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Do adjustment costs influence firms' target adjustment speeds? International evidence from share repurchase legalization ☆

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ABSTRACT

Do firms change their capital structure adjustment speed towards a target when adjustment costs change? Under a unified capital structure approach that combines the static trade-off and pecking order theories, firms minimize adjustment costs in setting their target adjustment speed. For below-target firms, the availability of share repurchases lowers the expected cost of increasing leverage towards the target. Extending the adjustment cost-based unified framework to the availability of share repurchases, which exogenously lowers the expected cost of leverage increases for below-target firms, I show the availability of share repurchases to result in these firms increasing their leverage adjustment speed towards a target. As predicted, this effect does not hold for the above-target firms.

1. Introduction

A firm's capital structure is the combination of debt and equity that finances its operations and growth. Firms make incremental capital structure decisions by issuing debt and equity, repaying debt, and repurchasing shares. The two dominant theories that explain capital structure adjustment decisions by firms are the static trade-off theory (Kim, 1978; Kraus and Litzenberger, 1973; Myers, 1984; Scott, 1977) and pecking order theory (Myers, 1984; Myers and Majluf, 1984). Static trade-off theory suggests that firms attempt to maximize value by adjusting their leverage towards an optimal leverage ratio. The pecking order theory states that firms have no well-defined optimal (target) leverage ratio, and the information asymmetries lead firms to make sequential leverage adjustments to minimize finance costs. I study here the effects of the legalization of share repurchases on firms' capital structure decisions, taking into account both target adjustment behavior and adjustment costs.

Proposing a unified framework for the target adjustment process that employs these competing theories as complements, Byoun (2008) suggests that firms minimize the costs of asymmetric information associated with financing when they move towards a target leverage from a situation below- or above-target. Their leverage being lower (higher) than the target, below-target (above-target) firms are expected to increase (decrease) their leverage. The author shows that below-target (above-target) firms with a financial deficit (surplus), because their adjustment directions are aligned with their financing needs in that they can draw (repay) debt to increase (decrease) their leverage, incur lower adjustment costs and reach their

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target leverage more quickly. Byoun (2008) argues that when adjustment directions and financing needs are not aligned, adjustment costs are high, and firms move towards their target leverage more slowly.

Byoun (2008) is supported by a number of studies (e.g., Banerjee et al., 1999; Cook and Tang, 2010; Faulkender et al., 2008; Leary and Roberts, 2005). Access to share repurchases, like surpluses and deficits, asymmetrically affects above- and below-target firms' costs of converging on a target leverage. Below-target firms can increase their leverage towards a target by repurchasing shares from the open market, which reduces the denominator of the leverage ratio (Bonaimé et al., 2014; Dittmar, 2000).

To determine whether below-target firms' access to share repurchases speeds adjustment towards their target leverage, I use an identification methodology recently published by Wang et al. (2020), the legalization of share repurchases in international markets. I use this identification in the Byoun (2008) framework as an exogenous shock that reduces below-target firms' cost of increasing leverage. This identification also enables me to provide causal evidence of how the repurchases-induced lowered expected cost of increasing leverage affects below-target firms' adjustment speed towards their target leverage. Consistent with Byoun, I find the reduction of the repurchases-induced expected cost of capital structure adjustment to increase, for below-target firms, the adjustment speed towards the target.

Reforms in 15 international markets between 1980 and 2018 permitted firms to repurchase shares from the open market. This major relaxation represented an exogenous shock to below-target firms' capital structure adjustment costs, lowering the expected cost of adjusting leverage towards a target. To increase leverage before the reform, these firms had to use costly instruments like dividend payout and debt issuance.

Dividends are rigid and specialized for continuous permanent payouts compared to flexible repurchases used for transitory payouts (Jagannathan et al., 2000). When firms initiate dividends to indicate a permanent expected cash flow, the market expects them to continue steadily for a reasonable period (Brav et al., 2005; Guay and Harford, 2000). This stickiness makes it costly to fully adjust leverage to target ratios through dividend payments that may subsequently have to be reduced. Adjusting to targets by issuing additional debt consumes debt capacity and burdens firms with interest costs, and those debt results in raising excess cash that can exacerbate agency conflicts between managers and shareholders.

I consider the cost reduction due to the availability of repurchases to be meaningful only for below-target firms. Above-target firms, as they did before the legalization of repurchases, must repay debt or issue equity to reduce their leverage towards a target. The Byoun (2008) framework enables me to explore differences in the effects of share repurchase legalization on below- and above-target firms.

