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Abstract: Prior studies show that equity value has convex relations with earnings and book value of equity, respectively, due to growth and adaptation options (Burgstahler and Dichev 1997a; Zhang 2000). These studies, however, do not consider the role of institutions in affecting firms' ability to exercise growth and adaptation options. In this study, we investigate whether these convex relations vary with the degree of a country's economic freedom, which may influence the frictions and costs of exercising these options. We develop four hypotheses: In countries with greater economic freedom, (1) a firm's capital investment in response to profitability is greater; (2) the relation between equity value and earnings, given equity book value, is more convex; (3) the relation between equity value and equity book value, given earnings, is more convex; and (4) the relation between stock return and profitability change is more convex. Using the index of economic freedom from the Fraser Institute, we test our hypotheses with data from 30 countries during the 2000–2010 period. The empirical results are consistent with these hypotheses. The effect of economic freedom that we document is distinct from the effects of GDP level and growth, legal origin, law enforcement, investor protection, and quality of accounting standards. Our results suggest that greater economic freedom enhances equity value through more efficient management of investment options.

Keywords: Economic freedom; Investment flexibility; Real options; Equity value.
Data Availability: Data used in this study are available from public sources.

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I. INTRODUCTION

Prior studies show that equity value has convex relations with earnings and book value of equity due to firms' growth and adaptation opportunities (Berger et al. 1996; Burgstahler and Dichev 1997a; Zhang 2000; Biddle et al. 2001; Hao et al. 2011). This real-options-based approach to valuation provides insights into the role of active management in value creation. Previous studies, however, take firms' ability to exercise such options for granted. More realistically, unlike financial options, the frictions and costs of exercising real options are non-trivial and therefore may limit firms' ability to respond to potential investment opportunities and negatively affect equity value. This suggests that economic environments that provide firms with greater freedom to make investment decisions enhance the firms' equity value attributable to real options. In this study, we investigate the effect of the extent of a country's economic freedom on firms' investment flexibility and equity value that are attributable to growth/adaptation options.

Economic freedom refers to the degree to which a jurisdiction's policies and institutions protect the rights of corporations and individuals to pursue their economic objectives without interference (Gwartney et al. 2011). We expect a greater variation in economic environments across countries than among regions within the same country, because (1) institutions that protect ownership and decision rights are established at the country level (La Porta et al. 1998), and (2) laws and regulations that limit the government's capacity to intervene in corporate and private decisions are also enacted at the country level (Gwartney and Lawson 2003; Kreft and Sobel 2005). Economists at the Fraser Institute constructed an index of economic freedom that measures the extent of countries' protection of property rights and ease of conducting business since the 1980s. Prior studies employing this index show that, across countries, greater economic freedom is associated with higher

investment growth and economic growth (Easton and Walker 1997; Dawson 1998; Gwartney et al. 2006).

We define investment flexibility as a firm's ability to adjust the amount of capital investment in response to its current or projected profitability. Managers' freedom to adjust existing operations enhances equity value, because when they have such freedom, they can capitalize on favorable investment opportunities and limit losses from adverse market conditions as new information arrives (Myers 1977). Because current profitability informs managers about the desirability of future investment options (expansion, adaptation, or maintaining current operations), the firm's future investment has a positive relation with current profitability (Biddle et al. 2001). Since a profitable firm's future investment creates value and an unprofitable firm's adaptation to alternative uses mitigates losses and thereby enhances value, equity value has a convex relation with profitability (Burgstahler and Dichev 1997a; Zhang 2000). As greater economic freedom reduces friction and allows a firm to exercise these investment options, such freedom can enhance the firm's future investment in response to current profitability (investment flexibility) and the degree of convexity of equity value with profitability.[1]

Based on the above reasoning, we develop the following four hypotheses with regard to the effect of economic freedom on investment flexibility and equity value. In countries with greater economic freedom, we expect that (1) a firm's capital investment in response to profitability is greater, (2) the relation between equity value and earnings (given equity book value) is more convex,[2] (3) the relation between equity value and equity book value (given

[1] Realized investment is affected by the firm's desire and ability to take advantage of investment opportunities. As further explained in the hypothesis development section below, we fix a firm's investment rule (based on profitability) and assume that the firm follows the investment rule. A firm operating in a country with higher frictions and costs, i.e., low economic freedom, undertakes less investment in response to current profitability than it would if it were operating in a country with lower frictions and costs. Thus the firm's realized investment manifests its ability to take advantage of investment opportunities.

[2] The extent of economic freedom in a country may impact the degree of convexity in the relation between equity value and earnings (both scaled by equity book value) in that country. Our primary question, however, is: For firms where the growth/adaptation options are likely to be valuable, is the equity value attributable to those

earnings) is more convex, and (4) the relation between stock return (equity value change) and profitability change is more convex. Our empirical results are consistent with these four hypotheses, and the effects of economic freedom that we document are distinct from those of the GDP level and growth, legal origin, law enforcement, investor protection, and quality of accounting standards. Our results suggest that greater economic freedom enhances equity value by enhancing managers' ability to exercise growth and adaptation options efficiently.

Our study makes the following contributions. First, we extend previous studies with real-options-based valuation by taking into consideration the cross-country differences in economic freedom that affect management's ability to make investment/divestment decisions in response to growth and adaptation opportunities. The empirical evidence also adds credibility to organizational design theory, which holds that organizational performance depends on the environment in which the firm operates (Roberts 2004).

Second, we provide empirical evidence that economic institutions that protect managers' decision rights enhance the value of active management. Our findings regarding the effect of economic freedom on value creation complement findings from prior studies on how institutions affect investment efficiency and equity value (e.g., Rajan and Zingales 1998b; La Porta et al. 2002). While prior studies emphasize the role of financial markets and take managerial decisions as given, our economic reasoning highlights the role of managerial decisions in creating value.

Finally, our empirical results on the effects of economic freedom have implications for policy makers, investors, and researchers. For policy makers, our results suggest that increasing a country's economic freedom can enhance corporate investment efficiency and equity value. For investors, valuation of equity using such accounting variables as earnings

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options higher in countries with greater economic freedom? Therefore, we make comparisons across countries and define a country as having a more convex relation if the equity value attributable to growth (adaptation) options is higher in that country than in another, for firms with high (low) profitability. We define convexity in a similar manner when formulating and testing our research hypotheses.

and equity book value must take into consideration the economic environment that protects managers' freedom to make investment decisions. This is particularly important when using multiples of earnings or equity book value to value the equity of firms across countries, given that our findings indicate that the multiples differ across countries. Researchers also need to be cautious when comparing the value relevance of accounting numbers across countries or financial-reporting regimes, because differences in the regression coefficients for earnings and book value of equity may be affected by economic factors, such as the extent of economic freedom, and accounting aspects, such as the quality of financial reporting standards.

Next, Section II discusses related literature and develops research hypotheses. Section III lays out the research design and describes the sample. Section IV presents the empirical results and robustness checks. Section V concludes the paper.

II. RELATED LITERATURE AND HYPOTHESIS DEVELOPMENT

Managerial decision rights and value creation

Although the role of firms as the ultimate creators of value has long been acknowledged, a formal theory that recognizes managers' role in allocating resources as the critical component of value creation has developed only over the past two decades. Important early contributions include those of Rajan and Zingales (1998a) and Holmström (1999), which highlight the importance of property rights and access to critical resources, such as human capital, in value creation. Roberts (2004, 104-105) explains the intuition:

> The firm's control over access to resources … gives the firm power … to specify "the rules of the game." … The point of doing so is to create value by making the firm an effective mechanism for coordination and motivation—a more effective mechanism than simple market relations. … [T]he central role for power harks back to the idea in the property rights literature that ownership is important because it conveys power.

Aghion and Tirole (1997) initiated a related stream of literature that emphasizes the incentive effect of delegation, demonstrating that granting managers what they term *real*

authority over business decisions creates value for two reasons. First, having such real authority enables them to better utilize local knowledge, and second, this authority provides additional incentives to search for and adopt better solutions. Baker et al. (1999) extend Aghion and Tirole's (1997) approach, and Newman and Novoselov (2009) apply it to accounting settings. The managerial economics literature demonstrates that giving managers power in the form of flexibility to make business decisions is the optimal way to maximize value, provided that appropriate safeguards against opportunism are in place. In summary, these studies imply that the value of management depends on whether and how management's decision rights are protected and delegated in a given country.

Researchers in accounting have developed real-options valuation models and provide important insights into the role of active management of investment options in value creation (Burgstahler and Dichev 1997a; Zhang 2000), but these valuation models do not consider frictions affecting firms' ability to exercise growth/adaptation options. In practice, unlike financial options, the frictions and costs of exercising real options are non-trivial and may have considerable impacts on equity value (Zingales 2000). Some of these frictions and costs depend on the institutional environment of the country in which a firm operates.[3] Management's decision rights over future investments, for example, could be hindered to varying degrees by legal restrictions, regulatory burdens, and government directives. In particular, some countries impose restrictions on capital flows and trade and regulate takeover activities, whereas other countries make it difficult for state-owned enterprises to lay off employees, sell assets, or declare bankruptcy. Furthermore, through corporate taxes, governments expropriate firms' resources that could be deployed to finance investment and entrepreneurship activities (Djankov et al. 2010). The above-mentioned constraints on firms'

[3] We focus on frictions and costs that are external to the firm and not under the firm's control. In contrast, Berger et al. (1996) examine the (negative) impact of agency conflicts between management and shareholders on the value of adaptation options, and Jensen (1993) examines how agency conflicts delay the exercise of the exit option.

freedom to optimally adjust investments cause differences in equity value for the same earnings and equity book value across countries, holding everything else constant. In what follows, we employ a real-options-based valuation approach to analyze the effects of economic freedom on investment flexibility and equity value and develop testable hypotheses.

Effect of economic freedom on the relation between capital investment and profitability

Real-options-based valuation models view equity value as a function of future cash flows from existing assets in place and investment opportunities, which are represented by a set of real options (Burgstahler and Dichev 1997a, Zhang 2000). The underlying investment policy of the real-options-based valuation is that the firm will expand (growth option) or contract (adaptation option) its operations depending on future profitability. To the extent that current profitability is informative about future profitability, it affects the likelihood that those options will be exercised. As a result, equity value is a convex function of current profitability. While previous studies tend to presume that firms may freely exercise real options, in reality, many firms lack the freedom to exercise all available investment options. In this section, we illustrate how economic freedom affects investment flexibility.

We follow Zhang's (2000) framework, in which managers should allocate capital to investment opportunities to enhance value and current profitability guides managers' investment decisions in the next period. Specifically, the firm anticipates the following investment options: (1) maintain the same scale of operations as those in the current period, (2) expand its operations by investing additional capital, and (3) discontinue or divest existing operations. To express the manager's decision, the firm's current-period profitability is defined as $q = X/B$, where X is current-period earnings and B is the corresponding equity book value ($B > 0$). Let q_g* be the level of profitability above which the firm finds it optimal to exercise the growth option by adding capital, and let q_a* be the level of profitability below which the firm finds it optimal to discontinue or divest existing operations by withdrawing

capital. If the firm's profitability q is between q_g* and q_a*, the firm finds it optimal to maintain its existing operations. The firm's decision rule on capital investment, *I(q),* in the above three scenarios can be expressed as: $I(q) > 0$, if $q > q_g$*; $I(q) < 0$, if $q < q_a$*; and $I(q) = 0$, if $q_a^* \leq q \leq q_g^*$.

Since Zhang (2000) assumes no friction in exercising the growth and adaptation options, the firm in this model optimally exercises all investment options under the investment rule. More realistically, various government policies and institutions may interfere in the firm's exercise of investment options. To illustrate the effect of economic freedom on the firm's investment response to profitability, we express the amount of capital investment in the following equation:

$$CI = f * B * I(q), \quad (1)$$

where *CI* is the anticipated amount of capital investment/divestment, and *f* is the degree of economic freedom, ranging between zero and one, with higher *f* indicating greater freedom to adjust investments. *B* is the scale of existing operations, and we assume that investment/divestment increases with *B*. *I(q)* is capital investment normalized by existing book value of equity, following the previously defined decision rule.

