number of Supervisors" is an endogenous variable. The augmented regressions show that GDP and population are good instruments for "Number of Supervisors" because they both strongly correlate with the variable. At the same time, there is no reason to assume that both variables correlate with the error term in our principal estimation model because the Detected Offenses should be independent of country size (either measured by GDP or population). We would expect only the size of the financial market to provide "room for infringements". The results qualitatively remain if we either drop GDP or population from the regressions (not reported here for brevity).

	AR (A), Step 1: Dependent Variable is log("Number of Supervisors") β (SE)	AR (A), Step 2: Dependent Variable is log("Detected Offenses"+1) β (SE)
Population [log #]	0.331***	
	(0.0868)	
GDP [log $]	0.316***	
	(0.0804)	
Number of Supervisors [log #]		0.669***
		(0.138)
Residuals		-0.681**
		(0.293)
Constant	1.307	-1.799**
	(0.836)	(0.818)
N	84	84
adj. R^2 in %	77.39	20.70

* p<0.1, ** p<0.05, *** p<0.01
Standard errors in parentheses (…)

Table 12: Instrumental variable regressions

This table presents instrumental variable regressions. The independent variable is log("Detected Offenses over Trading Activity") in all regressions. The first column is a two stage least square regression where "Number of Supervisors" is instrumented by GDP and population according to the results of Table 11. The second column is the same regression with standard errors clustered by country. The third regression uses a generalized method of moments estimate with robust standard errors. The final column presents a random effects instrumental variable regression, allowing for unobserved heterogeneity.

	2SLS β (SE)	2SLS Clust. SEs (by Country) β (SE)	GMM IV Estimate Robust SEs β (SE)	Random Effects IV Regression β (SE)
Number of Supervisors [log #]	1.093***	1.093***	1.068***	1.114***
	(0.151)	(0.215)	(0.128)	(0.201)
Formalized Cooperation (D)	-0.865***	-0.865*	-0.842***	-0.861**
	(0.256)	(0.465)	(0.264)	(0.339)
Publication of Decision (D)	-0.810***	-0.810**	-0.842***	-0.844**
	(0.254)	(0.352)	(0.212)	(0.338)
Minimum Imprisonment	-0.210**	-0.210*	-0.214***	-0.224*
[log months]	(0.100)	(0.108)	(0.0739)	(0.132)
Shareholder Suits Index [#]	-0.225**	-0.225	-0.252***	-0.188
	(0.0909)	(0.153)	(0.0870)	(0.118)
Constant	-2.069*	-2.069	-1.640	-2.358
	(1.103)	(1.998)	(1.109)	(1.471)
Controls:				
Market Capitalization/GDP	yes	yes	yes	yes
Rule of Law Index	yes	yes	yes	yes
Police Reported Crime/Population	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes
N	84	84	84	84
adj. R^2 in %	36.08	36.08	36.31	
Number of Groups				28
R^2 in % overall				44.43

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

Standard errors in parentheses (…)

Table 13: Robustness checks, scaled dependent variable, part I

This table presents OLS regressions using the scaled variable "Detected Offenses over Trading Activity" as dependent. Trading activity is thereby measured by the log of the annual trading volume. The independent and control variables have been introduced in Tables 3 to 6. In column (I) we regresses "Detected Offenses over Trading Activity" on the number of supervisors and a constant without any additional controls. In columns (J) to (L) we add the control variables "Market Capitalization/GDP", "Rule of Law Index", "Police Reported Crime/Population" and year dummies. We further add the independent variables "Formalized Cooperation" and "Publication of Decision". The first line with respect to every variable of the regression model presents the parameter coefficients and their level of significance. The second line presents the standardized coefficients in squared brackets, i.e. the parameter as if all data was transferred into a z-score prior to the regressions. The third line reports the standard errors of each parameter estimate.

