Does the Ease of Starting a New Business Affect Country's Financial Vulnerability? Evidence from Eight European Economies

Anggita Leviastuti[1*]

Abstract: This paper investigates whether indicators on the ease of doing business explain the variation of financial system vulnerability amongst the eight biggest European economics between 1999 and 2014. Using a mixed-effects estimation method for sectoral observations nested within countries, the results suggest that easy access to get credit is associated with increased financial vulnerability, as measured by decreased excess return in the equity market. The significance of some governance perception variables also marks the role of institutional environment towards vulnerability by facilitating the openness towards new business. Finally, a high degree of openness is not always good, especially if they are combined with better institutional environment. This confirms the importance of the level of openness, as well as its channels, in determining the extent of vulnerability.

Keywords: Ease of doing business, liberalization, financial vulnerability, mixed-effects estimation method, econometrics, financial engineering.

Introduction

Often associated with larger economies, developed financial systems stimulate the creation of new business, thus accelerating economic growth [1], while each is enjoying the benefit from fewer restrictions towards international capital flows [2]. They typically have more investment projects, entrepreneurs, investors, and financial institutions serving the role of intermediaries. However, some oppose the idea of financial development as it can be among factors determining the extent of instability [3].

An economy exhibits vulnerability if it possesses a mechanism that allows small exogenous shocks to generate financial crises that have the disproportionally large-scale effect [4]. It also spread out to both the financial system and real activity [5,6]. In particular, debt financing of investment [7,8,9], as well as volatility in financial market proxies [10] is thought to entail destabilizing effect. The excess return was chosen as a proxy for vulnerability. This is motivated by Tsomocos [11], and Aspachs *et al.* [10] who argue that both increased default probability and reduction in aggregate profitability are the key concepts to characterize a vulnerable system and either, or both of them would have an impact upon economic welfare.

The main objective of this research is to reveal whether country-specific factors indicating liberalization provides information on the variance of

vulnerability between countries. Within the scope of this research paper, liberalization is described as the easiness on doing business, using *Distance to Frontier* (DF) score contained in the World Bank *Doing Business* database as proxies. The DF scores are selected to build variables categorized under the "ease of doing business" group. While previous studies use mainly banking exposure and macroeconomic indicators, the use of DF variables as a reflection of economic liberalization provides contributions to the literature of financial vulnerability measurement.

Illing [12] argue that for countries with the more financial wealth in the form of equity, the role of wealth effects of stock prices as propagation channel of crises should be significant. Therefore, by focusing on developed economies as samples, it is interesting to find out whether the stronger the linkage between the financial system and the aggregate economy, the more inevitable the spillover effect of crises to the economy [10]. Besides, having assessed several central, eastern, and south-eastern European countries, Gardo and Martin [13] found that countries with a higher degree of financial integration tended to be affected by crises more severely through several transmission channels including declining profitability. Finally, Aghion, *et al.* [14] argue that investment in countries with the highly developed financial system is not constrained by cash flow making shocks to cash flow are irrelevant in terms of explaining vulnerability.

The country-sector equity market excess return is selected as the dependent variable. This selection is based on 632 sectoral observations nested within countries. The model is specified in the multilevel form, with random intercept and random slopes, to

[1] Faculty of Industrial Technology, Industrial Management Research Group, Institut Teknologi Badung, Jl. Ganeca 10, Bandung 40132. Email: anggita@ti.itb.ac.id

* Corresponding author

enable to analyze the importance of the country-level characteristics towards the output. Having the dividend yield as sector-level characteristic, the random slopes is useful to explain that vulnerability builds up in the real sector before it spills over to the financial sector. Drawing this connection is essential, as the financial market, and the aggregate economy becomes more integrated [15]. This is the same argument in which Gardo and Martin [13] used to explain issues building up in the U.S housing market before it spilt over to the financial market and brought in the global financial crisis.

The mixed-effects model is used in this study. The results show statistical significance of "getting credit" among six DF variables, as well as its interaction with the dividend yield. This aligns with Minsky (cited in [5]), that financial system becomes more vulnerable as debt investment grows following easier access for entrepreneurs to apply for credit. This result follows the significance of the governance measures such as "regulatory quality"; as well as the interaction between dividend yield and both "political stability" and "rule of law" in affecting decreased profitability in the equity market. The use of governance variables, however, introduces policy endogeneity problem since authorities can influence the situation of a financial environment that is said to be vulnerable [10]. It is result also confirms the importance of the openness level, and the openness channels, in determining the extent of vulnerability.