I show for a 15-country pooled sample that capital structure adjustment speed increases relative to the pre-legalization period by 67.1 % and not at all for the above-target firms. A dynamic analysis further shows this effect to cluster in the years after legalization, which is consistent with a causal interpretation.

My main finding is robust to alternative research designs. For example, my results are not subject to the estimation method of the target leverage, and given that a country-by-country analysis shows adjustment speed to increase significantly for 10 of the 15 countries, it is unlikely that one or two outliers drive the results. Moreover, I obtain stronger results with the adoption year (i.e., the year in which share repurchases start to become widely used) than with the legalization year.

I examine whether below-target firms tend to substitute their debt issuances with share repurchases after legalization. Issuing debt is costly for these firms due to the cost of interest, consumption of debt capacity, and tendency to exacerbate agency conflicts if there is no use of those funds. Given the availability of share repurchases, I expect these firms to reduce debt issuances and increase their leverage through share repurchases. Consistent with the expectation that below-target firms will, given their availability, use share repurchases to increase their leverage, I find a significant reduction in debt issuance by these firms following the legalization of share repurchases.[2] I validate my main finding by showing that firms tend to substitute, as they are made available, low-cost for high-cost leverage adjustment methods.

To explore the channels through which legalization propagates into lower adjustment costs, I consider three channels through which share repurchases lower leverage adjustment costs: tax, institutional quality, and restrictions on share repurchases. Share repurchases being taxed at the capital gains and dividends at the ordinary income rate, the tax difference between the two rates favors repurchasing shares (Jacob and Jacob, 2013; Moser, 2007; Wang et al., 2020). Consistent with this circumstance, I find cost reduction resulting from the legalization of share repurchases to have a greater impact on below-target firms in countries with higher tax differences. The observed effect of institutional quality on firms' payout patterns is a higher percentage of earnings paid out to reduce firm-level agency costs in countries with weaker institutions (Ellahie and Kaplan, 2021). Accordingly, I find the effect of share repurchase legalization on the speed of capital structure adjustment to be more substantial in countries with weak than in those with strong institutions. Lastly, restrictions on share repurchases should limit the effect of their legalization (Wang et al., 2020), and, indeed, I find that the impact of share repurchase legalization on below-target firms diminishes as restrictions increase.

[2] That Wang et al. (2020) do not find a robust reduction in debt issuance after the legalization of share repurchases might be explained by our focus on below-target firms, which have a strong incentive to substitute share repurchases for debt financing, or that their study included only firms that repurchased shares in the two years following legalization. If these firms had large amounts of excess cash enabling them to pay out immediately after legalization, the study design could bias estimations towards zero as these firms would not issue debt both before and after legalization. I do not apply the filter as in Wang et al. (2020) to avoid the biased sample issue.

My paper contributes to the broad literature on capital structure causal evidence of the effect of expected cost on the speed of firms' capital structure adjustments. Byoun (2008) found selection costs associated with asymmetric information to affect the adjustment of capital structure towards a target. I extend Byoun's (2008) finding, which identified financial position (surplus/deficit) as the determinant of adjustment speed, to consider reductions in expected adjustment costs induced by the availability of share repurchases. I thus confirm Byoun's (2008) prima facie evidence that transaction costs influence corporate capital structure adjustment decisions. I provide evidence that firms tend to substitute, as they become available, low-cost for high-cost leverage adjustment instruments, as demonstrated by below-target firms' debt reduction following the legalization of share repurchases. Using Wang et al.'s (2020) identification, in which open market share repurchase legalization constitutes an exogenous shock to below-target firms' cost of adjusting capital structure, alleviates endogeneity concerns and enables me to identify the causal effect of the expected cost of capital structure adjustment on adjustment speed in the Byoun (2008) framework.

In a recent working paper, Wang et al. (2021) use the Wang et al. (2020) identification methodology for firms' capital structure adjustments. Confining their sample to firms that repurchased shares immediately upon legalization, the authors show those repurchases to generally correspond (for both above- and below-target firms) to a reduction in the distance from the target leverage. Their work, an extension of Wang et al. (2020), confirms studies such as that of Dittmar (2000), which identifies leverage adjustments as one objective of share repurchases. A key difference between my study and that of Wang et al. (2021) concerns the research problem and sample selection. Neither focusing on actual repurchases, nor restricting my research design to repurchasing firms or repurchasing behaviors, I examine, for a substantially larger sample, the expected adjustment cost change that occurs consequent to the ability to repurchase shares. Specifically, I use Wang et al.'s (2020) identification in Byoun's (2008) adjustment cost framework to investigate the effect on below-target firms of cost reductions associated with repurchase-induced adjustments.