	OLS (I) β [std.β] (SE)	OLS (J) β [std.β] (SE)	OLS (K) β [std.β] (SE)	OLS (L) β [std.β] (SE)
Number of Supervisors [#]	0.00061*** [0.529] (0.00011)	0.00068*** [0.593] (0.00011)	0.00082*** [0.716] (0.00011)	0.00089*** [0.779] (0.00011)
Formalized Cooperation (D)			-0.52152*** [-0.303] (0.16494)	-0.47523*** [-0.276] (0.15303)
Publication of Decision (D)				-0.53694*** [-0.312] (0.14412)
Constant	0.20318* (0.10529)	-0.07786 (0.22417)	0.03432 (0.21507)	0.30792 (0.21200)
Controls:				
Market Capitalization/GDP	no	yes	yes	yes
Rule of Law Index	no	yes	yes	yes
Police Reported Crime/Population	no	yes	yes	yes
Year Fixed Effects	no	yes	yes	yes
N	84	84	84	84
adj. R^2 in %	27.09	29.12	36.54	45.74

* p<0.1, ** p<0.05, *** p<0.01
Standardized parameter coefficients in squared brackets […]
Standard errors in parentheses (…)

Table 14: Robustness checks, scaled dependent variable, part II

This table continues the stepwise regressions of Table 13. The dependent variable is "Detected Offenses over Trading Activity". We add the independent variables "Minimum Imprisonment" and "Shareholder Suits" index in OLS (E) and (F). OLS (G) repeats OLS (F) without the controls to reveal that the results not affected by potential multicolinearity caused by the controls. OLS (H) introduces the additional independent variables "Cooperation also in Later Stages" and "Limit on Fines". However, this reduces the number of observations to 27 because only 9 European Union member states provide this information.

	OLS (M) β [std.β] (SE)	OLS (N) β [std.β] (SE)	OLS (O) β [std.β] (SE)	OLS (P) β [std.β] (SE)
Number of Supervisors [#]	0.00094*** [0.822] (0.00011)	0.00087*** [0.761] (0.00010)	0.00078*** [0.680] (0.00011)	0.00100*** [1.166] (0.00017)
Formalized Cooperation (D)	-0.44294*** [-0.257] (0.15183)	-0.35559** [-0.206] (0.14148)	-0.26210* [-0.152] (0.15490)	-0.93604*** [-0.636] (0.26125)
Publication of Decision (D)	-0.53122*** [-0.308] (0.14203)	-0.48942*** [-0.284] (0.13106)	-0.51193*** [-0.297] (0.14494)	-1.48557*** [-0.844] (0.26437)
Minimum Imprisonment (months)	-0.01264* [-0.173] (0.00700)	-0.01088* [-0.149] (0.00645)	-0.01371** [-0.187] (0.00638)	-0.00563 [-0.141] (0.00479)
Shareholder Suits Index [#]		-0.19080*** [-0.317] (0.05008)	-0.10282* [-0.171] (0.05177)	-0.31155* [-0.401] (0.15046)
Cooperation also in Later Stages (D)				-0.91857*** [-0.624] (0.21584)
Limit on Fines (D)				1.41850*** [0.963] (0.28081)
Constant	0.41508* (0.21713)	1.61427*** (0.37273)	1.24817*** (0.35015)	3.44943*** (1.17750)
Controls:				
Market Capitalization/GDP	yes	yes	no	no
Rule of Law Index	yes	yes	no	no
Police Reported Crime/Population	yes	yes	no	no
Year Fixed Effects	yes	yes	no	no
N	84	84	84	27
adj. R^2 in %	47.33	55.46	44.90	77.01

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

Standardized parameter coefficients in squared brackets […], Standard errors in parentheses (…)

Table 15: Robustness checks, scaled dependent variable, instrumental variable regressions

This table presents further robustness checks using instrumental variable regressions. The independent variable is "Detected Offenses over Trading Activity" in all regressions. The first column is a two stage least square regression where "Number of Supervisors" is instrumented by GDP and population according to the results of Table 11. The second column is the same regression with standard errors clustered by country. The third regression uses a generalized method of moments estimate with robust standard errors. The final column presents a random effects instrumental variable regression, allowing for unobserved heterogeneity in the panel.