Methods

Problem Definition

Several studies assessed how financial liberalization has a positive contribution on stimulating economic growth through reducing the cost of capital [16], as well as increasing aggregate domestic investment [6, 17], and promoting deeper financial markets and banking sectors [18]. Moreover, Bekaert *et al.* [6] quantified this positive effect as they found that equity-market-liberalizations, on average, lead to a one per cent increase in annual real economic growth over five years. However, these relationships should not be treated as causality.

On the other hand, liberalization creates specific channels that are responsible for increased vulnerability. Some examples are a massive expansion of credit [19] and excessive lending [20], mainly due to limited monitoring capacity of regulatory authorities, the inability of banks to discriminate suitable investments especially during booms, and the existence of insurance against banking failures [12, 14, 21, 22]. Arestis [23] discusses how liberalization can also induce speculative pressures, fueled by both over-expectation to speculative opportunities and pressures on competing in financial markets, mainly due to the speed and volume of information flow in recent years [21].

Furthermore, this research is motivated by the arguments that financial liberalization alone cannot function in the absence of a supportive institutional environment. Researchers have argued that also of pre-existing distortions, weak institutional settings could bring out the other side of international capital mobility; that is to increase the likelihood of financial crises. Several previous studies have shown the impact of control by certain political elites and regulatory barriers [24], as well as weak legal system [25], may prevent us from extracting the full benefits of liberalization optimally. Pre-existing distortions and fragile institutional settings may impair the benefit liberalization practices and can increase the probability of financial crises, resulting from high volatility and risks [2, 24].

Finally, the review of the existing body of literature shows that financial liberalization stimulates economic growth at the expense of growing financial vulnerability. At the same time, all aspects that characterized the developed financial system, i.e. free capital flows, increasing importance of intermediaries, can also be the channels that indicate vulnerability. Using data from eight European countries, the research seeks to how a country's vulnerability to the financial crisis be modelled; and whether "ease of doing business" indicators possess any explanatory power in why some countries are more fragile to financial crises compared to others.

Treating DF scores from World Bank *Doing Business* database as proxies for confidence is the key requirement for drawing a connection to excess return as a proxy for vulnerability. This is relevant to Crockett [26], who argued that confidence is the key requirement of a stable financial system. The argument motivates the use of perception index, as they reflect confidence, to see whether they have explanatory power towards the varying degree of financial vulnerability across European countries. This leads to the hypothesis that countries with a more supportive business environment are associated with more vulnerability to financial crises, affecting both the stock market and the economy of respective countries. Finally, although the hypothesis cannot be perceived as a relationship between liberalization and financial crisis, testing the hypothesis may explain whether the severity of crisis impact is likely to be intensified by the presence of vulnerability.

Data

The country selection satisfies the hypothesis testing on whether the variation of country effects on doing

Table 1. Description of country-effect variables

Variables	Units	Frequency	Definition	Source
Ease of doing business				
Starting a business	index from 0-100	Annual	The ease of starting a new business as indicated by number of procedures, days required, cost, and minimum capital	*Doing Business* database
Getting credit	index from 0-100	Annual	The ease of getting credit for financing business as indicated by strength of legal rights and depth of credit information	*Doing Business* database
Protecting minority investors	index from 0-100	Annual	The extent of minority investors' protection as indicated by the extent of conflict of interest regulation and the extent of shareholder governance	*Doing Business* database
Paying taxes	index from 0-100	Annual	Tax rules enforced by domestic authority as indicated by number of payments per year, time per year, and total tax rate	*Doing Business* database
Trading across borders	index from 0-100	Annual	The ease of performing cross-border trade as indicated by number of documents required, days required, and cost	*Doing Business* database
Enforcing contracts	index from 0-100	Annual	The ease of legalising commitments as indicated by number of procedures, days required, and cost	*Doing Business* database
Governance indicator				
Voice and accountability	index from 0-100	Annual	The extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media	The Worldwide Governance Indicators database
Political stability	index from 0-100	Annual	The likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism	The Worldwide Governance Indicators database
Regulatory quality	index from 0-100	Annual	The ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development	The Worldwide Governance Indicators database
Rule of law	index from 0-100	Annual	The extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence	The Worldwide Governance Indicators database
Control of corruption	index from 0-100	Annual	The extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests	The Worldwide Governance Indicators database
Banking exposure				
Banking foreign exposure	% of GDP	Annual	Foreign claims (include deposits, loans, debt securities) of domestic banks, scaled by GDP	BIS Consolidated statistics
Credit growth	% of GDP	Annual	Domestic credit to private sector by banks	World Bank WDI
Interest rate exposure	in %	Annual	Domestic short-term interest rate	IMF IFS
Domestic financial and economic fundamentals				
International investment position	% of GDP	Annual	Net value of foreign assets owned by domestic residents and of domestic assets owned by foreigners	IMF CPIS data
Trade	% of GDP	Annual	Sum of exports and imports, scaled by GDP	World Bank WDI
Financial depth	% of GDP	Annual	Equity market capitalization, scaled by GDP	World Bank WDI
Exchange rate exposure	in national currency/USD	Annual	Exchange rate, expressed in national currency rate per USD	IMF IFS
FX reserves	% of GDP	Annual	Foreign exchange reserves, scaled by GDP	IMF IRT
Current account	% of GDP	Annual	Current account balance, scaled by GDP	IMF WEO
Unemployment rate	in %	Annual	Unemployment rate	IMF WEO
Inflation rate	in %	Annual	End of period consumer prices expressed as year-on-year changes	IMF WEO
Government budget	% of GDP	Annual	Fiscal balance, scaled by GDP	IMF WEO