The main advantage of Byoun's (2008) framework is that it considers adjustment costs with firm heterogeneity. I show the ability to repurchase shares to not result in cost reductions and hence be immaterial for above-target firms. By including characteristics like tax and institutional quality, I extend Byoun's (2008) framework to consider the market as well as firm heterogeneity. I show market heterogeneity as a channel for propagating cost reductions associated with share repurchases to affect the speed of capital structure adjustment for below-target firms. I further extend the Byoun (2008) framework to validate my results by following more recent literature (e.g., Bonaimé et al., 2014; Flannery and Hankins, 2013) that employs a two-step system GMM to estimate target leverage.

The remainder of the paper is organized as follows. In Section 2, I discuss the capital structure and target adjustment theory and how share repurchases can reduce the expected cost of target adjustment for below-target firms. The section develops under Byoun (2008) framework for below- and above-target firms a theoretical link between lower leverage adjustment costs and adjustment speed. Hypothesis development, data, and methodology are discussed in Section 3, and estimation procedures, results, and their implications are in Section 4. The results of robustness tests are reported in Section 5, results of validation tests are in Section 6. In Section 7, I describe the cross-sectional analysis examining how the legalization of share repurchases varies with market-specific characteristics. Section 8 concludes.

2. Capital structure adjustments and share repurchases

2.1. Target leverage and cost of adjustment

Two theories in the capital structure literature, trade-off and pecking order, present competing explanations for whether firms adjust capital structure towards a target leverage or merely to minimize costs. Myers (1984) suggests that firms' optimal leverage maximizes value by trading off the costs and benefits of debt. Debt tax shields provide an incentive to increase debt financing, hence managers can increase debt to increase firm value, at least to the point that the bankruptcy costs of debt begin to outweigh the tax benefits. This tradeoff results in the marginal benefit of debt declining with increasing debt, and an optimal level of debt/equity choice existing that maximizes firm value. Pecking order theory (Myers, 1984; Myers and Majluf, 1984), on the other hand, suggests that firms follow a hierarchical order of internal equity (retained earnings), debt, and new equity to minimize informational asymmetry costs associated with financing decisions.

Byoun (2008), contrary to the previous literature, regards these as complementary rather than competing theories. His study, which examines the trade-off framework with costs due to asymmetric information similar to pecking order theory, is also part of the extant target adjustment literature, which includes, among other studies, Hovakimian et al. (2001), Fama and French (2002), Flannery and Rangan (2006), Kayhan and Titman (2007), and Lemmon et al. (2008). Out of these studies, including those of Hovakimian et al. (2001), Fama and French (2002), Kayhan and Titman (2007), and Byoun (2008), have come models for estimating target leverage in the first stage. These studies then deploy the first stage result in the calculation of the distance to target in the second stage regression independent variables. Reduced form models like those of Flannery and Rangan (2006) and Lemmon et al. (2008), on the other hand, do not run a two stage model, instead estimate target adjustment in a single step.

In this study, I examine the ability to repurchase shares in the target adjustment process and compare target adjustment with repurchases and the costs, such as issuing debt, suggested by the pecking order theory. I require the use of an adjustment cost-based dynamic-tradeoff model. Reduced-form models, however useful for assessing target adjustment behavior in

various contexts, lack the complexity for fully capturing the cost-of-adjustment of capital structure as suggested by pecking order theory, unlike two-step models. Moreover, all two-step models are unsuitable for assessing the cost involved in target adjustment. Two-step models like Kayhan and Titman's (2007), for example, are dynamic but not dynamic tradeoff models. Unlike general dynamic models that compare actual to target leverage, dynamic-tradeoff models consider the cost of adjustment to drive the capital structure choice.