	2SLS β (SE)	2SLS Clust. SEs (by Country) β (SE)	GMM IV Estimate Robus SEs β (SE)	Random Effects IV Regression β (SE)
Number of Supervisors [#]	0.00101***	0.00101***	0.000926***	0.000989***
	(0.000108)	(0.000248)	(0.000218)	(0.000185)
Formalized Cooperation (D)	-0.420***	-0.420*	-0.391*	-0.379
	(0.144)	(0.227)	(0.208)	(0.245)
Publication of Decision (D)	-0.521***	-0.521***	-0.524***	-0.542**
	(0.133)	(0.175)	(0.161)	(0.227)
Minimum Imprisonment (months)	-0.0131**	-0.0131	-0.00890	-0.0147
	(0.00655)	(0.00965)	(0.00819)	(0.0111)
Shareholder Suits Index [#]	-0.179***	-0.179*	-0.202**	-0.138*
	(0.0507)	(0.0875)	(0.0784)	(0.0833)
Constant	1.531***	1.531**	1.686***	1.404**
	(0.378)	(0.650)	(0.585)	(0.616)
Controls:				
Market Capitalization/GDP	yes	yes	yes	yes
Rule of Law Index	yes	yes	yes	yes
Police Reported Crime/Population	yes	yes	yes	yes
Year Fixed Effects	yes	yes	yes	yes
N	84	84	84	84
adj. R^2 in %	54.40	54.40	55.02	
Number of Groups				28
R^2 in % overall				57.67

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

Standard errors in parentheses (…)

Table 16: Robustness checks, Poisson and Negative Binomial regressions, part I
This table repeats OLS (A) to (D) using Poisson regressions. Since "Detected Offenses" is a count variable that can take zero values, a Poisson or Negative Binomial Regression Model might be more appropriate to assess the determinants of detected market abuses. Therefore, we regress "Detected Offenses" on its covariates and controls in PR (A) to (D).

	PR (A) β (SE)	PR (B) β (SE)	PR (C) β (SE)	PR (D) β (SE)
Number of Supervisors [#]	0.000748*** (0.0000239)	0.000806*** (0.0000259)	0.00118*** (0.0000374)	0.00114*** (0.0000368)
Formalized Cooperation (D)			-1.253*** (0.0754)	-1.239*** (0.0784)
Publication of Decision (D)				-0.519*** (0.0591)
Constant	2.185*** (0.0403)	1.805*** (0.0835)	2.093*** (0.0862)	2.447*** (0.0909)
Market Capitalization/GDP	no	yes	yes	yes
Rule of Law Index	no	yes	yes	yes
Police Reported Crime/Population	no	yes	yes	yes
Year Fixed Effects	no	yes	yes	yes
N	84	84	84	84
Pseudo R^2 in %	30.55	36.61	48.41	51.26

* p<0.1, ** p<0.05, *** p<0.01
Standard errors in parentheses (…)

Table 17: Robustness checks, Poisson and Negative Binomial regressions, part II
This table continues the robustness checks, using Poisson regressions and a Negative Binomial regression model. Dependent variable is always "Detected Offenses". Columns one, two and four present Poisson Regressions introducing additional covariates, while the third column shows the estimates using a Negative Binomial Regression Model.

	PR (E) β (SE)	PR (F) β (SE)	NBREG(G) β (SE)	PR (H) β (SE)
Number of Supervisors [#]	0.00117*** (0.0000368)	0.000996*** (0.0000381)	0.00109*** (0.000209)	0.00142*** (0.000134)
Formalized Cooperation (D)	-1.161*** (0.0784)	-0.890*** (0.0773)	-0.579** (0.274)	-1.532*** (0.252)
Publication of Decision (D)	-0.499*** (0.0601)	-0.387*** (0.0609)	-0.549** (0.240)	-1.699*** (0.192)
Minimum Imprisonment [months]	-0.0145*** (0.00306)	-0.0153*** (0.00322)	-0.0146 (0.0112)	-0.000595 (0.00370)
Shareholder Suits Index [#]		-0.256*** (0.0237)	-0.225** (0.101)	-0.0677 (0.124)
Coop. also in Later Stages (D)				-1.042*** (0.178)
Limit on Fines (D)				1.588*** (0.204)
Constant	2.568*** (0.0913)	4.214*** (0.171)	3.676*** (0.740)	3.710*** (0.969)
Controls:				
Market Capitalization/GDP	yes	yes	yes	no
Rule of Law Index	yes	yes	yes	no
Police Reported Crime/Population	yes	yes	yes	no
Year Fixed Effects	yes	yes	yes	no
N	84	84	84	27
Pseudo R^2 in %	52.19	56.56	7.714	68.54