business environment determine the vulnerability of a country's financial system. Based on economic size ranking, according to The World Bank, eight European countries are included in the sample: France, Germany, Italy, Netherlands, Spain, United Kingdom, Sweden and Switzerland. The selection is not without reasons; as, despite their large economy, Italy and Spain were among the countries that were hit hard during the sovereign debt crisis. This raises a question about whether developed economies are associated with more vulnerability is somewhat true. Data were collected from 1999 to 2014. To match the frequency with most of the country-effect variables, the data is defined on an annual basis. The time-

period is divided into two categories to differentiate "crisis" (2007-2013) and "stable" (others except from 2007 to 2013) period.

Excess return is used as a dependent variable and is calculated as the value-weighted annual return minus the three-month U.S. T-bill rate in annual units. The value-weighted return is calculated as log return using the market price data from Datastream. The model specification includes dividend yield as control variable at sector-level characteristic to describe the linkage between real economic return and stock market return, while at the same time, enabling measurement of linear function between the lagged excess return and the dividend yield [27]. Dividend yield can also be seen as a response of economic condition since dividends tend to grow when the economy grows [28]. As the country's financial vulnerability can intensify the spillover of crisis impact on the real economy, the dividend yield can describe the linkage between real economic return and stock market return.

Other control variables are grouped into four categories, which are listed in Table 1, where Table 2 shows all control variables along with their descriptive statistics. The first category is the "ease of doing

business" indicator taken from *Distance to Frontier* (DF) score contained in the World Bank *Doing Business* database. The score is ranging from 0 to 100. It shows the distance of each economy to the "frontier", which represents the best performance observed on each indicator across all economies in the sample since 2005 [29]. However, since the focus is more to the measurement, which indicates the country's acceptance of new businesses and entrepreneurial activities, six variables are carefully selected to represent this group.

The second category of country effects includes governance perception variables which were taken from the Worldwide Governance Indicators (WGI) database. This group of variables marks the importance of the institutional environment as requirements to engage in liberalization. Out of the six WGI measures, this research only focuses on five variables which, by definitions, are complementary to countries' regulatory supports towards new businesses. In addition to the two categories of perception variables, some variables indicating banking exposure and macroeconomic fundamentals are considered as valuable inputs to the model. Variables such as foreign banking assets, trade flows, inflation, and stock market capitalization as a percentage of GDP