In Equation (1), given the investment rule based on current profitability *q*, a firm will want to optimally take all investment opportunities that satisfy the rule. The firm's ability to take investment opportunities, and thus the realized investment, however, is affected by economic freedom. The lower the frictions and costs impeding the firm's ability to undertake the desired investment (higher *f*), the greater is the firm's investment in response to profitability (investment flexibility). This leads to our first hypothesis:

H1: The relation of a firm's capital investment to profitability is stronger in countries with greater economic freedom.

Economic freedom and equity value attributable to the growth option

We now develop empirical predictions regarding the effect of economic freedom on the convex relations of equity value with profitability. Let V be the value of an equity-financed firm and k be the earnings capitalization factor. In the absence of economic frictions and costs of investment such that all investment options are fully exercised, and assuming unbiased accounting for depreciation, Zhang (2000, 2014) shows that equity value can be expressed as:

$$V = B[P(q) + kq + C(q)] = BP(q) + kX + BC(q), \quad (2)$$

where $P(q)$ is the value of the (put) option to adapt/divest operations, and $C(q)$ is the value of the (call) option to grow, both normalized by the scale measure, B. If the amount of capital investment is positively related to economic freedom, the corresponding equity value equation that incorporates economic freedom into the capital investment decision in (1) can be written as follows:

$$V = B[fP(q) + kq + fC(q)] = fBP(q) + kX + fBC(q), \quad (3)$$

where f is a parameter that measures the degree of economic freedom, as in (1).

As in Zhang (2000), we explore the effects of economic freedom on equity value attributable to growth options and adaptation options separately. We first focus on the effect of economic freedom on equity value attributable to growth options. By taking partial derivative of V with respect to X given B in Equation (3), we obtain:

$$\left.\frac{dV}{dX}\right|_B = fP'(q) + k + fC'(q). \quad (4)$$

Equation (4) shows that equity value is an increasing and convex function of profitability q or equivalently, earnings X given B. When profitability is too low or negative, operations are likely to be discontinued. It then follows that equity value (V) is determined by book value, and thus the relation between equity value and earnings is close to zero. As earnings (profitability) increase to a sufficiently high level, equity value increases, because the firm becomes more likely to expand its operations. As a result, given book value, equity value is determined mostly by whether and how growth options are exercised, and the value

of the adaptation option is irrelevant. In particular, equation (4) shows that parameter *f* (economic freedom) acts as an adjustment factor on the slope of equity value with respect to earnings, given equity book value.

By taking a second derivative of Equation (4) with respect to *X*, we obtain:

$$d\left(\left.\frac{dV}{dX}\right|_B\right)\Big/dX = \frac{1}{B}\left[fP''(q) + fC''(q)\right] > 0. \quad (5)$$

Equation (5) shows that the slope change of equity value (*V*) with respect to earnings (given equity book value) increases with the firm's freedom to exercise the growth option (*f*). Figure 1 shows the effect of economic freedom on the convexity of the equity value as a function of profitability *q*. The dotted linear line represents the value of a firm operating in a country without economic freedom ($f = 0$) and maintaining its current operations forever. Growth options are relevant for equity value for $q > q_g^*$, where q_g^* is the threshold of exercising the growth option, as defined above. If the firm operates in a country with economic freedom $f > 0$, equity value is an increasing and convex function of earnings, given equity book value. In contrast, if the firm operates in a country with economic freedom f_0, where $0 < f_0 < f$, the firm's equity value has a less convex relation with earnings, given equity book value, because the firm cannot undertake as much capital investment as it would in a country with more economic freedom, *f*. In the region where $q < q_g^*$, the value of growth options becomes irrelevant, and economic freedom has little effect on equity value attributable to growth. Furthermore, equity value is a linear function of earnings, given equity book value, if the firm maintains its current operations ($q_a^* \le q \le q_g^*$). The above analysis leads to our second hypothesis:[4]

H2: The relation of a firm's equity value to earnings, given equity book value, is more

[4] Our valuation model and research hypothesis do not take competition into consideration. Higher levels of profitability are likely to attract competition and subsequently become less sustainable, thereby weakening the convex relation between equity value and earnings, given book value of equity. If economic freedom has a strong positive correlation with competition, we are less likely to find results supporting the hypothesis that economic freedom enhances the convex relation between equity value and earnings, given book value of equity.

convex in countries with greater economic freedom.

Economic freedom and equity value attributable to the adaptation option

We explore the effect of economic freedom on equity value attributable to the adaptation option using a similar approach. To examine the relation between equity value (*V*) and equity book value (*B*), given earnings (*X*), we first take a partial derivative of *V* with respect to *B* in Equation (3):

$$\left.\frac{dV}{dB}\right|_X = -fqP'(q) + fP(q) - fqC'(q) + fC(q) \tag{6}$$

Equation (6) shows that the impact of equity book value on equity value is also dependent on *q*, but the behavior is non-monotonic. When *q* is sufficiently low (either negative or small positive) and the put option is in the money while the call option is out of the money, the first two terms in Equation (6) dominate the last two, so that *dV/dB* is positive. When *q* is sufficiently high, the outcomes are the opposite, and *dV/dB* is negative.[5] When the put option and the call option are both out of the money, *dV/dB* equals zero and equity value is a linear function of current earnings.

Taking a second derivative of Equation (6) with respect to *B* yields:

$$d\left(\left.\frac{dV}{dB}\right|_X\right)\Big/ dB = \frac{1}{B}q^2\left[fP''(q) + fC''(q)\right] > 0. \tag{7}$$

Equation (7) shows that the slope of equity value with respect to book value, given earnings, increases with economic freedom (*f*). This result is illustrated in Figure 1. Given earnings (*X*), as *q* moves from q_a* to its left, book value (*B*) increases, and equity value increases with a convex relation with book value. Furthermore, equity value has a more convex relation with book value (given earning) with greater economic freedom *f* than with f_0.

[5] See Hao, Jin, and Zhang (2011) for a geometric view of the non-monotonic relation of equity value with book value, given earnings, in valuation model (2).

This is because the firm undertakes less than the desired amount of divestments in a country with less economic freedom. The above analysis leads to our third hypothesis:

H3: The relation of a firm's equity value to equity book value, given earnings, is more convex in countries with greater economic freedom.

Economic freedom and stock return attributable to profitability change

We develop two hypotheses on how economic freedom influences the convex relations of equity value with earnings and book value of equity based on analyses of Equation (3) and Figure 1. The analyses of Equations (4) and (5) also reveal that, given economic freedom $f > 0$, equity value change is an increasing and convex function of profitability change. This increasing and convex function is documented in Chen and Zhang (2007), and we further consider the effect of economic freedom on this function. As Figure 1 reveals, for a given profitability change, an increase in economic freedom (from f_0 to f) enhances the slope of equity value change, or stock return, so long as profitability change is within the region where growth options are most relevant. This is because when profitability is too low or negative, the firm will limit operating losses by adapting existing resources to alternative uses, and economic freedom facilitates the firm's adaptation and leads to a greater value change for a given change of profitability. In contrast, when profitability is high, economic freedom facilitates the firm's expansion, and similarly causes greater value change for a given change of profitability.[6] The above analysis leads to our fourth hypothesis:

H4: The relation of stock return with change of profitability is more convex in countries with greater economic freedom.

III. RESEARCH DESIGN AND SAMPLE

[6] Similar to the reasoning in footnote no. 4, a large profitability change at an already high level of profitability may become unsustainable due to competition from within and outside of the country (Miller 1994; Burgstahler and Dichev 1997a; Fama and French 2000). We explore this potential effect of large profitability change in the empirical analysis.

Economic freedom and investment flexibility

We perform the empirical analysis in two stages to test the first hypothesis on the positive relation between economic freedom and investment flexibility. In the first stage, we estimate the sensitivity of investment/divestment to profitability and use it as our measure of investment flexibility. For each country-year, we estimate the following regression of capital investment (CI_t) on lagged profitability (PR_{t-1}):

$$CI_t = \gamma_0 + \gamma_1 PR_{t-1} + \gamma_2 D\_NPR_{t-1} + \gamma_3 D\_NPR_{t-1} * PR_{t-1} + \phi \cdot IND_t + \varepsilon_t, \quad (8)$$

where capital investment equals the change in common equity, divided by the beginning common equity;[7] profitability equals earnings before extraordinary items available for common shareholders, divided by average common equity; *D_NPR* is an indicator variable coded as one if *PR* is negative, and zero otherwise; *IND* is a set of indicator variables representing industry, based on classifications in Fama and French (1997); and ε is a random disturbance term with zero mean. The subscripts denote time periods. Industry indicator variables are included to control for variation in capital investments across industries. Equation (8) includes *D_NPR* and *D_NPR*PR* to allow for potentially different responses of investments to profitability between profit firms and loss firms. We focus on the coefficient γ_1, which we expect to be positive because it captures profit firms' investment flexibility.

In the second stage, we regress the estimate of γ_1 in Equation (8) on the economic freedom index (*EFI*) of the corresponding country-year. The index, constructed by the Fraser Institute, is a comprehensive measure of the extent to which a given country's institutions and policies are dedicated to personal choice, voluntary exchange, open markets, and clearly defined and enforced property rights. Specifically, the index incorporates 42 variables covering five areas: (1) size of government in terms of expenditures, taxes, and enterprises; (2)

[7] We measure capital investment by change in common equity when testing H1 because this is more in line with the subsequent tests on the relation between equity value (return) and profitability (change of profitability). If firms increase investment in response to profitability but finance the investment by debt, then share capital does not increase and we are less likely to find evidence supporting H1. The empirical results are similar when capital investment is measured by change in net operating assets and profitability is measured by return on assets.

legal structure and security of property rights; (3) access to sound money; (4) freedom to trade internationally; and (5) regulation of credit, labor, and business. Each variable is scored on a scale from 0 to 10 based on the distribution of the underlying data. The component ratings in each area are averaged to derive a rating for each of the five areas. In turn, the five area ratings are averaged to derive the summary rating for each country. Data used to construct each variable come from the International Monetary Fund, the World Bank, the World Economic Forum, and other independent sources. A higher score on the index indicates greater economic freedom.

We hypothesize that investment flexibility increases with economic freedom, thus a positive coefficient on *EFI* in the regression of γ_1. In the regression, we control for a set of potential confounding factors that could be associated with investment flexibility, including level and growth of GDP. To the extent that these two factors capture growth/adaptation opportunities in the economy, we expect investment flexibility to be higher in countries with higher GDP growth (*GDPTH*) and per capita GDP (*LNGDP*). The other potential confounding factors include legal origin, law and order, shareholders' and creditors' rights, level of ownership concentration in private firms, and quality of accounting standards, denoted by the six variables described below. *COMMON* is an indicator variable coded as one if the country has a common-law legal origin, and zero otherwise. *LAW* is the law-and-order tradition in the country, based on an index constructed by International Country Risk, a country risk-rating agency. *SHRI* is an index for the shareholders' anti-director rights in the country (Spamann 2010). *DEBTRI* is an index for creditors' rights in the country (La Porta et al. 2008). *OWNCON* indicates ownership concentration, which equals the average percentage of common shares owned by the three largest shareholders in the country's 10 largest nonfinancial, privately owned domestic firms (La Porta et al. 1998). *ACC* is an index that indicates the quality of a country's accounting standards, as measured by inclusion or

omission of various items in annual reports (La Porta et al. 1998). See the Appendix for detailed variable definitions.

We control for the above potential confounding variables in the regression, because a stream of finance research demonstrates that investment efficiency and firm value are positively associated with deepening financial markets, which in turn rely on strong investor protection through enforcement of securities laws and disclosures (Rajan and Zingales 1998b; Wurgler 2000; La Porta et al. 2002, 2006). In addition, because law, enforcement, and investor protection influence the extent of a country's economic freedom, it is important to control for them to ensure that the effect of economic freedom is over and above the effects of these confounding factors. We have no predictions for the results of these control variables, however, because they are identified primarily based on prior research that examines investment efficiency and firm value and the focus of our study is investment flexibility and the value of growth/adaptation options. For completeness, we also run the regression of $\gamma_1 + \gamma_3$ (for loss firms), even though we have no prediction for the sign of the coefficient on *EFI*.