* p<0.1, ** p<0.05, *** p<0.01
Standard errors in parentheses

Table 18: Robustness checks, winsorized variables and weighted regressions

This table presents a robustness check with respect to the joint distribution of "Detected Offenses" and the "Number of Supervisors" and two weighted regressions. In the first column, we repeat OLS (F) but smooth the skewed distribution of "Detected Offenses" and the "Number of Supervisors" by winsorizing at the 0.05 and 0.95 percentile. The second and third column present weighted least square regressions, weighted by the sample countries' population and their GDP.

	Winsorized β (SE)	Population Weighted Regression β (SE)	GDP Weighted Regression β (SE)
Number of Supervisors (Winsorized)	0.00112*** (0.00012)		
Number of Supervisors		0.00101*** (0.00000869)	0.000998*** (0.000000)
Formalized Cooperation (D)	-0.33275** (0.14138)	-0.777*** (0.0150)	-0.813*** (0.0000957)
Publication of Decision (D)	-0.36181*** (0.13593)	-0.876*** (0.0138)	-0.0119*** (0.00000317)
Minimum Imprisonment (months)	-0.01988*** (0.00664)	-0.00975*** (0.000509)	-0.826*** (0.0000842)
Shareholder Suits Index	-0.19196*** (0.04987)	-0.189*** (0.00428)	2.482*** (0.000239)
Constant	1.93624*** (0.39210)	2.124*** (0.0333)	-0.229*** (0.0000308)
Controls:			
Market Capitalization/GDP	yes	yes	yes
Rule of Law Index	yes	yes	yes
Police Reported Crime/Population	yes	yes	yes
Year Fixed Effects	yes	yes	yes
N	84	84	84
adj. R^2 in %	55.20	79.14	78.60

* p<0.1, ** p<0.05, *** p<0.01
Standard errors in parentheses

Table 18: Robustness checks, alternative dependent variable

This table presents robustness checks using "Transmitted Cases over Trading Activity" as dependent variable. Sweden has been dropped from the sample due to its outlying numbers of "Transmitted Cases".

	OLS (A) β [std.β] (SE)	OLS (B) β [std.β] (SE)	OLS (C) β [std.β] (SE)	OLS (D) β [std.β] (SE)
Number of Supervisors [#]	0.00240*** [0.447] (0.00054)	0.00260*** [0.485] (0.00056)	0.00287*** [0.533] (0.00065)	0.00312*** [0.580] (0.00056)
Formalized Cooperation (D)			-0.09024 [-0.088] (0.11412)	-0.00773 [-0.008] (0.09844)
Publication of Decision (D)				-0.46027*** [-0.448] (0.08612)
Constant	-0.00330 (0.07769)	-0.41310*** (0.14308)	-0.39709*** (0.14486)	-0.21564* (0.12801)
Controls:				
Market Capitalization/GDP	no	yes	yes	yes
Rule of Law Index	no	yes	yes	yes
Police Reported Crime/Population	no	yes	yes	yes
Year Fixed Effects	no	yes	yes	yes
N	81	81	81	81
adj. R^2 in %	18.93	29.21	28.84	48.35

* p<0.1, ** p<0.05, *** p<0.01
Standard errors in parentheses

Figure 1. Detected Market Abuse Cases and Capital Market Activity (Number of Listed Firms)