Table 2. Summary statistics of country-effect variables

Variables	mean	s.d.	p25	p50	p75	min.	max.
Business environment							
A. Ease of doing business							
Starting a business	84.937	7.652	81.647	86.860	90.358	58.545	94.603
Getting credit	70.578	15.293	56.250	68.750	81.250	43.750	100.000
Protecting minority investors	54.433	13.496	48.333	56.667	60.000	30.000	80.000
Paying taxes	77.710	10.740	71.851	79.964	87.552	51.329	90.557
Trading across borders	86.684	4.540	84.640	87.237	89.146	60.771	93.427
Enforcing contracts	67.596	11.792	64.908	72.203	75.796	34.660	77.803
B. Governance perception							
Voice and Accountability	91.644	6.685	87.590	92.840	97.390	74.410	100.000
Political stability	73.110	18.045	60.865	73.100	90.285	30.140	100.000
Regulatory quality	90.516	7.103	85.784	92.857	96.370	74.641	99.526
Rule of law	89.929	10.252	89.045	93.780	96.640	60.290	100.000
Control of corruption	89.834	10.292	88.915	93.235	96.600	57.420	99.050
Banking exposure							
Banking foreign exposure	0.616	0.281	0.394	0.548	0.802	0.265	1.478
Credit growth	119.934	47.420	95.794	116.275	154.939	0.000	207.619
Interest rate exposure	-0.046	0.219	-0.205	-0.065	0.090	-0.680	0.680
Variables	mean	s.d.	p25	p50	p75	min.	max.
Domestic financial and economic fundamentals							
International investment position	3.719	57.436	-19.663	-8.971	23.118	-97.383	148.602
Trade	115.591	78.850	51.806	86.191	195.551	0.000	259.471
Financial depth	85.783	63.037	42.901	76.925	117.235	0.000	291.658
Exchange rate exposure	1.704	2.299	0.734	0.811	1.115	0.494	10.551
FX reserves	0.050	0.105	0.012	0.017	0.049	0.007	0.713
Current account	2.326	5.302	-1.641	1.434	6.681	-9.648	14.537
Unemployment rate	7.781	4.218	5.150	7.634	8.900	1.703	26.100
Inflation rate	1.746	1.123	0.961	1.678	2.448	-1.042	5.135
Government budget	-2.154	2.953	-3.615	-1.678	0.100	-10.957	3.417

are frequently used within the broad literature of vulnerability measurement based on liberalization indicators, as these variables provide good proxies for financial development.

Model Specification

The model was constructed using a multilevel specification. In the multilevel model, individual observations are nested within the higher level, i.e. countries, which is useful to reveal the information about "country effects" as well as "individual effects", in addition to interactions between them, i.e. "cross-level effects" [30]. The use of country effects allows analyzing the differences in outcomes across countries, in which they reflect differences in country-specific variables, for example, how differences in policy and institutional environment affect economic performance.

Using multi-country data, Bryan and Jenkins [30] discuss the application multilevel approach to analyze country effects with respect to a linear model specification as follows.

$$y_{ic} = \propto + \beta X_{ic} + \gamma Z_c + u_c + \varepsilon_{ic}; i = 1, \dots Nc; c = 1, \dots, C \quad (1)$$

Where, $y_{i,c}$ is assumed to be a function of both observed and unobserved predictors, for each individual i in country c. $X_{i,c}$ are the variables included in the individual-level characteristics. Z_c are the variables summarizing the country-level features. There are also unobserved individual effects ($\varepsilon_{i,c}$) and country effects (u_c). Each of them is assumed to be normally distributed and uncorrelated with $X_{i,c}$ and Z_c. This is similar to the properties of Random Effect (RE) estimation. Finally, γ would be the parameter of interest, as this research aims to analyze how variations in country variables affect its financial vulnerability.

Modification of equation (1) is possible. Rather than specifying that both individual- and country-specific variables have explanatory power towards dependent variable at the same level, it is sometimes desirable to test whether the variations in the country-effects will influence the sensitivity of individual-level variables in predicting the output. This dependence is modelled in which coefficients of lower-level variables are expressed as functions of country-level variables [31]. In that case, equation (1) is restated in that the β now becomes β_c to model different impact of country-effect variables to $X_{i,c}$. The country-effect variables are moved into the second level equation.

$$y_{ic} = \propto + \beta_c X_{ic} + \varepsilon_{ic}, ; i = 1, \dots Nc; c = 1, \dots, C \quad (2)$$
$$\beta_c = \beta_{0c} + \beta_{1c} Z_c + u_c \quad (3)$$

From equation (3), β_{jc} is the jth element of β_{1c}. β_{j0} is a constant and u_c is the random component of the parameter. This formulation is a common in the multilevel literature [27,31] and is equivalent to adding interaction terms between $X_{i,c}$ and Z_c to the first level equation. Substituting equation (3) into (2). The new equation can be analyzed using the mixed-effects estimation approach.

$$y_{ic} = \propto + (\beta_{0c} + \beta_{1c} Z_c + u_c) X_{ic} + \varepsilon_{ic}$$
$$y_{ic} = \propto + \beta_{0c} X_{ic} + \beta_{1c} Z_c X_{ic} + u_c X_{ic} + \varepsilon_{ic} \quad (4)$$

The model specification in equation (4) will be best estimated using the "full random coefficients model", allowing analysis of both intercept and slopes in the first-level equation as containing random effects. The random factors result from not only from the effect of grouping in level two but also from Z_c. To model the random intercept, equation (4) needs to be rewritten as follows

$$y_{ic} = \beta_0 + \beta_1 X_{ic} + \varepsilon_{ic}; i = 1, \dots, Nc \ c = 1, \dots, C \quad (5)$$
$$\beta_0 = \beta_{00} + \beta_{01} Z_c + u_0 \quad (6)$$
$$\beta_1 = \beta_{10} + \beta_{11} Z_c + u_1 \quad (7)$$