Byoun's (2008), being an adjustment cost-based dynamic-tradeoff model, which considers firm heterogeneity, is a suitable candidature framework for my study. It captures the role in reaching the target not only of target adjustment behavior as described in trade-off theory, but also asymmetric information/transaction cost as suggested by pecking order theory. Byoun (2008) further shows that firms' adjustment costs are not uniform. When above-target firms accumulate a financial surplus, for example, they repay debt and reach the target faster than below-target firms with a surplus, and vice versa. In my study, cost reduction due to the availability of share repurchases is not homogeneous, affecting above- and below-target firms differently (refer to Section 2.2). Although these characteristics qualify Byoun's (2008) as the best framework for the present study, the model is primarily intended to detect the cost associated with debt change. Consequently, in Section 3.4, I use additional specifications to account for explicit changes in outstanding equity more appropriate for my research.

Byoun (2008) strong empirical evidence, using the unified theory, that above- and below-target firms tend to move towards optimal leverage at a slower speed as the cost of adjustment increases aligns with the results of studies by Banerjee et al. (1999) and more recently Zhou et al. (2016), among others. They find firms to typically not be at optimal leverage but rather adjust leverage towards the target over time and the adjustment cost to determine the speed of adjustment. In other words, an external shock that lowers the cost should result in an increase in the speed of adjusting capital structure.

2.2. Share repurchases and their impact on the target adjustment behavior of firms

Prior studies have shown share repurchases to serve as a flexible payout instrument against volatile earnings (Grullon and Michaely, 2002) and effectively change the capital structure (Bonaimé et al., 2014; Dittmar, 2000; Harris and Raviv, 1991). Repurchasing outstanding shares decreases equity, which increases leverage by directly affecting the denominator of the leverage ratio, rendering the instrument a low-cost solution for below-target firms seeking to increase leverage. Share repurchases play an essential role in helping (especially profitable) firms that would become under-leveraged over time maintain an ideal level of leverage (Hovakimian et al., 2001).

Below-target firms had several ways of adjusting capital structure before the legalization of share repurchases. Issuing debt and paying dividends towards that end are theoretically attended by caveats. Issuing debt, although it increases below-target firms' leverage, consumes debt capacity and incurs interest costs, as well as causes agency problems in the event that managers do not use the funds in a way that generates value. Employing dividends to increase leverage implies a commitment to sustaining the same dividend level once initiated, even after the adjustment is complete, and the market often reacts negatively to a decline in dividends (Brav et al., 2005). Because they also, being tied to a firm's long-term expected earnings, convey a dedicated signal (Guay and Harford, 2000; Jagannathan et al., 2000), using dividends to adjust leverage may sacrifice the benefits associated with dividend signaling.

Brav et al. (2005) and Iyer and Rao (2017) show share repurchases to be a more flexible instrument than dividends. Firms are not committed to repeating share repurchases annually, a rigidity that attends the use of dividends to increase the leverage that is costly for below-target firms. Share repurchases significantly reduce the cost of capital structure adjustment for below-target firms, but have no effect on over-leveraged firms, which, their objective being to decrease leverage to reach a target, must use debt repayment or equity issuance.

3. Hypothesis development, data sources, and model specification

3.1. Hypothesis development

Presuming share repurchases to lower adjustment speed, I assess, using the Byoun (2008) framework, whether adjustment speed varies between a period during which firms have, and a period during which they do not have, access to share repurchases. Many international markets began legalizing open market share repurchases during the 1980 s, using an identification method deployed by Wang et al. (2020), who consider two time periods, one during which firms repurchase shares (i.e., the post-legalization period), and one during which they do not repurchase shares (i.e., the pre-legalization period).

Wang et al. (2020) use a staggered DID framework to investigate, between treatment firms and control firms, how the legalization of share repurchases affects firm variables like debt issuance, dividends, capital expenditures, and R&D. But the treatment firms in Wang et al. (2020) are those that repurchase shares within two years of the practice's legalization. Although I use their identification, my research question being about adjustment cost reduction consequent to the availability of share repurchases, I consider the entire sample rather than only firms that engaged in repurchases. Although my firm selection differs from Wang et al. (2020), my country selection is similar to the authors'. Wang et al. (2020) select only countries with no record of share repurchases pre-legalization, and only markets in which firms were likely to engage in repurchases within two years of legalization.