Economic freedom and the convex relation between equity value and earnings, given book value of equity

To test H2, we also use a two-stage approach. First, following Burgstahler and Dichev (1997a), and consistent with Equation (2), we use earnings scaled by book value of equity as a proxy for the potential value of growth options and estimate the following regression by country-year:

$$\frac{MV_t}{BV_{t-1}} = \alpha_0 + \alpha_1 G_{Nt} + \alpha_2 G_{Ht} + \alpha_3 \frac{E_t}{BV_{t-1}} + \alpha_4 G_{Nt} \frac{E_t}{BV_{t-1}} + \alpha_5 G_{Ht} \frac{E_t}{BV_{t-1}} + \phi \cdot IND_t + \varepsilon_t, \qquad (9)$$

where *MV* equals market value of equity, *BV* equals book value of equity, *E* equals earnings before extraordinary items available for common shareholders, and *IND* is a set of indicator variables representing industry, as defined in Equation (8). The subscripts denote time

periods, and thus E_t/BV_{t-1} indicates profitability.[8] For each country-year, we divide firms into three groups based on the sign and ranking of E_t/BV_{t-1}: negative, positive-high, and positive-low, where the latter two groups are separated by the median of positive E_t/BV_{t-1} in the country-year.[9] G_N is an indicator variable coded as one if the firm's E_t/BV_{t-1} is negative (i.e., a loss firm, since our sample excludes firms with negative lagged or current *BV*), and zero otherwise. G_H is an indicator variable coded as one if the firm's E_t/BV_{t-1} is positive-high, and zero otherwise. We use this grouping because the value of the growth option is a convex function of earnings, given book value of equity (Burgstahler and Dichev 1997a; Biddle et al. 2001; Hao et al. 2011), and the valuation of loss firms is distinct from that of profit firms.[10] We predict the coefficient on E_t/BV_{t-1} to increase with the level of profitability (i.e., $\alpha_3 < \alpha_3 + \alpha_5$). For loss firms, the growth option is irrelevant, but the adaptation option becomes relevant. If firms with more negative profitability have a higher probability of adaptation and turnaround (Collins et al. 1997), the coefficient $\alpha_3 + \alpha_4$ could be negative.

In the second stage, we regress the coefficients for E_t/BV_{t-1} in Equation (9), including α_3, $\alpha_3 + \alpha_4$, and $\alpha_3 + \alpha_5$, on *EFI* of the corresponding country-year. To ensure that the result captures the effect of economic freedom rather than other institutional factors, we control for several confounding factors that could be associated with the value of growth options obtained in the first stage. First, we control for the mean profitability of the respective group (negative, positive-low, or positive-high) in the country-year. This is to ensure that the variation of the coefficient on *EFI* across the three regressions is not due to differences among α_3, $\alpha_3 + \alpha_4$, and $\alpha_3 + \alpha_5$ that are driven by different average profitability across

[8] Burgstahler and Dichev (1997a) use a similar model without a distinction between profit and loss firms, but they do not interpret earnings divided by book value of equity as profitability. Zhang (2000) uses a similar valuation model and provides a theoretical basis for incorporating profitability into the model.

[9] The regression results are similar when the high- and low-groups in Equations (9) to (12) are separated by the median of positive values of firms in all countries and years.

[10] The level of profitability to trigger a firm's adaptation is likely to depend on firm characteristics. Loss appears to signal a significantly "worse" managerial performance than small profit, which prompts managers to avoid it by managing earnings. Collins et al. (1999) find that for negative earnings, book value explains equity value due to its proxy for future normal earnings and for the adaptation option.

countries and years. Second, we control for GDP growth (*GDPTH*), per-capita GDP (*LNGDP*), and institutional factors (*COMMON*, *LAW*, *SHRI*, *DEBTRI*, *OWNCON*, and *ACC*), as previously defined, for reasons similar to those when we test the hypothesized relation between economic freedom and investment flexibility in H1. We have no predictions for the results of these control variables, however, because prior research studies the relationships of these institutional factors with firm value or equity value, but not with the convex relation between equity value and earnings, given book value of equity.

In the test of H2, we focus on firms with high E_t/BV_{t-1}, because the convex relation between equity value and earnings, given equity book value, is driven mainly by this group. If the relation for the high-E_t/BV_{t-1} group is more convex in countries with greater economic freedom, the coefficient on E_t/BV_{t-1} in Equation (9) for the group would increase with economic freedom, thus yielding a positive coefficient on *EFI* in the regression of $\alpha_3 + \alpha_5$. We do not have a prediction for the result from the regression of α_3, because the value of growth option is less important for low-E_t/BV_{t-1} firms. For loss firms, as the adaptation option becomes more relevant, the coefficient on *EFI* in the regression of $\alpha_3 + \alpha_4$ could be negative (i.e., economic freedom enhances loss firms' ability to exercise the adaptation option and turnaround).

Economic freedom and the convex relation between equity value and book value of equity, given earnings

To test H3, we use an approach similar to that for testing H2. In the first stage, we estimate the following equation by country-year to examine the relation between equity market value and book value:

$$\frac{MV_t}{E_t} = \beta_0 + \beta_1 D_{Nt} + \beta_2 D_{Ht} + \beta_3 \frac{BV_t}{E_t} + \beta_4 D_{Nt} \frac{BV_t}{E_t} + \beta_5 D_{Ht} \frac{BV_t}{E_t} + \phi \cdot IND_t + \varphi_t \qquad (10)$$

where *MV*, *BV*, and *E* are defined as in the previous analyses. Both *MV* and *BV* are scaled by earnings, *E*, to control for the value of the growth option. For each country-year, we divide

firms into three groups based on the sign and ranking of BV_t/E_t: negative, positive-high, and positive-low, where the latter two groups are separated by the median of positive BV_t/E_t in the country-year. D_N is an indicator variable coded as one if the firm's BV_t/E_t is negative, due to negative earnings, and zero otherwise. D_H is an indicator variable coded as one if the firm's BV_t/E_t is positive-high, and zero otherwise.

We do the partition in Equation (10) because the value of the adaptation option is more relevant to equity valuation when earnings are lower (i.e., higher BV_t/E_t, given positive earnings) and the value of the adaptation option is an increasing and convex function of BV_t/E_t (Burgstahler and Dichev 1997a; Biddle et al. 2001; Hao et al. 2011). We separate loss firms from low-BV_t/E_t firms, because there is a discontinuity in the distribution of BV_t/E_t around zero. BV_t/E_t increases as earnings decrease toward zero, but it drops to a large negative value when earnings fall just below zero. We expect the coefficient on BV_t/E_t to increase with BV_t/E_t for profit firms (i.e., $\beta_3 < \beta_3 + \beta_5$). For loss firms, where the adaptation option becomes relevant, we expect a positive relation between equity value and book value of equity, given earnings, and thus positive $\beta_3 + \beta_4$.

In the second stage, we regress the coefficients for BV_t/E_t obtained in the first stage, including β_3, $\beta_3 + \beta_4$, and $\beta_3 + \beta_5$, on *EFI* of the corresponding country-year. In the regression, we control for the mean BV_t/E_t of each respective group (positive-low, negative, or positive-high) in the country-year, for a reason similar to that for controlling for the group's mean profitability when testing H2. We also control for the effects of GDP level and growth and other institutional factors, which are the same as those in the second stage of the analysis when testing H2.

In testing H3, we focus on the group with high BV_t/E_t, because the convex relation between market value and book value of equity, given earnings, is driven mainly by this group of firms. If the relation for the high-BV_t/E_t group is more convex in countries with

greater economic freedom, the coefficient on BV_t/E_t in Equation (10) for the group would increase with economic freedom, thus yielding a positive coefficient on *EFI* in the regression of $\beta_3 + \beta_5$. We do not have a prediction for the coefficient on *EFI* in the regression of β_3, because the adaptation option is less relevant when BV_t/E_t is low, i.e., earnings are high, given book value of equity. For loss firms, if the adaptation option is more relevant to equity value when losses are greater ($\beta_3 + \beta_4 > 0$), the coefficient on *EFI* in the regression of $\beta_3 + \beta_4$ would be positive, to the extent that economic freedom enhances the relationship between equity value and the value of the adaptation option.

Economic freedom and the convex relation between stock return and profitability change

To test H4, we use a two-stage approach similar to that for testing H2. In the first stage, we estimate a model based on Chen and Zhang (2007) to examine the convex relation between stock return (equity value change) and profitability change by country-year. Chen and Zhang (2007) document the convex relation for a sample of U.S. firms, and we expect a similar result for our cross-country sample. The model is as follows:

$$R_t = \delta_0 + \delta_1 G_{Nt} + \delta_2 G_{Ht} + \delta_3 \Delta q_t + \delta_4 G_{Nt} * \Delta q_t + \delta_5 G_{Ht} * \Delta q_t + \delta_6 x_t + \delta_7 \Delta b_t + \phi IND_t + \varepsilon_t, \quad (11)$$

where R_t equals annual stock return; Δq_t equals change in profitability ($E_t/BV_{t-1} - E_{t-1}/BV_{t-2}$), multiplied by beginning book value of equity over beginning equity value (BV_{t-1}/MV_{t-1}); x_t equals earnings divided by beginning equity value (E_t/MV_{t-1}); and Δb_t equals change in book value of equity divided by beginning equity (($BV_t - BV_{t-1})/BV_{t-1}$), multiplied by ($1 - BV_{t-1}/MV_{t-1}$). The above three variables are as defined in Chen and Zhang (2007). G_N, G_H, and *IND* are defined previously. To the extent that all profitability changes are sustainable, we expect the coefficient on Δq_t to increase with profitability for profit firms (i.e., $\delta_3 < \delta_3 + \delta_5$). For loss

firms, the growth option is less relevant, but if those with a greater decline in profitability have a higher probability of adaptation and turnaround, $\delta_3 + \delta_4$ could be negative.

In the second stage, we regress the coefficients for Δq_t obtained in the first stage, including δ_3, $\delta_3 + \delta_4$, and $\delta_3 + \delta_5$, on *EFI* of the corresponding country-year and the same control variables as in the second-stage analysis when testing H2, except that the mean of the group's E_t/BV_{t-1} is replaced by the mean of Δq_t.

In the test of H4, we focus on firms with high profitability, because the convex relation between stock return and change of profitability is driven mainly by this group of firms. If the relation for the high-profitability group is more convex in countries with greater economic freedom, the coefficient on Δq_t in Equation (11) for the group would increase with economic freedom, thus yielding a positive coefficient on *EFI* in the regression of $\delta_3 + \delta_5$. We do not have a prediction for the result from the regression of δ_3, because the value of the growth option is less important for low-profitability firms. For loss firms, the growth option is less relevant, and we do not have a prediction for the coefficient on *EFI*. If $\delta_3 + \delta_4$ is negative, however, the coefficient on *EFI* could be negative, based on a reasoning similar to the one we use in the regression of $\alpha_3 + \alpha_4$.