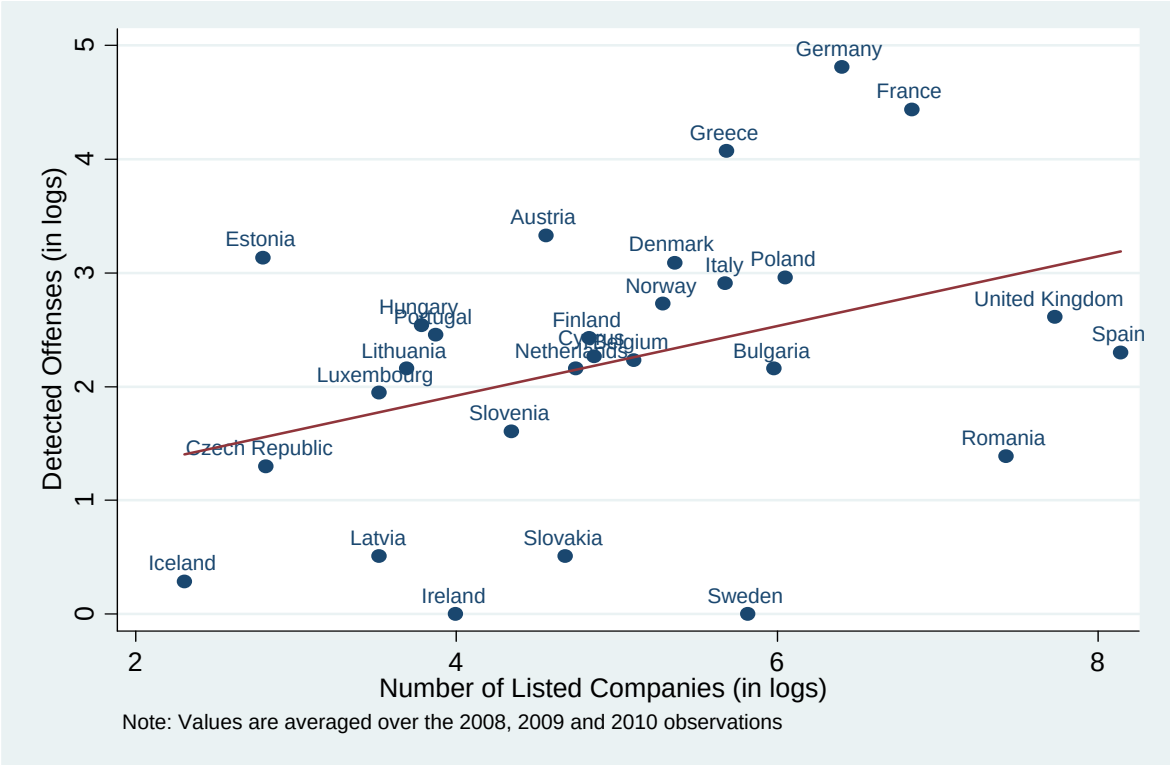


Figure 2. Detected Market Abuse Cases and Capital Market Activity (Billion Stocks Traded)