The first criteria matter, there being three types of repurchases: tender offer, Dutch auction, and open-market share repurchases. The latter predominates, accounting for more than 90 % of the overall volume of share repurchases and the focus of Wang et al. (2020). The authors find that prior to the legalization of open-market share repurchases, firms in some countries used unpopular repurchasing methods like private tender offers, which Comment and Jarrell (1991) show to be at most peripheral, their volume being insignificant due to the high service fees paid to third parties and high premiums paid to stockholders who tender. Given the unknown motivations for such repurchases, whether open-market share repurchases represent an unexpected cost reduction in those countries is debatable. In line with Wang et al. (2020), I exclude countries with prior records of unpopular repurchasing methods, such as private tender offers, and markets in which firms do not repurchase shares within two years of the open-market repurchases' legalization. As can be seen in Table 1, which shows my final sample of countries and the years in which open market share repurchase was legalized, Canada was the first (in 1985), and Turkey was the latest (in 2009) country in the sample to legalize share repurchases.[3]

Assuming that markets recognize the change in the law and firms become aware of attendant expected reductions in adjustment cost over time, I investigate, as well as the year of legalization, the year of adoption of share repurchases in each market. I define the share repurchase intensity as the total per year share repurchases divided by the previous year's total book value of shares in a given market after legalization. Then I define the adoption year using the Chow test for structural breaks to identify the onset of a significant increase in share repurchase intensity in each market. Details regarding adoption years and analysis using adoption years are provided in Section 5.1.

I consider the legalization of share repurchases to be an external shock to the cost of capital structure adjustment for this filtered set of countries. This identification allows for a meaningful comparison of the Byoun (2008) framework's target adjustment speeds during the pre and post-legalization periods of share repurchases. I propose as my central hypothesis:

H1: Share repurchase legalization causes firms with below-target leverage to increase leverage more towards the target leverage.

3.2. Data

I use several data sources for this study. My main data source for the firm financials reported in Table 1 for 15 international markets from 1980 to 2018 is Thomson Reuters Worldscope. I follow previous studies in excluding from the sample financial firms and regulated utilities, represented by SIC codes 6000–6799 and 4800–4999, respectively. These firms' capital structures differ significantly from, and their capital structure adjustment decisions may not convey the same information as those of, nonfinancial and unregulated firms. For example, the high leverage ratio typical of financial firms, with or without share repurchases, renders them equivalent to above-target firms in the nonfinancial category. I also remove firms with negative values for total assets, book and market value of equity, and net sales, which may be used as a deflator for leverage, to avoid complications when interpreting nonpositive values. Otherwise, I retain the entire sample without filtering on the basis of share repurchase behaviour.

The Securities Data Company (SDC) Platinum database from which I acquire share repurchase announcement details is essential for excluding, through comparison with actual repurchases in the Worldscope database, countries with repurchase records before the legalization year and those that exhibit a significantly delayed response to the legalization of share repurchases. I collect tax information as a secondary data source from the OECD Tax Database and other studies, such as that of Ellahie and Kaplan (2021).

Information related to open market share repurchases, including years of legalization, is obtained from Wang et al. (2020) and sources mentioned in their study, summarized in Table 2.

In addition, the details of all variables are provided in Table 3.

3.3. Model specification

My primary target adjustment model, a modified version of that employed by Byoun (2008), is:

$$\Delta \frac{D_{ict}}{A_{ict}} = \left[\frac{D}{A}\right]^{*}_{ict} - \frac{D_{ic(t-1)}}{A_{ic(t-1)}} \tag{1}$$

[3] Except for Kuwait and Russia, I ended up with the same countries as Wang et al. (2020). For Russia there is no data related to the pre-legalization period. Ambiguities are associated with Kuwait, Wang et al. (2020) citing Capital Markets Law (2010), which notes only that it seeks to regulate securities transactions in the country, as the legal enactment that enabled firms previously resitricted from doing so to repurchase shares. Pre-2010 market reports show firms in Kuwait to have repurchased large amounts of shares. For example, according to NBK Capital Kuwait in Focus (2009), "In July 2009, Markaz announced that it had received approval from the Central Bank of Kuwait (CBK) to buy back up to 10% of its shares within a six-month period, effective July 23, 2009″ and "National Investments Company announced its request to buy back 10% of its shares within a six-month period as of November 21, 2009," and SDC also shows share repurchase announcements related to Commercial Bank of Kuwait KSC and Global Investment House KSCC in the 2007 and 2008 periods. Academic studies with a broader focus on repurchases in this market are few. Hamouda (2018) notes that 50% of Kuwait firms repurchased only 3,758 shares during the entire 2008–2014 period, and that repurchases in this market, in contrast to other markets in the study, are not occurring freely. Capital Markets Law likely constituting reforms to existing practices, which have not provided complete freedom since 2010, I consider Kuwait an outlier in my context.