Data Sources and Sample

We collect an economic freedom index for each country and year from the Fraser Institute.[11] For U.S. firms, stock-return data are from CRSP and the remaining financial data are from Compustat. For non-U.S. firms, stock-return data are from Datastream, and other financial data are from Worldscope. GDP growth and per-capita GDP data are from the International Macroeconomic Data Set, available from the Economic Research Service of the U.S. Department of Agriculture. Data on institutional factors (legal origin, law and order,

[11] The Heritage Foundation in the United States also publishes an index of economic freedom since 1994. Hanke and Walters (1997) show that the correlation coefficient between the index from the Fraser Institute and the index from the Heritage Foundation equals 0.85. We follow most prior studies published in academic journals and use the Fraser Institute's index.

shareholders' and creditors' rights, ownership concentration, and quality of accounting standards) are from La Porta et al. (1998, 2008), Spamann (2010), and International Country Risk, a country risk-rating agency. We exclude firms with negative book value of equity, so that the sign of profitability, q, is determined by the sign of earnings. We also exclude small firms, defined as either the book value or the market value of equity being less than five million U.S. dollars equivalent at year-end, and country-years that have less than 100 firms. The final sample includes 194,996 firm-year observations from 30 countries for the 2000–2010 period.[12]

Table 1 presents the summary of descriptive statistics of variables by country. Panel A shows the country-level variables, including legal origin, law and order, shareholders' rights, creditors' rights, ownership concentration, and quality of accounting standards. Forty percent of the countries in the sample have a common-law legal origin, and Brazil and Philippines have the lowest law-and-order index. Panel A also shows the mean of the country-year-level variables, including the economic freedom index, GDP growth, and per-capita GDP, over the sample years by country. Turkey and Brazil have the lowest means of the economic freedom index (6.03 and 6.14, respectively), while Hong Kong and Singapore have the highest means (8.89 and 8.64, respectively). There is a large variation in the mean GDP growth rate over the sample period, ranging from 0.04 percent for Italy to 5.79 percent for India.

Panel B of Table 1 shows the mean of each firm-year-level variable over the sample period by country.[13] The mean of capital investment growth (CI_t) is positive for all countries, ranging from 8.1 percent (Japan) to 28.7 percent (Australia). The mean of profitability (PR_{t-1})

[12] This is the sample size in the test of H2. The sample sizes in other tests differ slightly due to missing data on certain financial variables. The sample period starts from 2000, because the Fraser Institute's index was updated only once every five years between 1980 and 2000.

[13] The continuous firm-year-level variables are winsorized at the 5th and 95th percentiles to reduce the influence of extreme values on the regression coefficients. We require a country-year to have at least 100 firms at the beginning of the sample-selection process. Five country-years that satisfy this requirement have less than 100 firms remaining (ranging from 90 to 99) after imposing the data requirements, but we retain them in the sample. The regression results are similar and the conclusions are unaffected when these five country-years are dropped.

ranges from 2.2 percent (Canada) to 22.4 percent (South Africa). The mean of market-to-book value of equity (MV_t/BV_t) ranges from 1.56 (South Korea) to 3.21 (Sweden). The mean of current profitability (E_t/BV_{t-1}) ranges from 1 percent (Canada) to 20 percent (South Africa). The mean of MV_t/E_t ranges from 5.46 (Australia) to 19.87 (Greece). The mean of BV_t/E_t ranges from 3.48 (Australia) to 16.30 (Japan). The mean of annual stock return has a wide distribution, ranging from 2.3 percent for Greece to 50.1 percent for Brazil. Most countries experience a decline in mean profitability over the prior year (Δq_t), but the range is relative small, from -1.9 percent for Italy to 0.4 percent for Chile.

IV. EMPIRICAL RESULTS

Economic freedom and investment flexibility

Table 2 presents the results for testing H1, the hypothesized relation between economic freedom and investment flexibility. Panel A presents the summary result for Equation (8), first stage of the analysis, where capital investment (*CI*) is regressed on profitability (*PR*) by country-year. The mean of γ_1, our measure of managerial investment flexibility for profit firms, equals 0.845 (t = 26.46). The mean of $\gamma_1 + \gamma_3$ equals -0.772 (t = -6.94), which indicates that for loss firms, a greater loss is associated with greater subsequent capital investment.[14] Panel A also shows that the results are similar when capital investment is measured by change in net operating assets and profitability is measured by return on assets.

Panel B of Table 2 presents the results from the regression of γ_1 on economic freedom, *EFI*.[15] The regression also controls for differences in the level and growth of GDP and

[14] One possible explanation for this result is that a loss may signal worse-than-expected performance to the firm's stakeholders, thereby acting as a catalyst for the manager to increase investments to turn around the firm (Burgstahler and Dichev 1997b). Similarly, managers may be reluctant to exit or divest until firm performance deteriorates significantly (Jensen 1993). Another possible explanation is that loss firms overstate expenses deliberately, a big bath approach, and then subsequently reverse them, causing an increase in equity.

[15] We compute *t*-statistics of all regression coefficients based on standard errors adjusted for heteroskedasticity and with two-way clustering on country and year, and *p*-values based on two-tailed tests. The regression results are similar when we run a weighted-least-squares regression, where the weights are inversely proportional to the standard errors on the coefficients estimated in the first stage.

institutional factors (legal origin, law and order, shareholders' rights, creditors' rights, ownership concentration, and quality of accounting standards) across countries. Column (1) shows that the coefficient on *EFI* equals 0.249 (t = 2.30). Multiplying this coefficient by the inter-quartile range of *EFI* (= 1.026) gives 0.255, which suggests that moving *EFI* from the first quartile to the third quartile increases the mean γ_1 by about 30 percent (= 0.255/0.845). This result shows evidence of a positive association between economic freedom and investment flexibility, which is consistent with H1. Column (1) also shows that investment flexibility is positively associated with GDP growth and negatively associated with a law-and-order tradition. Column (3) shows that when capital investment is measured by change in net operating assets and profitability is measured by return on assets, the coefficient on *EFI* equals 0.266 (t = 2.57), consistent with the result in Column (1).

Although not a focus of our study, we also run a regression of $\gamma_1 + \gamma_3$ on *EFI* and present the coefficients in Column (2) in Panel B of Table 2. The coefficient on *EFI* is not significantly different from zero. The coefficients on *GDPTH*, *LNGDP*, and *SHRI* are significantly negative, and the coefficients on *COMMON* and *LAW* are significantly positive. Although the sign of each of these five coefficients on control variables is opposite to that of the corresponding coefficient in Column (1), the results are not inconsistent, because a more negative dependent variable in Column (2) implies larger investment growth in response to greater loss. Column (4) shows that the coefficient on *EFI* is not significantly different from zero when capital investment is measured by change in net operating assets and profitability is measured by return on assets.

Economic freedom and the convex relation between equity value and earnings, given equity book value

Table 3 presents the results for testing H2, the hypothesized relation between economic freedom and the convex relation between equity value and earnings given book value of

equity. Panel A presents the summary result for Equation (9), first stage of the analysis, where equity value is regressed on earnings by country-year and both variables are scaled by book value of equity. The mean estimate of α_3 and $\alpha_3 + \alpha_5$ equals 4.808 (t = 18.16) and 13.643 (t = 45.04), respectively, and $\alpha_3 + \alpha_5$ is significantly greater than α_3 ($p < 0.001$, F-value not tabulated), consistent with a convex relation between equity value and the value of growth options. The result is similar when the comparison is based on medians. These results are consistent with previous findings in Burgstahler and Dichev (1997a) based on U.S. data.

The mean estimate of $\alpha_3 + \alpha_4$ equals -4.002 (t = -14.01), suggesting that for loss firms, more negative profitability is associated with higher equity value. One interpretation for this result is that the greater the loss, the more managers are pressured to find better ways of utilizing assets, which can include redesigning or repositioning the product, streamlining the product line, or finding a new market.

Panel B of Table 3 presents the results from the regression of α_3, $\alpha_3 + \alpha_4$, and $\alpha_3 + \alpha_5$, obtained in the first-stage regression for firms with positive-low, negative, and positive-high profitability, respectively. Column (1) shows that when the dependent variable is α_3, where the value of growth options is relatively small, the coefficient on *EFI* equals 1.315 (t = 1.41). The result indicates a positive but statistically insignificant association between economic freedom and equity value attributable to growth options for firms with small profitability. Among the control variables, only *DEBTRI* (creditors' rights) is associated with α_3 (coefficient = -0.959 and t = -3.70). Column (2) shows that when the dependent variable is $\alpha_3 + \alpha_4$, the coefficient on *EFI* equals -1.521 (t = -1.65). The result suggests that for loss firms, economic freedom is not statistically significantly associated with equity value that is attributable to the value of growth options. The coefficient on the mean E_t/BV_{t-1} of this group is significantly positive, which indicates that it is important to control for the extent of profitability across groups when comparing results among different regressions. Similar to

the result in Column (2) of Table 2, Panel B, for loss firms, the coefficients on *GDPTH* and *LNGDP* are significantly negative and the coefficient on *LAW* is significantly positive.

Column (3) in Panel B of Table 3 shows that when the dependent variable is $\alpha_3 + \alpha_5$, where the value of growth options is greater, the coefficient on *EFI* equals 1.239 (t = 1.73, *p* = 0.085). The result indicates a positive association between economic freedom and equity value attributable to growth options for firms with high profitability, which is consistent with H2.[16] Multiplying the coefficient for *EFI* in Column (3) by the inter-quartile range of 1.026 for *EFI* gives 1.271, which suggests that moving *EFI* from the first quartile to the third quartile would increase the mean $\alpha_3 + \alpha_5$ by 9.3 percent (= 1.271/13.643). The coefficient on the mean E_t/BV_{t-1} of this high-profitability group is significantly positive.

Economic freedom and the convex relation between equity value and book value of equity, given earnings

Table 4 presents the results for testing H3, the hypothesized relation between economic freedom and equity value attributable to the adaptation option. Panel A presents the summary results for Equation (10), the first stage of the analysis, where equity market value is regressed on equity book value by country-year to estimate the value of the adaptation option. The mean of β_3 equals 0.425 (t = 7.12), and the mean of $\beta_3 + \beta_5$ equals 1.076 (t = 69.54). The mean of $\beta_3 + \beta_5$ is significantly greater than the mean of β_3 ($p < 0.001$, *F*-value not tabulated). Similarly, the median of $\beta_3 + \beta_5$ is significantly greater than the median of β_3. These results are consistent with our expectations, as well as previous findings in Burgstahler and Dichev (1997a) based on U.S. data. The mean estimate of $\beta_3 + \beta_4$ equals 1.032 (*t* = 54.02), which suggests that a loss firm's equity value is greater if its book value of equity is greater, given negative earnings.

[16] As discussed in footnote no. 2, we interpret a significantly positive coefficient on *EFI* in the regression of $\alpha_3 + \alpha_5$ as evidence supporting H2. It is not necessary for the coefficient on *EFI* to be greater in the regression of $\alpha_3 + \alpha_5$ than in the regression of α_3 to support H2.

Panel B of Table 4 presents the results from the regression of β_3, $\beta_3 + \beta_4$, and $\beta_3 + \beta_5$, obtained in the first stage, when BV_t/E_t is positive-low, negative, and positive-high, respectively. Column (1) shows that when the dependent variable is β_3, where the value of the adaptation option is relatively small, the coefficient on *EFI* is not significantly different from zero. The coefficients on *LAW*, *DEBTRI*, *OWNCON*, and *ACC* are significantly positive, and the coefficients on *LNGDP* and *SHRI* are significantly negative. Column (2) shows that when the dependent variable is $\beta_3 + \beta_4$ (loss firms), the coefficient on *EFI* is not significantly different from zero. The coefficients on *Mean*(BV_t/E_t) and *GDPTH* are significantly positive, and the coefficient on *SHRI* is significantly negative.

Column (3) in Panel B of Table 4 shows that when the dependent variable is $\beta_3 + \beta_5$, where the value of the adaptation option is relatively large, the coefficient on *EFI* equals 0.062 (t = 2.30). Multiplying this coefficient by the inter-quartile range of *EFI* (= 1.026) gives 0.064, which suggests that moving *EFI* from the first to the third quartile would increase the mean $\beta_3 + \beta_5$ by about 6 percent (= 0.064/1.076). The result provides evidence supporting H3.[17]

Economic freedom and the convex relation between stock return and profitability change

Table 5 presents the results for testing H4, the hypothesized impact of economic freedom on the relation between stock return and profitability change. Panel A presents the summary result for Equation (11), the first stage of the analysis, where annual stock return is regressed on profitability change, earnings scaled by equity value, and change in equity book value, by country-year. The mean (median) of δ_3 for the group with positive-low profitability equals 0.510 (0.485), and the mean (median) of $\delta_3 + \delta_5$ for the group with positive-high

[17] The coefficient for *Mean*(*BV/E*) in Column (3) is significantly negative, which suggests that given high *BV/E* (based on the rankings within a country-year), the relation between market value and book value of equity is less convex if the overall *BV/E* is higher. One explanation for this result is that when a country-year has higher average *BV/E* (i.e., lower profitability), its general economic environment is unfavorable, making it more difficult for high-*BV/E* firms to exercise the adaptation option.

profitability equals 0.525 (0.542). On average, $\delta_3 + \delta_5$ is greater than δ_3, but the difference is not statistically significant at conventional levels. The mean of $\delta_3 + \delta_4$ equals -0.257 (t = -3.93), suggesting that for loss firms, a greater decline in profitability over the prior year is associated with a higher stock return. The negative mean of $\delta_3 + \delta_4$ is consistent with the result for the negative mean of $\alpha_3 + \alpha_4$ in Panel A of Table 3.