Finally, a single equation is obtained by substituting equation (6) and (7) into equation (5).

$$y_{ic} = (\beta_{00} + \beta_{01} Z_c + u_0) + (\beta_{10} + \beta_{11} Z_c + u_1) X_{ic} + \varepsilon_{ic} \quad (8)$$
$$y_{ic} = \beta_{00} + \beta_{01} Z_c + \beta_{10} X_{ic} + \beta_{11} Z_c X_{ic} + u_0 + u_1 X_{ic} + \varepsilon_{ic} \quad (9)$$

In handling data with hierarchical structure, the mixed-effects model is superior to OLS regression for several reasons. According to Garson [32], the most important reason is because mixed-effects model handle random effects, a common property of data which are sampled within groups. While clustering observations in groups typically lead to correlated error terms; OLS depends on independency of observations, thus leading to possible misinterpretation with regards to the importance of one or another predictor. Mixed models also handle the risk of increased Type I error by treating beta coefficients as random effects drawn from a normal distribution of possible betas. This is different to OLS regression which treats beta parameters as they are fixed coefficients.

Results and Discussions

Mixed-effect Estimation

Parameter estimation based on equation (9) was performed using Stata. With lagged dividend yield represents $X_{i,c}$, crisis dummy, and all country-effect

variables are included in the Z_c, there are seven parameters to estimate. The compound intercept $(\beta_{00} + \beta_{01} Z_c)$, slope for dividend yield (β_{10}), slope for crisis dummy, and the beta coefficient for each interaction term between $X_{i,c}$ and Z_c (β_{11}) are estimated directly using the fixed effects, which are analogous to applying standard regression. Meanwhile, as both the intercept and the slopes are assumed to have random factors, standard deviation of parameter on both country-level $(u_0+u_1X_{i,c})$ and individual-level (ε_{ic}) are estimated using the random effects.

Table 3 reports the result of mixed-effect regression from 632 country-sector observations. The Table 3 reports the estimates of the following model:

$$R_{ic,t} = \beta_0 + \beta_1 dy_{ic,t-1} + \varepsilon_{ic}; \ i = 1, ..., Nc;$$
$$c = 1, ..., C$$
$$\beta_0 = \beta_{00} + \beta_{01} Z_{c,t-1} + u_0$$
$$\beta_1 = \beta_{10} + \beta_{11} Z_{c,t-1} + \gamma_1 Crisis_t + u_1$$

Variation on country effects are assumed to build up vulnerability within the real sector, before they spill over the impact of shock to equity market; resulting in decreased excess return. Interaction terms represent how variation in the country-effects affects variation in equity market return through expectation of the economic condition.

Some country-effect variables such as "protecting minority investors", "enforcing contracts", "political stability", "international investment position", "credit growth", "FX reserves", and "current account" are significant only when they are specified as interaction terms with the dividend yield. This confirms the existence of potential channels between the real and financial sector, with those variables possibly transmit their variations within a country into variations on the equity market return via dividend yield. Confirming the "expectation effect", it is what happened with those variables in the past year that will affect the equity market return via both investors' expectation on future cash flows.

For "doing business" variables, higher values with a positive coefficient for each indicator is associated with a desirable environment for entrepreneurs to start a new business. However, this is not the case with "starting a business", "paying taxes", "trading across borders" and "enforcing contract" as standalone variables. Interaction terms between dividend yield and "starting a new business", "getting credit", and "enforcing contract" also have negative coefficients. Looking at the significance of some "governance perception" variables such as "regulatory quality" and "rule of law", as well as interaction terms between "dividend yield-political stability" and "dividend yield-

rule of law" confirm the important role of institutional environment in supporting financial stability.