Table 1
Share repurchases legalization years for 15 countries.

Country	Share Repurchases Legalization Year	Share Repurchases Adoption Year
Canada	1985	1986
China	2005	2007
Germany	1998	1999
Greece	2003	2004
Israel	1999	2003
Japan	1995	1997
Netherlands	1992	1996
New Zealand	1994	1997
Singapore	1998	1998
South Africa	2000	2004
South Korea	1994	1998
Spain	1989	1992
Switzerland	1992	1996
Taiwan	2000	2002
Turkey	2009	2010

The table shows the year of legalization of share repurchases for each country. The table also shows the year of adoption of the law change. To estimate the adoption year, I examine the actual share repurchase intensity as measured by the total per year share repurchases in a particular market divided by the previous year's total book value of shares in the market after the legalization of share repurchases. When share repurchase intensity increases abruptly, I identify that year as the adoption year using the Chow test for structural breaks. The adoption year ensures that firms are fully aware of the law change and availability of share repurchases.

Table 2
The impact of share repurchases on below- and above-target firms.

Country	Referring literature (source Wang et al. (2020))
Canada	IBA Corporate and M&A Law Committee (2014); Anand (2015)
China	Administration of Repurchase of Public Shares by Listed Companies Procedures −2005
Germany	Kim, Schremper, and Varaiya (2005)
Greece	Drousia, Episcopos, and Leledakis (2019)
Israel	IBA Corporate and M&A Law Committee (2014)
Japan	Sabri (2003); Kim et al. (2005)
Netherlands	IBA Corporate and M&A Law Committee (2014);Van Holder, Van de Kerckhove, and Heyman (2015)
New Zealand	Sabri (2003)
Singapore	Chua (2011); Sabri (2003)
South Africa	Bhana (2007)
South Korea	Lee et al. (2005); Isa and Lee (2014)
Spain	Lainez, Jarne, and Callao (1999); Davies, Hopt, Nowak, and van Solinge (2013)
Switzerland	Kim et al. (2005)
Taiwan	Sabri (2003); Wang, Lin, Fung, and Chen (2013)
Turkey	Dizkırıcı (2013)

where D_{ict} is long-term debt and A_{ict} the total assets of firm i in country c at time t, $\left[\frac{D}{A}\right]^{*}_{ict}$ is the target debt to asset ratio, and $\Delta\frac{D_{ict}}{A_{ict}} = \frac{D_{ict}}{A_{ict}} - \frac{D_{ic(t-1)}}{A_{ic(t-1)}}$ is the change in leverage of firm i in country c at time t. This basic equation represents the theoretical model with 100 % adjustment speed. Assuming all firms' debt adjustments to be made taking into consideration their positions with their targets in a market with no frictions, I rearrange the above equation to account for frictions and relative positions of leverage above and below targets as follows:

$$\Delta\frac{D_{ict}}{A_{ict}} = \alpha_1 + \alpha_2 TDE_{ict} * D^{above}_{ict} + \alpha_3 TDE_{ict} * D^{below}_{ict} + \delta_i + \gamma_t + \varepsilon_{ict} \quad (2)$$

where TDE_{ict} is the deviation of the debt ratio from the target leverage given by $TDE_{ict} = \left[\frac{D}{A}\right]^{*}_{ict} - \frac{D_{ic(t-1)}}{A_{ic(t-1)}}$, D^{above}_{ict} is a dummy variable equal to one if leverage is above the target leverage, and D^{below}_{ict} is a dummy variable equal to one if leverage is below the target leverage. TDE_{ict} measures the distance to the optimal from the leverage at time t-1, D^{above}_{it} and D^{below}_{it} whether a firm is below or above its target. δ_i and γ_t are firm and year fixed effects, respectively. If there are no frictions in the market, I would expect to see $\alpha_1 = 0$, $\alpha_2 = \alpha_3 = 1$, but given the frictions attached to capital structure adjustments, I expect α_2 and α_3 to be less than 1.

Table 3
Variable definitions.