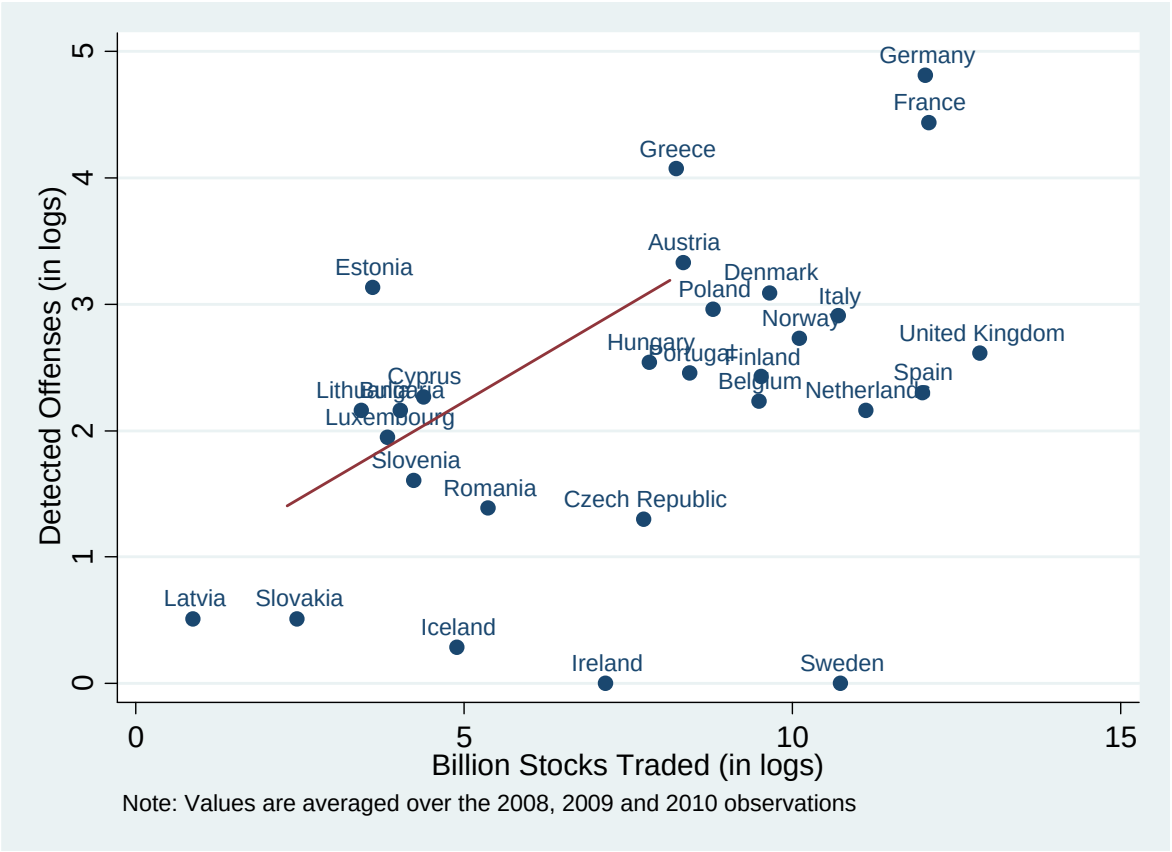
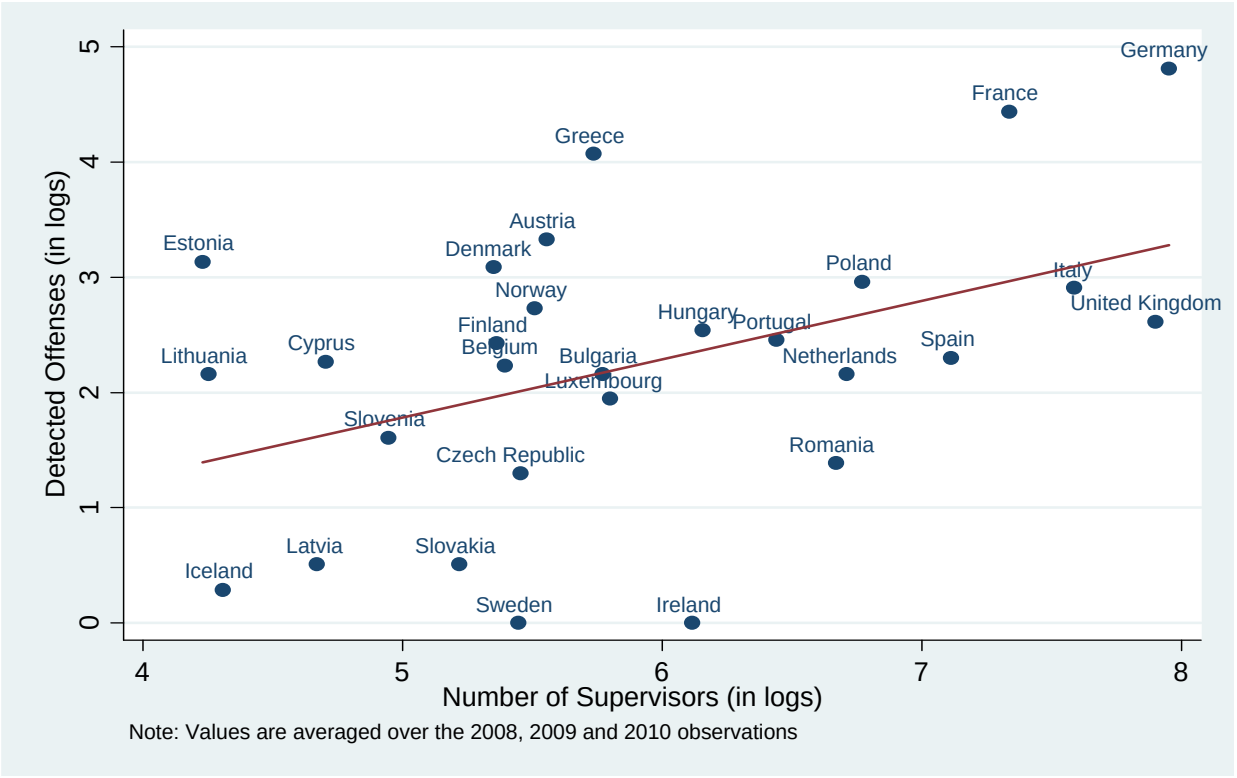