Table 3. Parameter estimation using mixed-effect regression model

Variables	Coefficient	Standard error
Panel A: Fixed parts		
Dividend yield	-58.320	48.630
Starting business	-0.092	1.032
Getting credit	2.437***	0.589
Protecting investors	0.071	0.699
Paying taxes	-1.222	0.931
Trading across borders	-1.432**	0.624
Enforcing contract	-0.327	0.786
Voice & accountability	-1.596	1.933
Political stability	0.380	0.538
Regulatory quality	-4.798**	1.865
Rule of law	5.207***	1.221
Control of corruption	-1.528	1.266
Banking exposure	-82.460***	26.700
Credit growth	-0.159	0.297
Interest rate	-65.440***	8.985
Intl. Investment Position	-0.370*	0.212
Export Import	0.344*	0.176
Financial depth	0.005	0.067
Exchange rate	-6.607	4.641
FX reserves	8.586	27.950
Current account	-0.104	0.981
Unemployment	-7.469***	1.375
Inflation	-5.659**	2.333
Government budget	-7.972***	1.382
Dividend yield * Starting business	-0.190	0.287
Dividend yield * Getting credit	-0.494***	0.174
Dividend yield * Protecting investors	0.606***	0.231
Dividend yield * Paying taxes	0.460*	0.264
Dividend yield * Trading across borders	0.240	0.192
Dividend yield * Enforcing contract	-0.329	0.270
Dividend yield * Voice & accountability	0.240	0.556
Dividend yield * Political stability	-0.444***	0.154
Dividend yield * Regulatory quality	0.914	0.556
Dividend yield * Rule of law	-0.825**	0.343
Dividend yield * Control of corruption	0.473	0.376
Dividend yield * Banking exposure	2.563	7.800
Dividend yield * Credit growth	-0.093	0.084
Dividend yield * Interest rate	6.543***	2.394
Dividend yield * Intl. Investment Position	0.209***	0.067
Dividend yield * Export import	0.028	0.053
Dividend yield * Financial depth	-0.038	0.023
Dividend yield * Exchange rate	-0.855	1.330
Dividend yield * FX reserves	10.430	8.842
Dividend yield * Current account	-0.472	0.318
Dividend yield * Unemployment	2.136***	0.466
Dividend yield * Inflation	-1.211	0.764
Dividend yield * Government budget	2.143***	0.394
Dividend yield * Crisis	6.864***	1.625
Constant	383.100**	163.000
Panel B: Random parts		
St. deviation (Dividend yield)	0.0000339	0
St. deviation (Constant)	0.0001284	0
Correlation (Dividend yield-Constant)	-0.862	0
St. deviation (Residual)	20.110	0

***, **, * significance at 1%, 5%, and 10% levels, respectively.

However, the negative coefficient on "the rule of law" as a standalone variable may lead to confusion. Nevertheless, the significance of "governance perception" variables might be interpreted that liberalization is not always a better way for profit, especially when there is a lack of support in terms of the institutional environment. Entrepreneurs operating in countries with a low barrier to entry, low tax rate, or adequate provision of credit may not benefit from those practices when, at the same time, they need to face ineffective bureaucracy, the weak rule of law, corruption, and political conflicts.

Among the "doing business" group, "getting credit" variable turns out to be the most statistically significant, with a 1% level in both standalone and interaction term. The negative coefficient signals the positive relationship between uneasy access to credit with a higher excess return. Looking the other way around, more credit opportunities motivates entrepreneurs to borrow more, creating more source of vulnerability as represented by decreased excess return. This confirms the idea of Fisher [7], Keynes [8], and Minsky (cited in [5]) about the destabilizing effect of debt investment to the financial system. Also looking at the negative coefficient on the interaction term between dividend yield and "getting credit", this result may indicate the negative effect of international capital flows as an additional source of credit to financial vulnerability.

"Crisis" dummy is placed in the level-two equation of the model. This allows treating the crisis as an exogenous shock which may amplify the crisis impact due to increased vulnerability given the variations of country effects. This specification also satisfies that real economy tends to experience the impact of crisis for some time prior to transmission into equity market; hence building up vulnerability and amplified the crisis impact when it is transmitted into the financial markets [13]. Looking at the results, the crisis coefficient is 6.864 and is significant at 1% level. During the crisis period, any symptom of increased vulnerability resulting from the variation of country-effect variables will result in more significant impact towards equity market return, since the beta coefficient for dividend yield (β_1) is now higher. However, this crisis coefficient should not be interpreted as it affects how vulnerability behaves as a result of variation country-effect variables. Testing this requires a similar approach to Bekaert *et al.* [27], in which they suggest the use of the three-level model.

Finally, the random parts section in panel B provides an estimation of the error term. The standard deviation of the constant and standard deviation of the dividend yield indicate u_0 and $u_1 X_{i,c}$, respectively. The sum of the two standard deviation components is the standard deviation at the country-level.