Variable	Description
Leverage Measures	
LDLeverageBV	Measures firms' leverage via long-term debt and book value of assets as $LDLeverageBV = \frac{Long\ \ Term\ \ Debt}{Long\ \ Term\ \ Debt+Book\ \ Val\ \ of\ \ Equity+Pref\ \ Stock-Def\ \ Tax}$ where Long term debt is Worldscope item 3251; Common Equity is Worldscope item 03501; Preferred Stock is Worldscope item 3451; and Deferred Taxes is Worldscope item 3263.
LDLeverageMV	Measures firms' leverage via long-term debt and book value of assets as $LDLeverageMV = \frac{Long\ \ Term\ \ Debt}{Long\ \ Term\ \ Debt+Market\ \ Val\ \ of\ \ Equity+Pref\ \ Stock-Def\ \ Tax}$ where Market Val of Equity is Worldscope item 08,001 and the rest of the variables correspond to the same LDLeverageBV Worldscope items.
LeverageLD_TA	The original Byoun (2008) measure of leverage, calculated as $LeverageLD\_TA = \frac{Long\ \ Term\ \ Debt}{Total\ \ Assets}$ where Total Assets is Worldscope item 07230 and the rest of the variables correspond to the same LDLeverageBV Worldscope items.
Dependent Variables	
$\Delta D_{ict}/A_{ict}$ (Change_Leverage)	A firm-year variable that indicates the change of leverage from time t-1 to t, calculated as $\Delta\left[\frac{D}{A}\right]_{ict} = \frac{D}{Aict} - \frac{D}{Aic(t-1)}$, where D is the debt measure and A the asset measure. The measure changes based on the leverage measure used to calculate it. Versions of this variable including *Change_LDLeverageBV, Change_LDLeverageMV, Change_TDLeverageBV, Change_TDLeverageMV*, and *Change_ LeverageByoun* indicate when the measure is calculated using long-term debt book leverage, long term debt market leverage, total debt book leverage, total debt market leverage, and the Byoun (2008) measure of leverage.
Independent Variables	
Target Lev	A firm-year variable that indicates the target level of leverage for a given country in year t calculated using two methods: (i) Byoun (2008) regression estimation with industry fixed-effects, and (ii) lagged explanatory variable and GMM approach.
Leverage_lag	This firm-year variable is calculated by lagging one year of the corresponding leverage measure, which can be *LDLeverageBV_lag, LDLeverageMV_lag, TDLeverageBV_lag, TDLeverageMV_lag or LeverageLD_TA _lag*.
TDE	This firm-year variable measures the distance between the target leverage (Target Lev) and lagged Leverage (Leverage_lag) calculated using the abovementioned measures. TDE has its default meaning when calculated using book value of leverage. Depending on the measure used, TDE indicates market leverage, Byoun (2008) measures leverage (long-term debt divided by total assets), or TDE calculated using the distance between the GMM estimated target leverage and lagged book value of leverage.
Longterm debt	A firm-year variable that indicates the Long Term Debt position of firm i in country c at time t (Worldscope item 3251).
Total Debt	A firm-year variable that indicates the Total Debt position of firm i in country c at time t (Worldscope item 3255).
D^{above}	This dummy variable equals one if the leverage (calculated using either measure depending on the context) of firm i in country c at time t is above the corresponding Target Leverage, and zero otherwise.
D^{below}	This dummy variable equals one if the leverage (calculated using either measure depending on the context) of firm i in country c at time t is below the corresponding Target Leverage, and zero otherwise.
Legalization	This dummy variable equals one for years greater than or equal to the legalization year of share repurchases for a given market, and zero otherwise.
Adoption	This dummy variable equals one for years greater than or equal to the adoption year of share repurchases for a given market, and zero otherwise.
$Before^{1yr}$	This dummy variable equals one if the year is the year before the legalization of share repurchases for a given market, and zero otherwise.
$After^{0}$	This dummy variable equals one if the year is the year of the legalization of share repurchases for a given market, and zero otherwise.
$After^{1yr}$	This dummy variable equals one if the year is a year after the legalization of share repurchases for a given market, and zero otherwise.
$After^{2yrs}$	This dummy variable equals one if the year is two years after the legalization of share repurchases for a given market, and zero otherwise.
$After^{2yrs+}$	This dummy variable equals one for all years more than two years after the legalization of share repurchases for a given market, and zero otherwise.
Variables for debt and equity financing	
Debt_Issuance	A firm-year variable calculated as [(Total debt at time t – Total debt at time (t-1))/ Total Assets at time t]*100.
Equity_Issuance	A firm-year variable calculated as [(Total equity at time t – Total equity at the time (t-1))/ Total Assets at time t]*100, where Total Equity is Worldscope item 03501.
Net_Sales	The natural log of [1 + Raw Net Sales or Revenues (Worldscope item 07240)], and the Worldscope item represents the Raw Net Sales or Revenues in the USD terms.
Net_Income	The natural log of [1 + Raw Net Income (Worldscope item 07250)], and the Worldscope item represents the Raw Net Income in the USD terms.
Leverage	A firm-year variable calculated as [Total Debt (Worldscope item 03255) / [Total Assets(Worldscope item 02999) + Com/Pfd Purchased, Retired, Converted, Redeemed (Worldscope item 04751)] * 100.
RoA	A firm-year variable calculated as [Net Income (Worldscope item 01651) / [Total Assets (Worldscope item 02999) + Com/ PfdPurchased, Retired, Converted, Redeemed (Worldscope item 04751)]] * 100.
Sales_Growth	A firm-year variable that indicates the sales growth of a firm. This variable can be directly obtained from Worldscope item 08631.