Panel B of Table 5 presents the results from the regression of δ_3, $\delta_3 + \delta_4$, and $\delta_3 + \delta_5$, obtained in the first stage when profitability is positive-low, negative, and positive-high, respectively. Column (1) shows that in the regressions of δ_3, the coefficient on *EFI* equals 0.236 (t = 3.28). Column (3) shows that in the regressions of $\delta_3 + \delta_5$, the coefficient on *EFI* equals 0.308 (t = 4.62). These results indicate that economic freedom enhances profit firms' stock-price movements that are attributable to changes in profitability, regardless whether the profitability is high or low. Column (2) shows that in the regression of $\delta_3 + \delta_4$ (loss firms), the coefficient on *EFI* equals -0.320 (t = -2.72). Since $\delta_3 + \delta_4$ is negative, on average, a negative coefficient on *EFI* indicates that economic freedom strengthens the association between greater profitability declines and higher stock returns, as documented in Panel A of Table 5.

Collectively, the results in Table 5 show that the relation between stock return and profitability change varies with economic freedom. But the relation is not convex when a firm's profitability moves from positive-low to positive-high. We conjecture that this result may be influenced by firms with an increase in profitability so large that it brings profitability to an unsustainable level, which attenuates the otherwise would-be convex relation (among profit firms). To investigate this explanation, we separate firms in the high-profitability group in Equation (11) into two categories: those with a very large increase in profitability (top-ten percent) and the rest. We first estimate the following equation:

$$R_t = \delta_0 + \delta_1 G_{Nt} + \delta_2 G_{Ht} + \delta_3 \Delta q_t + \delta_4 G_{Nt} * \Delta q_t + \delta_5 G_{Ht} * \Delta q_t + \delta_{5a} G_{Ht} * \Delta q_t * D10 + \delta_{5b} D10 + \delta_6 x_t + \delta_7 \Delta b_t + \phi\, IND_t + \varepsilon_t, \quad (12)$$

where *D10* is an indicator variable coded as one if the firm's Δq_t is at the top-ten percent of the high-profitability group in the country-year, and zero otherwise. All other variables are defined the same as in previous sections. Then, we run regressions of δ_3, $\delta_3 + \delta_4$, $\delta_3 + \delta_5$, and $\delta_3 + \delta_5 + \delta_{5a}$, obtained from the regression of Equation (12), on *EFI* and control variables.

Panel A of Table 6 shows the regression result of Equation (12). The mean (median) of δ_3 equals 0.511 (0.489), and the mean (median) of $\delta_3 + \delta_5$ equals 0.620 (0.618). The mean and median of $\delta_3 + \delta_5$ are both significantly greater than the mean and median of δ_3 ($p = 0.086$ and 0.067, respectively, based on two-tailed tests). The mean of $\delta_3 + \delta_5 + \delta_{5a}$ is not significantly different from zero. These results reveal a convex relation between stock return and change in profitability, except when the latter is extremely large.

Panel B of Table 6 presents the results from the regressions of δ_3, $\delta_3 + \delta_4$, $\delta_3 + \delta_5$, and $\delta_3 + \delta_5 + \delta_{5a}$ on *EFI* and the control variables. The results in Columns (1) and (2) for the regressions of δ_3 and $\delta_3 + \delta_4$ are similar to those in the corresponding columns in Table 5, Panel B, which is expected. Column (3) shows that in the regression of $\delta_3 + \delta_5$, for firms in the high-profitability group but not among the top-ten percent of profitability increase, the coefficient on *EFI* equals 0.535 ($t = 3.23$). This coefficient is much greater than the coefficient on *EFI* for the entire high-profitability group (= 0.308, in Column (3) of Table 5, Panel B). Column (4) shows that in the regression of $\delta_3 + \delta_5 + \delta_{5a}$, the coefficient for *EFI* is not significantly different from zero. Taken together, the results in Table 6 show a convex relation between stock return and change in profitability, except when the profitability change is very large, and the relation is more convex in countries with greater economic freedom.

Robustness checks

In the primary analyses, we do not run a regression for the pooled sample that includes all countries and years. This is because the independent variables would include one E_t/BV_{t-1} (or BV_t/E_t) for each of the negative, positive-low, and positive-high group and their

interaction effects with the economic freedom index, as well as eight control variables and their interaction effects with E_t/BV_{t-1} (or BV_t/E_t) for each of the three groups, which would make the analysis very complicated. Nevertheless, as robustness checks, we perform the following two sets of pooled regression analyses, which drop the interaction effects between the eight control variables and the three groups of E_t/BV_{t-1} (or BV_t/E_t):

$$MV_t/BV_{t-1} = \alpha_0 + G_{Lt}*[\alpha_1(E_t/BV_{t-1}) + \alpha_2 EFI_t*(E_t/BV_{t-1})] + G_{Nt}*[\beta_0 + \beta_1(E_t/BV_{t-1}) + \beta_2 EFI_t*(E_t/BV_{t-1})] + G_{Ht}*[\gamma_0 + \gamma_1(E_t/BV_{t-1}) + \gamma_2 EFI_t*(E_t/BV_{t-1})] + \delta EFI_t + \lambda\, CONTROL_t + \phi\, IND_t + \varepsilon_t, \quad (13)$$

$$MV_t/E_t = \alpha_0 + D_{Lt}*[\alpha_1(BV_t/E_t) + \alpha_2 EFI_t*(BV_t/E_t)] + D_{Nt}*[\beta_0 + \beta_1(BV_t/E_t) + \beta_2 EFI_t*(BV_t/E_t)] + D_{Ht}*[\gamma_0 + \gamma_1(BV_t/E_t) + \gamma_2 EFI_t*(BV_t/E_t)] + \delta EFI_t + \lambda\, CONTROL_t + \phi\, IND_t + \varepsilon_t, \quad (14)$$

where G_L (D_L) is an indicator variable coded as one if the firm belongs to the group of positive-low E_t/BV_{t-1} (BV_t/E_t) and zero otherwise, and *CONTROL* is a set of eight control variables that are in the regressions in Panel B of Tables 3 and 4. All other variables are defined as in previous sections. For ease of interpreting the coefficients, *EFI* in the pooled regression is scaled to range between zero and one. The variables of interest are $EFI*(E_t/BV_{t-1})$ for the high-E_t/BV_{t-1} group in Equation (13) and $EFI*(BV_t/E_t)$ for the high-BV_t/E_t group in Equation (14).[18]

We first estimate Equations (13) and (14) without the interaction terms $EFI*(E_t/BV_{t-1})$ and $EFI*(BV_t/E_t)$. The results are presented in Columns (1) and (3) of Table 7. In both columns, the coefficients α_1, β_1, and γ_1 are all significantly different from zero, and γ_1 is significantly greater than α_1 ($p < 0.01$, t-values not shown). These results are consistent with the results in Panel A of Tables 3 and 4, and confirm the convex relations of equity value with earnings, given equity book value, and with equity book value, given earnings.

Next, we estimate the full equations (13) and (14), and the results are presented in Table

[18] The regression results for the interaction effects $EFI_t*(E_t/BV_{t-1})$ (or $EFI_t*(BV_t/E_t)$) are unaffected when we divide the main effect of *EFI* into three, one for each group of E_t/BV_{t-1} (or BV_t/E_t).

7, Columns (2) and (4), respectively. Column (2) shows that α_2, the coefficient on $EFI^*(E_t/BV_{t-1})$ for the group with positive-low profitability, equals -0.786 (t = -0.42), and γ_2, the coefficient on $EFI^*(E_t/BV_{t-1})$ for the group with positive-high profitability, equals 4.521 (t = 2.18). These two results are consistent with those reported in Table 3, Panel B and support H2. Column (2) also shows that β_2 equals -6.234 (t = -3.28). This result, together with the significantly negative β_1 in Column (1), indicates that for loss firms, equity value is higher if E_t/BV_{t-1} is more negative, and the relation is stronger in countries with greater economic freedom.

Turning to the results for Equation (14), Column (4) of Table 7 shows that α_2, the coefficient on $EFI^*(BV_t/E_t)$ for the group with positive-low BV_t/E_t, equals 1.108 (t = 2.65), and γ_2, the coefficient on $EFI^*(BV_t/E_t)$ for the group with positive-high BV_t/E_t, equals 0.400 (t = 2.14). These two results provide evidence consistent with H3.[19] Column (4) also shows that β_2 equals 0.570 (t = 1.80). This result, together with the significantly positive β_1 in Column (3), indicates that the equity value of loss firms that is attributable to the book value of equity is greater when the loss is greater (i.e., BV_t/E_t is less negative) and that this relation is stronger in countries with greater economic freedom.

To further disentangle the effect of economic freedom from the effects of other institutional variables, we replicate all regressions after replacing *EFI* by the residual obtained from the regression of *EFI* on *GDPTH*, *LNGDP*, *COMMON*, *LAW*, *SHRI*, *DEBTRI*, *OWNCON*, and *ACC* (estimated by country-year). The regression residual of *EFI* captures the economic freedom index that is not explained by the eight institutional factors. The results (not tabulated) are similar to those presented in the tables.

V. CONCLUSIONS

[19] Although γ_2 is smaller than α_2 in Column (4) of Table 7, the convex relation between equity value and BV_t/E_t still holds since α_1 is negative and γ_1 is positive.

This paper provides empirical evidence from a cross-country study on the effects of economic freedom on a firm's capital investment response to profitability and on the relation between equity value and accounting profitability. Employing the real-options-based valuation approach, we hypothesize that in a country with greater economic freedom, (1) the firm's capital investment response to profitability is higher, (2) equity value and earnings or book value of equity have a more convex relation when the firm's profitability is such that the value of growth options or adaptation options is of greater relevance, and (3) stock return and profitability change have a more convex relation. Using the index of economic freedom from the Fraser Institute, we test our hypotheses with data from 30 countries during the 2000–2010 period. The empirical results support these hypotheses and suggest that greater economic freedom enhances equity value through more efficient exercise of investment options.

Our study contributes to the real-options-based valuation literature by incorporating institutional factors that affect the frictions and costs of exercising real options. While our study focuses on cross-country comparisons, future research could investigate differences in firm characteristics, such as financial constraints and management quality, that may affect firms' ability to effectively utilize growth and adaptation opportunities. Our study also has implications for valuation research in an international setting (Bhojraj et al. 2003). Our empirical results suggest that international equity valuation using accounting-based multiples should select peer firms that are matched on not only firm-specific factors but also institutional characteristics, such as economic freedom. Finally, our results indicate that the different relations between accounting numbers and equity value across countries or financial reporting regimes can result from differences in economic environments, such as protection of managers' freedom to make investment decisions, and not just differences in the quality of accounting information or standards.