Table 4. Robustness check for dead sector treatment

Variables	Coefficient	Standard error
Dividend yield * Starting business	0.586***	0.220
Dividend yield * Getting credit	-0.189	0.157
Dividend yield * Protecting investors	0.156	0.200
Dividend yield * Paying taxes	0.204	0.208
Dividend yield * Trading across borders	0.221	0.192
Dividend yield * Enforcing contract	-0.317	0.271
Dividend yield * Voice & accountability	0.250	0.558
Dividend yield * Political stability	-0.511***	0.158
Dividend yield * Regulatory quality	1.037*	0.551
Dividend yield * Rule of law	-1.060***	0.329
Dividend yield * Control of corruption	0.535	0.376

The standard deviation of the residual, however, indicates the standard deviation at the observation-level (ε_{ic}). As the mixed models also need to adjust the covariance structure, this adjustment was done by Stata as the table shows the correlation coefficient between the constant term of the standard deviation and the standard deviation of the dividend yield.

Robustness Check

Two robustness checks were performed. The first one relates to the treatment of dead sectors since Datastream treats the dead sector using the last trading price resulting in repeated values in the price data and zero values in the return calculation. Ince and Porter (as cited in [33]), suggest to drop the observations with zero returns for capturing the zero returns due to dead sector treatment; even when it possibly eliminates important information contained in the zero returns which are caused by other than dead sector treatment by Datastream.

Table 4 shows that after eliminating ten observations due to treatment for dead sectors, the interaction term with political stability and the rule of law are robust given different treatment for the dead sector. However, interaction term with starting a business is significant at 1% level. This interaction may happen if the dead sector turns out to be the one with most restrictions in entry regulation, which may be due to strategic reason. The coefficient sign is positive, indicating that less barrier to entry contributes to less vulnerability as proxied by increased excess equity market return. As the dead sectors could also be the capital-intensive ones, this may explain why getting credit interaction becomes insignificant. Interpretation of these results, however, should be taken with cautions since there are risks that zero returns may come from active sectors that should be considered as regression input.

Table 5. Robustness check for different crisis period

Variables	Coefficient	Standard error
Dividend yield * Starting business	-0.0131	0.288
Dividend yield * Getting credit	-0.435**	0.176
Dividend yield * Protecting investors	0.336	0.229
Dividend yield * Paying taxes	0.402	0.267
Dividend yield * Trading across borders	0.245	0.195
Dividend yield * Enforcing contract	-0.434	0.273
Dividend yield * Voice & accountability	0.258	0.566
Dividend yield * Political stability	-0.440***	0.156
Dividend yield * Regulatory quality	1.212**	0.561
Dividend yield * Rule of law	-0.933***	0.346
Dividend yield * Control of corruption	0.332	0.387

***, **, * significance at 1%, 5%, and 10% levels, respectively.

Table 6. Estimating random effects

Country	u_0	u_1	Intercept	Slope
France	-1.39E-10	-3.17E-11	458.099	-98.28
Germany	1.31E-09	-2.15E-10	458.099	-98.28
Italy	4.94E-10	-5.47E-11	458.099	-98.28
Netherland	9.10E-10	-1.77E-10	458.099	-98.28
Spain	-2.05E-09	3.88E-10	458.099	-98.28
Sweden	1.98E-11	-4.56E-11	458.099	-98.28
Switzerland	-2.18E-10	2.90E-11	458.099	-98.28
United Kingdom	-6.00E-10	1.07E-10	458.099	-98.28

The second robustness check is related to the start of the crisis period. With the previous definition, the crisis period starts in July 2007 as the Fed announced the reduction in growth expectation due to the subprime crisis. However different opinion exists, such as Bekaert *et al.* [27], suggesting that the start of the crisis was marked by the collapse of Lehman Brother on 15 September 2008. As results are sensitive to data windows and choice of crisis date [34], it is best to check whether the mixed-effects results are robust to different specification of the crisis period.

Using different specification of crisis period, the standard errors do not differ by much as shown in Table 5. The interaction term with getting credit, political stability, and the rule of law also robust with different specification of the crisis period. However, the interaction between dividend yield and protecting investors becomes insignificant when the crisis started in 2008. Furthermore, regulatory quality becomes significant with the crisis is defined to begin in 2008. Given that the doing business variables tend to be stable over the year 2007-2008, the significant difference is found in return with all countries experience lower excess equity return market in 2008 compared to 2007. This could be explained as in 2007, the impact of the crisis was rather limited among the housing market, such as homeowners and real estate

funds. The positive coefficient marks the contribution of investor protection: When investors feel more protected, vulnerability is unlikely to increase. However, as the crisis grows into a systemic problem in 2008 with the fall of giant financial institutions, investor protection was no longer enough to resolve the trouble. Aiming to avoid further recession, regulatory actions such as bail-out announcement became indicators for solutions, thus creating positive sentiment in the market. Denote by its positive coefficient; effective regulatory actions were helpful to lessen the vulnerability of the financial system.