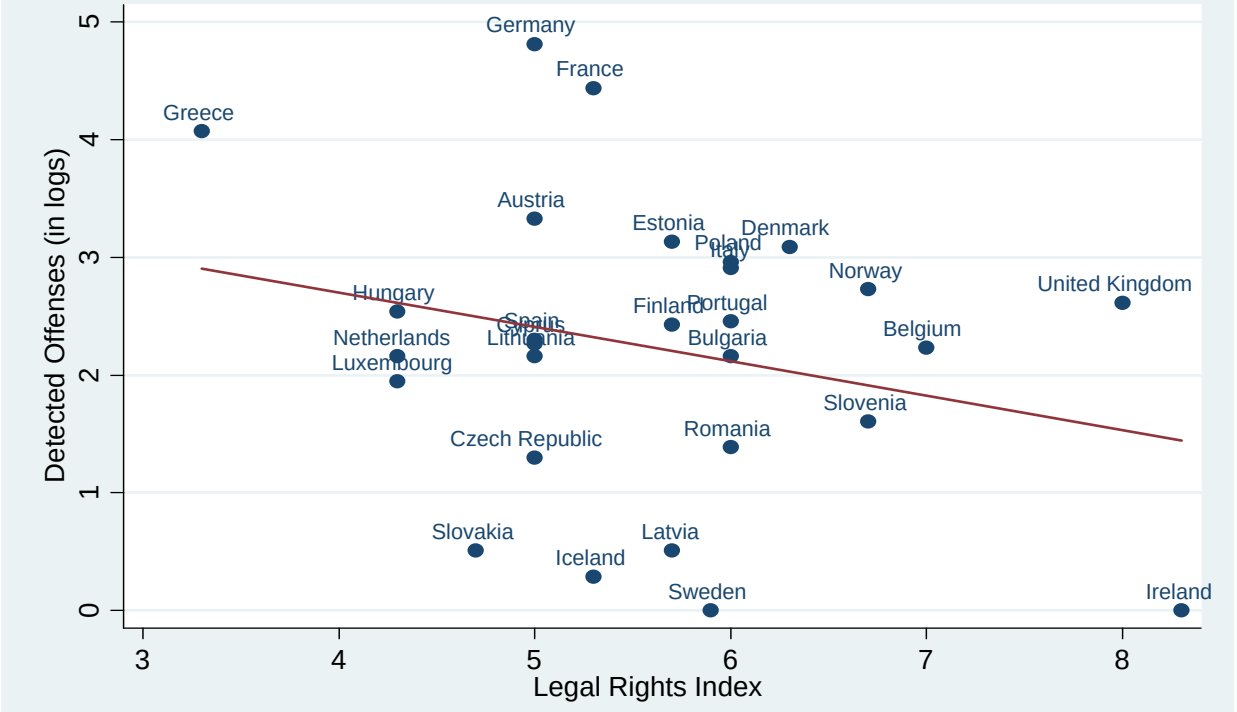