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Appendix
Definitions of Variables

Country-level variables	
COMMON	An indicator variable coded as one if the legal origin of the company law or commercial code of the country is English common law, and zero otherwise. Source: La Porta et al. (1998).
LAW	Assessment of the country's law-and-order tradition. The variable equals the average index during the sample period from 2000 to 2010. Source: International Country Risk (ICR, a country risk-rating agency).
SHRI	An index measuring the antidirector rights of shareholders in the country. The index is formed by adding one when: (1) the country allows shareholders to mail their proxy vote; (2) shareholders are not required to deposit their shares prior to the General Shareholders' Meeting; (3) cumulative voting or proportional representation of minorities on the board of directors is allowed; (4) an oppressed minorities mechanism is in place; (5) the minimum percentage of share capital that entitles a shareholder to call for an Extraordinary Shareholders' Meeting is less than or equal to 10%; or (6) when shareholders have preemptive rights that can only be waived by a shareholders' meeting. The index ranges from 0 (weak antidirector rights) to 5 (strong antidirector rights). The index was constructed by La Porta et al. (1998) and revised by Djankov et al. (2008) and Spamann (2010). Source: Spamann (2010).
DEBTRI	An index measuring creditors' rights. The index is formed by adding one when: (1) the country imposes restrictions, such as creditors' consent or minimum dividends, to file for reorganization; (2) secured creditors are able to gain possession of their security once the reorganization petition has been approved (no automatic stay); (3) secured creditors are ranked first in the distribution of the proceeds that result from the disposition of a bankrupt firm's assets; (4) the debtor does not retain the administration of its property pending the resolution of the reorganization. The index ranges from 0 (weak creditor rights) to 4 (strong creditor rights). Source: La Porta et al. (2008), available from http://scholar.harvard.edu/shleifer/publications/economic-consequences-legal-origins.
OWNCON	The average percentage of common shares owned by the top three shareholders in the 10 largest nonfinancial, privately owned domestic firms in a given country. A firm is considered privately owned if the state is not a known shareholder in it. Source: La Porta et al. (1998).
ACC	An index measuring the quality of a country's accounting standards. The index is created by examining and rating companies' annual reports on their inclusion or omission of 90 items. These items fall into seven categories, including general information, income statements, balance sheets, funds flow statements, accounting standards, stock data, and special items. A higher score on the index indicates higher quality of accounting standards. Source: La Porta et al. (1998).
Country-year-level variables	
EFI	Economic Freedom Index for the country and year. Source: www.freetheworld.com.
GDPTH	Real Gross Domestic Product (GDP) growth for the country and year. Source: Economic Research Service's International Macroeconomic Data Set.
LNGDP	Natural logarithm of real per-capita GDP for the country and year. Source: Economic Research Service's International Macroeconomic Data Set.

Firm-year-level variables (Sources: Compustat, CRSP, Datastream, and Worldscope)	
CI_t	Capital investment in year t, which equals change in book value of equity, scaled by beginning book value of equity.
PR_{t-1}	Profitability for year t-1, which equals earnings before extraordinary items available for common shareholders, scaled by average book value of equity.
MV_t/BV_{t-1}	Market value of common equity at the end of year t, divided by the beginning book value of equity.
E_t/BV_{t-1}	Earnings before extraordinary items available for common shareholders for year t, scaled by the beginning book value of equity.
MV_t/E_t	Market value of common equity at the end of year t, scaled by earnings before extraordinary items available for common shareholders for year t.
BV_t/E_t	Book value of common equity at the end of year t, scaled by earnings before extraordinary items available for common shareholders for year t.
R_t	Cumulative stock return over year t.
Δq_t	Change in profitability in year t (= $E_t/BV_{t-1} - E_{t-1}/BV_{t-2}$), multiplied by the beginning book value of equity/beginning market value of equity.
x_t	Earnings before extraordinary items available for common shareholders for year t, scaled by the beginning market value of equity.
Δb_t	Change in book value of equity in year t scaled by beginning book value of equity, and multiplied by (1 – beginning book value of equity/beginning market value of equity).

Table 1
Descriptive Statistics of Variables

Panel A: Country- and country-year level variables

	Country-level						Country-year level (Number of years and mean of variable)			
Country	*COMMON*	*LAW*	*SHRI*	*DEBTRI*	*OWNCON*	*ACC*	N	*EFI*	*GDPTH*	*LNGDP*
Australia	1	1.76	4.0	3	0.28	75	11	8.14	1.89	10.54
Brazil	0	-0.33	5.0	1	0.57	54	10	6.14	1.91	8.45
Canada	1	1.73	4.0	1	0.40	74	11	8.27	1.35	10.45
Chile	0	1.27	4.0	2	0.45	52	8	7.85	2.86	8.91
Denmark	0	1.92	4.0	3	0.45	62	10	7.88	0.51	10.76
Finland	0	1.94	3.5	1	0.37	77	10	7.82	1.92	10.53
France	0	1.41	3.0	0	0.34	69	10	7.36	0.78	10.42
Germany	0	1.65	2.5	3	0.48	62	10	7.64	0.93	10.43
Greece	0	0.77	2.0	1	0.67	55	10	7.05	3.12	10.01
Hong Kong	1	1.45	5.0	4	0.54	69	11	8.89	3.76	10.15
India	1	0.08	5.0	2	0.40	57	11	6.48	5.79	6.64
Israel	1	0.90	4.0	3	0.51	64	5	7.25	2.39	9.96
Italy	0	0.49	2.5	2	0.58	62	10	7.11	0.04	10.31
Japan	0	1.27	3.5	1	0.18	65	11	7.71	0.97	10.47
Korea	0	0.91	3.5	3	0.23	62	11	7.23	4.12	9.77
Malaysia	1	0.50	5.0	3	0.54	76	11	6.75	2.88	8.58
Netherlands	0	1.75	3.0	3	0.39	64	8	7.92	1.81	10.57
New Zealand	1	1.84	4.0	4	0.48	70	2	8.45	1.31	10.22
Norway	0	1.91	3.5	2	0.36	74	10	7.46	1.43	11.08
Philippines	0	-0.49	3.0	1	0.57	65	8	6.87	2.34	7.04
Singapore	1	1.61	5.0	3	0.49	78	11	8.64	3.53	10.22
South Africa	1	0.09	5.0	3	0.52	70	11	6.95	2.65	8.56
Spain	0	1.17	5.0	2	0.51	64	10	7.49	1.18	10.14
Sweden	0	1.87	3.5	1	0.28	83	10	7.53	1.79	10.60
Switzerland	0	1.86	3.0	1	0.41	68	10	8.29	1.13	10.82
Taiwan	0	0.88	3.0	2	0.18	65	10	7.58	2.95	9.64
Thailand	1	0.06	4.0	2	0.47	64	10	6.63	3.33	7.88
Turkey	0	0.06	2.0	2	0.59	51	10	6.03	2.24	8.75
UK	1	1.67	5.0	4	0.19	78	11	8.27	1.13	10.52
USA	1	1.55	3.0	1	0.20	71	11	8.20	0.83	10.64

Panel B: Firm-year level variables (number of observations and mean of variable)

Country	N	*CI*	*PR*	MV_t/BV_{t-1}	E_t/BV_{t-1}	MV_t/E_t	BV_t/E_t	*R*	Δq	*x*	Δb
Australia	8,320	0.287	0.025	3.19	0.02	5.46	3.48	0.233	-0.004	-0.001	0.127
Brazil	1,543	0.204	0.127	3.07	0.12	16.92	8.91	0.501	-0.005	0.080	0.044
Canada	8,935	0.226	0.022	2.91	0.01	8.34	5.00	0.241	-0.004	-0.000	0.107
Chile	860	0.105	0.129	1.91	0.12	13.99	10.57	0.345	0.004	0.082	0.035
Denmark	1,581	0.120	0.094	2.15	0.07	12.62	8.59	0.195	-0.017	0.043	0.047
Finland	1,149	0.112	0.124	2.50	0.10	12.78	7.12	0.198	-0.017	0.042	0.053
France	5,873	0.184	0.117	2.70	0.09	15.89	9.58	0.154	-0.012	0.041	0.077
Germany	5,973	0.171	0.075	2.68	0.04	14.41	8.50	0.120	-0.017	0.008	0.073
Greece	2,518	0.114	0.089	2.25	0.07	19.87	13.69	0.023	-0.017	0.021	0.071
Hong Kong	7,455	0.220	0.084	2.18	0.07	10.60	9.61	0.274	-0.009	0.046	0.051
India	5,924	0.236	0.196	3.06	0.18	14.46	8.36	0.425	-0.002	0.104	0.091
Israel	1,326	0.173	0.123	2.04	0.11	8.82	6.52	0.304	-0.005	0.058	0.059
Italy	2,417	0.141	0.068	2.44	0.04	17.17	11.09	0.075	-0.019	0.013	0.044
Japan	33,072	0.081	0.051	1.67	0.04	18.50	16.30	0.081	-0.007	0.023	0.036
Korea	10,204	0.158	0.063	1.56	0.05	10.14	11.19	0.232	-0.012	0.053	0.023
Malaysia	7,471	0.086	0.068	1.34	0.06	12.67	12.89	0.119	-0.010	0.050	0.024
Netherlands	909	0.182	0.145	2.93	0.13	13.68	7.48	0.189	-0.008	0.057	0.106
New Zealand	190	0.152	0.131	2.26	0.09	13.49	9.30	0.097	-0.018	0.046	0.068
Norway	1,560	0.224	0.063	2.77	0.05	10.05	6.65	0.228	-0.002	0.032	0.090
Philippines	982	0.158	0.078	1.67	0.08	14.65	13.55	0.295	0.001	0.068	0.041
Singapore	4,838	0.163	0.123	1.94	0.11	12.57	10.80	0.224	-0.014	0.062	0.046
South Africa	2,376	0.251	0.224	2.70	0.20	10.00	6.58	0.249	-0.017	0.112	0.095
Spain	1,188	0.124	0.135	2.78	0.12	17.95	10.39	0.163	-0.013	0.049	0.065
Sweden	2,640	0.201	0.078	3.21	0.06	11.43	5.50	0.195	-0.005	0.020	0.098
Switzerland	2,098	0.102	0.091	2.29	0.08	15.26	9.85	0.148	-0.007	0.041	0.045
Taiwan	9,836	0.093	0.089	1.78	0.07	14.56	11.03	0.246	-0.006	0.032	0.045
Thailand	3,407	0.129	0.119	1.70	0.11	11.05	9.65	0.242	-0.012	0.080	0.029
Turkey	1,879	0.274	0.115	2.23	0.10	11.22	8.14	0.320	-0.009	0.063	0.087
UK	12,025	0.217	0.071	3.06	0.04	10.42	6.29	0.130	-0.011	0.009	0.108
USA	46,451	0.138	0.057	2.88	0.04	14.46	7.63	0.129	-0.010	0.010	0.087

See Appendix for variable definitions.