Estimation of the Random Effects

One way to confirm whether the random effects is the correct specification for the model is to estimate the variance during post estimation analysis. The analysis is useful to estimate the errors on country-level equation (u_0 and u_1) and whether these errors explain the randomness of intercept and slope level-one equation. To do this, it is necessary to estimate the Best Linear Unbiased Predictors (BLUP) of the random effects, representing the amount of variation for both the intercept and the estimated beta coefficients [35]. Plugging the values into u_0 and u_1 in equation (8), this allows testing whether grouping by countries impact the difference in vulnerability as proxied by the equity market return.

$$y_{ic} = (\beta_{00} + \beta_{01} Z_c + u_0) + (\beta_{10} + \beta_{11} Z_c + u_1) X_{ic} + \varepsilon_{ic}$$
$$Intercept = (\beta_{00} + \beta_{01} Z_c + u_0) \qquad (10)$$
$$Slope = (\beta_{10} + \beta_{11} Z_c + u_1) X_{ic} \qquad (11)$$

Table 6 summarizes the estimates of u_0 and u_1 from the original model specification as well as estimates of intercept and slope by countries. While u_0 and u_1 vary by countries, their values approach zero. This results in the intercept and slope to be similar across countries, given other components in equation (10) and (11) are determined by the fixed effects. Since the random effects do not explain variations in the intercept and slope as a result of grouping the data by countries, it confirms that random effect specification is not necessary. Similar results will be obtained by using simpler estimation method such as fixed-effects estimation method.

Limitations

This research defines vulnerability through the formulation of the multilevel model in that country effects influence vulnerability to build up within the real sector before it spills over to the financial sector. This relationship, however, introduces feedback between equity market-real economy relationships via dividend yield as well as via "governance perception" variables, as a decision from authorities can

influence the perception of a financial environment that is said to be vulnerable [10].

Another limitation of the model comes from its variable specification. As "decreased profitability" in the equity market is selected as a proxy for measuring vulnerability, the point of view now must be reversed: negative coefficients are expected to capture the signs of vulnerability. Having "dividend yield" as a shock propagation channel also raise further concerns due to the non-mandatory nature of dividend yield; especially when dealing with some growth prospects. Finally, the variability of country effects is also problematic as perception variables may not differ much across samples.

Finally, since the mixed-effects model assumes at least asymptotically normally distribution on the group-level error (u_c), this cannot be fulfilled by small group size. Failing to assume normality on u_c will result in statistical significance test not being accurate. Bryan and Jenkins [30] argue that having small group-size affects the reliability of parameter estimates modelled through the mixed-effects model, especially when researchers are interested in uncovering the importance of the country effects. Although there is no specific rule regarding the minimum acceptable group size, their Monte-Carlo simulation results suggest that researchers require at least 25 countries for linear models and 30 countries for logit models.

Conclusions

The research aims to assess whether liberalization in a country affects the vulnerability of the country's financial system. Liberalization is represented by the ease of starting a business in a country, while the vulnerability is measured by equity market excess return. It is expected that higher easiness is associated with higher vulnerability via decreased return in the equity market. Using mixed-effects estimation method to 632 sector-country observations from 1999 to 2014, the regression results yield negative coefficient for "getting credit" variable, in which a country is valued due to its easiness in providing borrowing opportunities to entrepreneurs. This result confirms the argument that vulnerability rises as agents within countries become more dependent on debt investment. Some governance perception variables, such as political stability and the rule of law, are also negatively significant when they are specified in terms of its interaction with the dividend yield. These findings confirm the role of the robust institutional environment as prerequisites to achieve the easiness on doing business. However, a better institutional environment may trigger

business environment for being too loose, thus increasing vulnerability.

Nevertheless, the use of mixed-effects estimation method fails to explain whether country's variability on doing-business variable has a predictive power to variability in decreased profitability. The negligible effect of random parts in the slope parameter estimates suggest that the impact of the variation in country-level variables cannot be distinguished across countries. This is most likely a result from sample selection problem, as well as lack of variation in the data for doing business variables, especially since big economies tend to be liberal in allowing new businesses to grow. The model specification also suffers from endogeneity problems from the selection of country-level characteristics, especially with variables measuring governance level. The problem, known as "policy endogeneity", is because policy changes mark the way authorities respond to financial market performance. Finally, due to the small number of countries included in the sample, it is difficult to ensure the reliability of the parameter estimates.

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