Figure 3. Detected Market Abuse Cases and Intensity of Enforcement



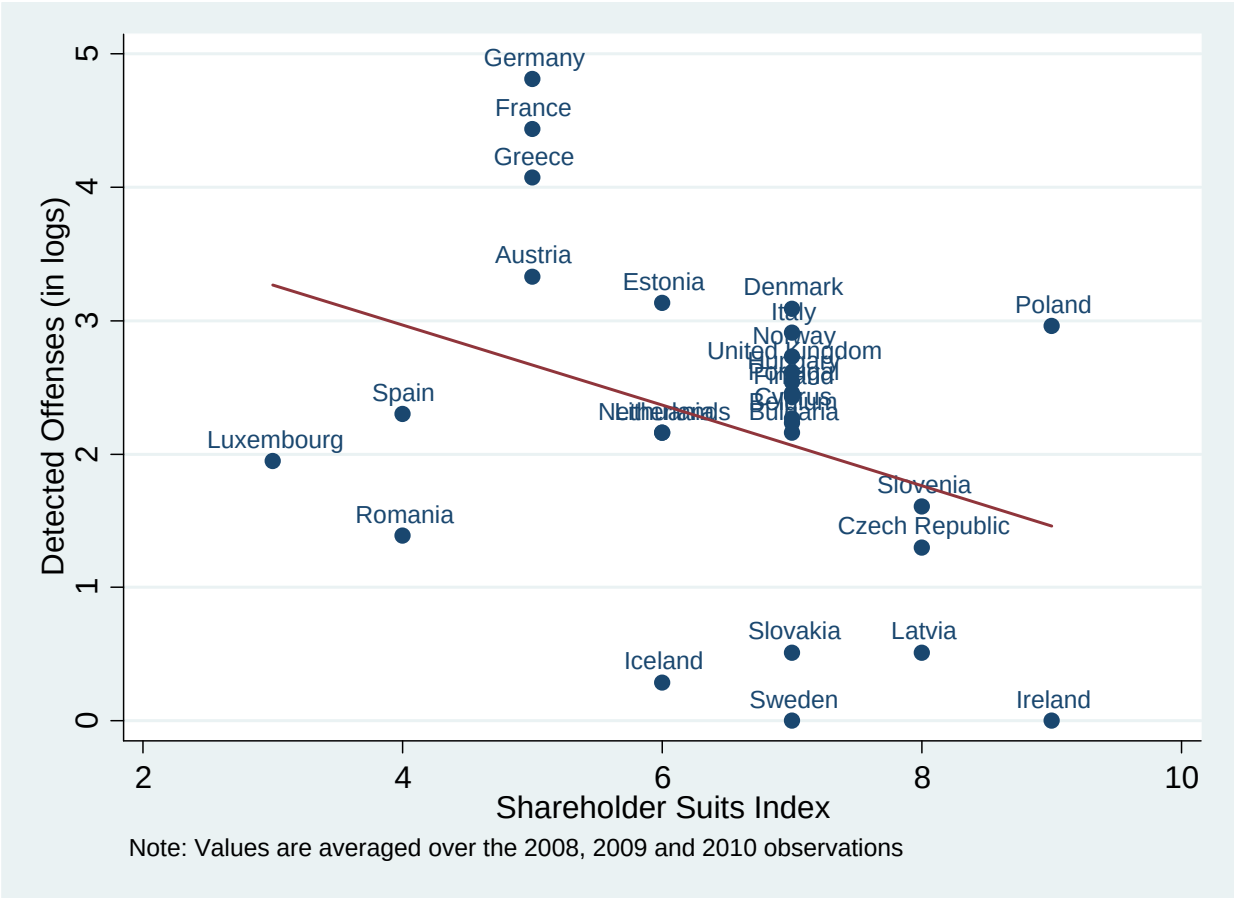
Note: Values are averaged over the 2008, 2009 and 2010 observations

Figure 4. Detected Market Abuse Cases and Legal Rights Index



Note: Values are averaged over the 2008, 2009 and 2010 observations

Figure 5. Detected Market Abuse Cases and Shareholder Suits Index



Note: Values are averaged over the 2008, 2009 and 2010 observations