Table 2
Summary of Regression Results for Investment Flexibility and Economic Freedom

Panel A: Summary results for the regression of capital investment on profitability by country-year

	N	Mean	t-stat.	Std dev.	Quartile 1	Median	Quartile 3
Model: $CI_t = \gamma_0 + \gamma_1 PR_{t-1} + \gamma_2 D\_NPR_{t-1} + \gamma_3 D\_NPR_{t-1} * PR_{t-1} + \phi\, IND_t + \mu_t$							
γ_0	292	0.066	4.19	0.271	-0.088	0.027	0.164
γ_1	292	0.845	26.46	0.546	0.502	0.805	1.143
γ_2	292	-0.026	-2.18	0.205	-0.082	-0.030	0.028
γ_3	292	-1.617	-13.49	2.049	-2.149	-1.321	-0.836
$\gamma_1 + \gamma_3$	292	-0.772	-6.94	1.902	-1.159	-0.508	-0.204
Adjusted R^2	292	0.139	24.16	0.099	0.086	0.134	0.181
Model: $CI^A_t = \gamma^A_0 + \gamma^A_1 PR^A_{t-1} + \gamma^A_2 D\_NPR^A_{t-1} + \gamma^A_3 D\_NPR^A_{t-1} * PR^A_{t-1} + \phi^A\, IND_t + \mu_t$							
γ_0	292	0.075	7.68	0.166	-0.028	0.046	0.149
γ_1	292	0.695	22.76	0.522	0.444	0.677	0.944
γ_2	292	-0.033	-5.34	0.105	-0.066	-0.031	-0.001
γ_3	292	-0.940	-12.26	1.310	-1.456	-0.864	-0.349
$\gamma_1 + \gamma_3$	292	-0.245	-3.62	1.156	-0.635	-0.149	-0.239
Adjusted R^2	292	0.090	17.55	0.088	0.044	0.087	0.130

Panel B: Results for the regression of investment flexibility on economic freedom and other variables (Dependent variable = Estimate of γ_1, $\gamma_1 + \gamma_3$, γ^A_1, and $\gamma^A_1 + \gamma^A_3$ in the regressions in Panel A)

	Dependent Variable =			
	γ_1	$\gamma_1 + \gamma_3$	γ^A_1	$\gamma^A_1 + \gamma^A_3$
Independent Variable	(1)	(2)	(3)	(4)
Intercept	-2.430**	5.634***	-1.740	1.560
	(-2.02)	(2.70)	(-1.63)	(0.71)
EFI	0.249**	-0.059	0.266**	0.117
	(2.30)	(-0.37)	(2.57)	(1.63)
GDPTH	0.053***	-0.120**	0.027*	-0.017
	(5.18)	(-2.03)	(1.92)	(-0.28)
LNGDP	0.152	-0.546**	-0.011	-0.256
	(1.41)	(-2.15)	(-0.12)	(-1.20)
COMMON	-0.117	0.400***	-0.204	-0.011
	(-1.05)	(3.44)	(-1.64)	(-0.20)
LAW	-0.446**	0.570**	-0.286*	0.171
	(-2.28)	(2.55)	(-1.85)	(0.62)
SHRI	0.009	-0.384***	-0.034	-0.111
	(0.15)	(-3.05)	(-0.69)	(-1.54)
DEBTRI	0.045	0.102	0.055	0.025
	(0.86)	(1.23)	(1.21)	(0.30)
OWNCON	-0.707	-0.983	-0.555**	-0.530
	(-1.53)	(-1.15)	(-2.15)	(-0.83)

ACC	0.008	0.007	0.017**	0.004
	(0.77)	(0.45)	(2.04)	(0.42)
Number of observations	292	292	292	292
Adjusted R^2 (%)	14.72	3.32	14.72	3.32

See the Appendix for variable definitions. *CI* (*CI*^{A}) equals capital investment, measured by change in common equity (net operating assets). *PR* (*PR*^{A}) equals profitability, measured by the rate of return on common equity (total assets). *D_NPR* (*D_NPR*^{A}) is an indicator variable coded as one if *PR* (*PR*^{A}) is negative and zero otherwise. *IND* is a set of indicator variables that represent industry. Panel A presents summary statistics of the coefficient estimates of γ's and γ^A's for 292 country-year-specific regressions. The sample consists of 186,423 firm-year observations from 30 countries for the 2000–2010 period. Panel B presents the results for regression of investment flexibility in a country-year (γ_1, $\gamma_1 + \gamma_3$, γ^A_1, and $\gamma^A_1 + \gamma^A_3$ obtained in the regressions in Panel A) on economic freedom and other variables. *t*-statistics, presented in parentheses below the coefficients, are computed based on standard errors adjusted for heteroskedasticity and with two-way clustering on country and year. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively, based on two-tailed tests.

Table 3
Summary of Regression Results for Equity Value Attributable to Growth Options and Economic Freedom

Panel A: Summary results for the regression of market value of equity on earnings by country-year

Model: $\frac{MV_t}{BV_{t-1}} = \alpha_0 + \alpha_1 G_N + \alpha_2 G_H + \alpha_3 \frac{E_t}{BV_{t-1}} + \alpha_4 G_N \frac{E_t}{BV_{t-1}} + \alpha_5 G_H \frac{E_t}{BV_{t-1}} + \phi \cdot IND_t + \varepsilon_t$

	N	Mean	t-stat.	Std. dev.	Quartile 1	Median	Quartile 3
α_0	292	0.990	14.98	1.129	0.425	0.872	1.439
α_1	292	-0.130	-2.83	0.786	-0.453	-0.102	0.128
α_2	292	-1.441	-19.84	1.241	-2.034	-1.183	-0.667
α_3	292	4.808	18.16	4.525	2.198	4.542	7.013
$\alpha_3 + \alpha_4$	292	-4.002	-14.01	4.881	-6.367	-2.920	-0.666
$\alpha_3 + \alpha_5$	292	13.643	45.04	5.176	10.071	13.313	16.681
Adjusted-R^2	292	0.418	54.08	0.132	0.340	0.413	0.495

Panel B: Results for the regression of equity value attributable to the growth option on economic freedom and other variables (Dependent variable = estimate of α_3, $\alpha_3 + \alpha_4$, and $\alpha_3 + \alpha_5$ in the regression in Panel A)

	Dependent Variable =		
	α_3	$\alpha_3 + \alpha_4$	$\alpha_3 + \alpha_5$
Independent variable	(1)	(2)	(3)
Intercept	0.838	27.172***	-12.969
	(0.12)	(3.42)	(-1.07)
EFI	1.315	-1.521	1.239*
	(1.41)	(-1.65)	(1.73)
MEAN(E_t/BV_{t-1})	10.842	25.684***	31.975***
	(1.42)	(2.71)	(4.67)
GDPTH	0.022	-0.420***	0.243
	(0.23)	(-3.04)	(1.42)
LNGDP	-0.385	-1.714***	1.450
	(-0.70)	(-3.50)	(1.59)
COMMON	-0.452	-1.157	0.412
	(-0.62)	(-1.50)	(0.35)
LAW	0.325	3.466***	-2.240
	(0.35)	(3.24)	(-1.47)
SHRI	0.846*	-0.379	0.451
	(1.73)	(-1.07)	(0.84)
DEBTRI	-0.959***	0.263	-0.163
	(-3.70)	(1.01)	(-0.36)
OWNCON	-1.538	-0.749	-4.929
	(-0.70)	(-0.28)	(-1.57)
ACC	-0.056	0.009	-0.036
	(-1.42)	(0.19)	(-0.55)

Number of observations	292	292	292
Adj.-R^2 (%)	3.54	14.88	17.88

See the Appendix for variable definitions. G_N is an indicator variable coded as one if the firm has negative E_t/BV_{t-1} and zero otherwise. G_H is an indicator variable coded as one if the firm's E_t/BV_{t-1} is above the median of the positive values in the country-year, and zero otherwise. *IND* is a set of indicator variables that represent industry. Panel A presents summary statistics of the coefficient estimates for 292 country-year-specific regressions. The sample consists of 194,996 firm-year observations from 30 countries for the 2000–2010 period. Panel B presents the results for the regression of the association between MV_t/BV_{t-1} and E_t/BV_{t-1} in a country-year (α_3, $\alpha_3 + \alpha_4$, and $\alpha_3 + \alpha_5$ obtained in the regression in Panel A) on economic freedom and other variables. *Mean*(E_t/BV_{t-1}) in Panel B equals the mean of E_t/BV_{t-1} for firms in the country-year and indicated group of E_t/BV_{t-1} (negative, positive-low, or positive-high). *t*-statistics, presented in parentheses below the coefficients, are computed based on standard errors adjusted for heteroskedasticity and with two-way clustering on country and year. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively, based on two-tailed tests.

Table 4
Summary of Regression Results for Equity Value Attributable to Adaptation Options and Economic Freedom

Panel A: Summary results for the regression of market value of equity on book value of equity by country-year:

Model: $\frac{MV_t}{E_t} = \beta_0 + \beta_1 D_N + \beta_2 D_H + \beta_3 \frac{BV_t}{E_t} + \beta_4 D_N \frac{BV_t}{E_t} + \beta_5 D_H \frac{BV_t}{E_t} + \phi \cdot IND_t + \varepsilon_t$

	N	Mean	t-stat.	Std. dev.	Quartile 1	Median	Quartile 3
β_0	292	9.619	17.91	9.175	4.706	8.737	13.711
β_1	292	-13.266	-27.83	8.144	-17.852	-12.167	-7.645
β_2	292	-6.590	-15.04	7.488	-10.288	-6.750	-2.717
β_3	292	0.425	7.12	1.019	0.092	0.490	0.817
$\beta_3 + \beta_4$	292	1.032	54.02	0.326	0.830	0.991	1.249
$\beta_3 + \beta_5$	292	1.076	69.54	0.264	0.888	1.063	1.244
Adjusted-R^2	292	0.752	108.57	0.118	0.704	0.780	0.830

Panel B: Results for the regression of equity value attributable to the adaptation option on economic freedom and other variables (dependent variable = estimate of β_3, $\beta_3 + \beta_4$, and $\beta_3 + \beta_5$ in the regression in Panel A)

	Dependent Variable =		
	β_3	$\beta_3 + \beta_4$	$\beta_3 + \beta_5$
Independent variable	(1)	(2)	(3)
Intercept	2.058**	0.911*	-0.118
	(2.06)	(1.78)	(-0.40)
EFI	-0.197	0.018	0.062**
	(-1.13)	(0.32)	(2.30)
MEAN(BV_t/E_t)	0.051	0.016*	-0.014***
	(0.86)	(1.73)	(-3.36)
GDPTH	0.009	0.031**	0.001
	(0.45)	(2.50)	(0.06)
LNGDP	-0.230**	0.011	0.107***
	(-2.06)	(0.40)	(4.77)
COMMON	0.119	0.011	-0.039**
	(0.53)	(0.44)	(-2.56)
LAW	0.610***	0.018	-0.158***
	(2.77)	(0.35)	(-3.16)
SHRI	-0.495***	-0.054**	-0.060***
	(-4.61)	(-2.15)	(-4.00)
DEBTRI	0.110*	-0.008	0.006
	(1.71)	(-0.35)	(0.52)
OWNCON	0.808**	0.096	0.214*
	(2.18)	(0.56)	(1.88)
ACC	0.035***	0.002	0.005***

	(3.79)	(0.53)	(3.95)
Number of observations	292	292	292
Adj.-R^2 (%)	17.63	7.42	23.12

See the Appendix for variable definitions. D_N is an indicator variable coded as one if the firm has negative BV_t/E_t and zero otherwise. D_H is an indicator variable coded as one if the firm's BV_t/E_t is above the median of the positive values in the country-year, and zero otherwise. *IND* is a set of indicator variables that represent industry. Panel A presents summary statistics of the coefficient estimates for 292 country-year-specific regressions. The sample consists of 194,955 firm-year observations from 30 countries for the 2000–2010 period. Panel B presents the results for the regression of the association between MV_t/E_t and BV_t/E_t in a country-year (β_3, $\beta_3 + \beta_4$, and $\beta_3 + \beta_5$ obtained in the regression in Panel A) on economic freedom and other variables. *Mean*(BV_t/E_t) in Panel B equals the mean of BV_t/E_t for firms in the country-year and the indicated group of BV_t/E_t (negative, positive-low, or positive-high). *t*-statistics, presented in parentheses below the coefficients, are computed based on standard errors adjusted for heteroskedasticity and with two-way clustering on country and year. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively, based on two-tailed tests.

Table 5
Summary of Regression Results for Stock Return Attributable to Profitability Change and Economic Freedom

Panel A: Summary results for the regression of annual stock return on profitability change, earnings, and change in book value of equity by country-year

Model: $R_t = \delta_0 + \delta_1 G_N + \delta_2 G_H + \delta_3 \Delta q_t + \delta_4 G_N * \Delta q_t + \delta_5 G_H * \Delta q_t + \delta_6 x_t + \delta_7 \Delta b_t + \phi\, IND_t + \varepsilon_t$

	N	Mean	t-stat.	Std. dev.	Quartile 1	Median	Quartile 3
δ_0	292	0.055	2.09	0.447	-0.198	0.019	0.272
δ_1	292	0.070	4.54	0.265	-0.072	0.045	0.165
δ_2	292	0.063	11.20	0.096	0.015	0.064	0.111
δ_3	292	0.510	13.85	0.629	0.128	0.485	0.883
$\delta_3 + \delta_4$	292	-0.257	-3.93	1.117	-0.508	-0.085	0.216
$\delta_3 + \delta_5$	292	0.525	11.52	0.778	0.114	0.542	0.987
δ_6	292	1.252	23.40	0.914	0.582	1.135	1.801
δ_7	292	0.123	6.92	0.305	-0.050	0.101	0.280
Adjusted-R^2	292	0.259	33.64	0.132	0.172	0.245	0.343

Panel B: Results for the regression of the return-profitability change relationship on economic freedom and other variables (dependent variable = estimate of δ_3, $\delta_3 + \delta_4$, and $\delta_3 + \delta_5$ in the regression in Panel A)

	Dependent Variable =		
	δ_3	$\delta_3 + \delta_4$	$\delta_3 + \delta_5$
Independent variable	(1)	(2)	(3)
Intercept	0.474	3.572***	0.929
	(0.67)	(3.37)	(1.36)
EFI	0.236***	-0.320***	0.308***
	(3.28)	(-2.72)	(4.62)
MEAN(Δq_t)	3.749***	3.032	1.381*
	(2.76)	(1.48)	(1.82)
GDPTH	-0.006	-0.044*	-0.018
	(-0.57)	(-1.71)	(-0.97)
LNGDP	-0.060	-0.143	-0.027
	(-0.54)	(-1.30)	(-0.33)
COMMON	0.054	0.410***	0.165**
	(0.90)	(5.82)	(2.45)
LAW	-0.176	0.324**	-0.255
	(-1.35)	(2.54)	(-1.36)
SHRI	-0.069	-0.296**	-0.149***
	(-1.39)	(-2.35)	(-2.86)
DEBTRI	-0.055**	0.082	-0.009
	(-2.47)	(1.42)	(-0.23)
OWNCON	-1.018***	-0.980**	-1.845***
	(-3.32)	(-1.99)	(-3.38)
ACC	-0.002	0.017	-0.013***

	(-0.70)	(1.15)	(-3.48)
Number of observations	292	292	292
Adj.-R^2 (%)	10.12	7.93	10.69

See the Appendix for variable definitions. G_N is an indicator variable coded as one if the firm has negative E_t/BV_{t-1} and zero otherwise. G_H is an indicator variable coded as one if the firm's E_t/BV_{t-1} is above the median of the positive values in the country-year, and zero otherwise. *IND* is a set of indicator variables that represent industry. Δ denotes change over the previous year. Panel A presents summary statistics of the coefficient estimates based on 292 country-year-specific regressions. The sample consists of 175,286 firm-year observations from 30 countries during the 2000–2010 period. Panel B presents the results for the regression of the association between annual stock return and profitability change (δ_3, $\delta_3 + \delta_4$, and $\delta_3 + \delta_5$ obtained in the regression in Panel A) on economic freedom and other variables. *Mean*(Δq_t) in Panel B equals the mean of Δq_t for firms in the country-year and the indicated group of E_t/BV_{t-1} (negative, positive-low, or positive-high). *t*-statistics, presented in parentheses below the coefficients, are computed based on standard errors adjusted for heteroskedasticity and with two-way clustering on country and year. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively, based on two-tailed tests.

Table 6
Summary of Regression Results for Stock Return Attributable to Profitability Change and Economic Freedom

Panel A: Summary results for the regression of annual stock return on profitability change, earnings, and change in book value of equity by country-year

Model: $R_t = \delta_0 + \delta_1 G_{Nt} + \delta_2 G_{Ht} + \delta_3 \Delta q_t + \delta_4 G_{Nt} * \Delta q_t + \delta_5 G_{Ht} * \Delta q_t + \delta_{5a} D10_t * \Delta q_t + \delta_{5b} D10_t + \delta_6 x_t + \delta_7 \Delta b_t + \phi\, IND_t + \varepsilon_t$

	N	Mean	t-stat.	Std. dev.	Quartile 1	Median	Quartile 3
δ_0	292	0.054	2.05	0.451	-0.213	0.016	0.270
δ_1	292	0.068	4.46	0.261	-0.070	0.042	0.166
δ_2	292	0.063	11.06	0.097	0.018	0.064	0.111
δ_3	292	0.511	13.79	0.633	0.146	0.489	0.890
δ_4	292	-0.772	-11.65	1.133	-1.128	-0.621	-0.212
δ_5	292	0.109	1.72	1.083	-0.542	0.094	0.796
δ_{5a}	292	0.935	0.81	19.772	-1.319	-0.033	1.455
δ_{5b}	292	0.035	0.09	6.355	-0.170	0.000	0.135
δ_6	292	1.245	23.09	0.921	0.588	1.161	1.816
δ_7	292	0.125	6.59	0.325	-0.044	0.105	0.279
$\delta_3 + \delta_4$	292	-0.261	-3.99	1.117	-0.488	-0.091	0.197
$\delta_3 + \delta_5$	292	0.620	10.38	1.021	0.043	0.618	1.197
$\delta_3 + \delta_5 + \delta_{5a}$	292	1.555	1.34	19.853	-0.632	0.465	1.810
Adjusted-R^2	292	0.265	34.17	0.132	0.173	0.254	0.346

Panel B: Results for the regression of the return-profitability change relationship on economic freedom and other variables (dependent variable = estimate of δ_3, $\delta_3 + \delta_4$, $\delta_3 + \delta_5$, and $\delta_3 + \delta_5 + \delta_{5a}$ in the regression in Panel A)

	Dependent Variable =			
	δ_3	$\delta_3 + \delta_4$	$\delta_3 + \delta_5$	$\delta_3 + \delta_5 + \delta_{5a}$
Independent variable	(1)	(2)	(3)	(4)
Intercept	0.347	3.247***	0.723*	-28.122
	(0.51)	(3.30)	(1.74)	(-0.84)
EFI	0.242***	-0.310***	0.535***	-0.726
	(3.48)	(-2.84)	(3.23)	(-0.33)
MEAN(Δq_t)	3.701***	2.996	1.309	-21.180***
	(2.72)	(1.49)	(1.56)	(-4.83)
GDPTH	-0.006	-0.046*	0.027	0.103
	(-0.51)	(-1.73)	(1.18)	(0.30)
LNGDP	-0.053	-0.130	-0.072	3.093
	(-0.49)	(-1.19)	(-0.63)	(1.21)
COMMON	0.042	0.401***	-0.104	-1.555
	(0.69)	(5.64)	(-0.57)	(-0.62)
LAW	-0.192	0.290**	-0.398*	-1.810
	(-1.48)	(2.55)	(-1.95)	(-0.31)
SHRI	-0.058	-0.286**	-0.138**	0.009

	(-1.16)	(-2.22)	(-2.51)	(0.01)
DEBTRI	-0.060***	0.077	0.003	1.435
	(-2.65)	(1.30)	(0.04)	(1.46)
OWNCON	-1.027***	-0.984*	-2.606***	7.504
	(-3.28)	(-1.92)	(-3.23)	(1.14)
ACC	-0.002	0.019	-0.021**	0.101
	(-0.64)	(1.22)	(-2.40)	(1.41)
Number of observations	292	292	292	292
Adj.-R^2 (%)	9.94	7.95	12.61	3.26

See the Appendix for variable definitions. G_N is an indicator variable coded as one if the firm has negative E_t/BV_{t-1} and zero otherwise. G_H is an indicator variable coded as one if the firm's E_t/BV_{t-1} is above the median of the positive values in the country-year, and zero otherwise. Δ denotes change over the previous year. *D10* is an indicator variable coded as one if the firm's Δq_t is among the top ten percent in the high-profitability group in the country-year, and zero otherwise. *IND* is a set of indicator variables that represent industry. Panel A presents summary statistics of the coefficient estimates based on 292 country-year-specific regressions. The sample consists of 175,286 firm-year observations from 30 countries during the 2000–2010 period. Panel B presents the results for the regression of the association between annual stock return and profitability change (δ_3, $\delta_3 + \delta_4$, $\delta_3 + \delta_5$, and $\delta_3 + \delta_5 + \delta_{5a}$ in the regression in Panel A) on economic freedom and other variables. *Mean*(Δq_t) in Panel B equals the mean of Δq_t for firms in the country-year and indicated group of E_t/BV_{t-1} (negative, positive-low, or positive-high). *t*-statistics, presented in parentheses below the coefficients, are computed based on standard errors adjusted for heteroskedasticity and with two-way clustering on country and year. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively, based on two-tailed tests.

Table 7
Summary of Results from the Pooled Regression of Market Value of Equity on Earnings or Book Value of Equity, Economic Freedom, Interaction Effects between Economic Freedom and Earnings or Book Value of Equity, and Control Variables

$$MV_t/BV_{t-1} = \alpha_0 + G_{Lt}*[\alpha_1(E_t/BV_{t-1}) + \alpha_2 EFI_t*(E_t/BV_{t-1})] + G_{Nt}*[\beta_0 + \beta_1(E_t/BV_{t-1}) + \beta_2 EFI_t*(E_t/BV_{t-1})] + G_{Ht}*[\gamma_0 + \gamma_1(E_t/BV_{t-1}) + \gamma_2 EFI_t*(E_t/BV_{t-1})] + \delta EFI_t + \lambda\, CONTROL_t + \phi\, IND_t + \varepsilon_t$$

$$MV_t/E_t = \alpha_0 + D_{Lt}*[\alpha_1(BV_t/E_t) + \alpha_2 EFI_t*(BV_t/E_t)] + D_{Nt}*[\beta_0 + \beta_1(BV_t/E_t) + \beta_2 EFI_t*(BV_t/E_t)] + D_{Ht}*[\gamma_0 + \gamma_1(BV_t/E_t) + \gamma_2 EFI_t*(BV_t/E_t)] + \delta EFI_t + \lambda\, CONTROL_t + \phi\, IND_t + \varepsilon_t$$

	Dependent Variable =			
	MV_t/BV_{t-1}		MV_t/E_t	
Coefficient	(1)	(2)	(3)	(4)
α_0	-0.734	-0.171	16.304**	18.925**
	(-0.51)	(-0.13)	(2.10)	(2.43)
α_1	7.695***	8.143***	0.500***	-0.203
	(8.14)	(4.83)	(7.95)	(-0.84)
α_2		-0.786		1.108***
		(-0.42)		(2.65)
β_0	-0.066	-0.039	-15.259***	-14.814***
	(-0.65)	(-0.43)	(-8.27)	(-8.61)
β_1	-4.643***	-0.173	0.919***	0.543**
	(-3.79)	(-0.17)	(18.50)	(2.51)
β_2		-6.234***		0.570*
		(-3.28)		(1.80)
γ_0	-1.101***	-1.115***	-4.674***	-4.598***
	(-4.92)	(-4.85)	(-6.53)	(-5.94)
γ_1	14.878***	11.898***	0.936***	0.676***
	(14.31)	(6.78)	(16.84)	(5.13)
γ_2		4.521**		0.400**
		(2.18)		(2.14)
δ	-0.254	-0.996**	-1.939	-7.074***
	(-0.49)	(-2.15)	(-0.77)	(-2.65)
CONTROL and *IND*	Included	Included	Included	Included
Number of observations	194,996	194,996	194,955	194,955
Adjusted R^2 (%)	64.84	64.99	77.41	77.63

See the Appendix for variable definitions. G_L (G_H) is an indicator variable coded as one if the firm's E_t/BV_{t-1} is below (above) the median of the positive values in the country-year, and zero otherwise. G_N is an indicator variable coded as one if the firm has negative E_t/BV_{t-1}, and zero otherwise. D_L (D_H) is an indicator variable coded as one if the firm's BV_t/E_t is below (above) the median of the positive values in the country-year, and zero otherwise. D_N is an indicator variable coded as one if the firm has negative BV_t/E_t, and zero otherwise. *EFI* is scaled to range between zero and one. *CONTROL* is a set of control variables, including *GDPTH*, *LNGDP*, *COMMON*, *LAW*, *SHRI*, *DEBTRI*, *OWNCON*, and *ACC*. *IND* is a set of indicator variables that represent industry. *t*-statistics, presented in parentheses below the coefficients, are computed based on standard errors adjusted for heteroskedasticity and with two-way clustering on country and year. The results for *CONTROL* and *IND* are not presented. ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively, based on two-tailed tests.

Figure 1
Economic Freedom and the Relation between Equity Value and Earnings, Given Equity Book Value