(*continued on next page*)

Table 3 (*continued*)

Variable	Description
Ebit_to_Sales	A firm-year variable calculated as [Earnings Before Interestand Taxes (Worldscope item 18191) / Net Sales (Wolrdscope item 01001)] * 100.
PPE_to_Sales	A firm-year variable calculated as Property, Plant AndEquipment (Wolrdscope item 02301) / Net Sales (Wolrdscope item 01001)] * 100.
Quick_Ratio	A firm-year variable that indicates the quick ratio of a firm. This variable can be directly obtained from Worldscope item 08101.
Market_Share	A firm-year variable calculated as a firm's sales as a percentage of the total sales of all the firms in the same SIC code, where sales are Worldscope item Wolrdscope item 01,001 and Total Assets is Worldscope item 07230.

$Legalization_{ct}$ is a dummy variable that indicates the share repurchase legalization event in country c at time t. I modify Equation (2) to arrive at the DID model for the Legalization event as follows:

$$\Delta \frac{D_{ict}}{A_{ict}} = \alpha_1 + \alpha_2 Legalization_{ct} + \alpha_3 TDE_{ict} * D_{ict}^{above} + \alpha_4 TDE_{ict} * D_{ict}^{below} + \alpha_5 TDE_{ict} * D_{ict}^{above} * Legalization_{ct} + \alpha_6 TDE_{ict} * D_{ict}^{below} * Legalization_{ct} + \delta_i + \gamma_t + \varepsilon_{ict} \quad (3)$$

As share repurchases are introduced, I expect to observe α_6 greater than 0, which measures the impact on the capital structure adjustment process of the reduction in frictions attributable to the legalization of share repurchases in country c for below-target firms. Although I do not have a precise prediction for α_5, I expect the impact of share repurchases on capital structure adjustment speed for above-target firms, because such firms are unaffected by their legalization, to generally be insignificant.

Because α_5 and α_6 capture the asymmetric effect of legalization on firms both above and below optimal leverage, these coefficients explain the degree to which share repurchases affect the speed of convergence towards the optimal for firms in each situation.

3.4. Measuring the target debt ratio

Firms' optimal leverage being unobservable, I use as a proxy for target leverage (i) as in many studies (Byoun, 2008; Flannery and Rangan, 2006; Hovakimian et al., 2001; Rajan and Zingales, 1995) the predicted leverage in a cross-sectional regression model setup, and (ii) a more advanced dynamic panel model with Generalised Method of Moment (GMM) techniques.

The strategy employed by Byoun (2008), adjusted for multicountry/industry setup, is demonstrated using Equation (4) as the first methodology for estimating optimal leverage:

$$\left[\frac{D}{A}\right]_{ict}^{*} = \lambda_t X_{ict} + \delta_{industry} + \varepsilon_{ict} \quad (4)$$

where X_{ict}, the firm and industry characteristic variables that determine the target leverage, including industry median debt ratio, marginal tax rate, operating income, the market-to-book ratio of assets, log of total assets, depreciation and amortization, fixed assets, research and development expenditures, common stock dividends as a fraction of total assets, and Altman's Z-score. $\delta_{industry}$ is industry fixed effects, the regression being run for each country and each year to capture any systematic variation in other variables across industry clusters. Country-year combinations for which the number of observations falls below 30 are combined with the adjacent years to ensure at least 30 observations when estimating target leverage.

As an additional technique for assessing target leverage, I deploy the dynamic panel and systems GMM methodology outlined in Section 4.3.

3.5. Different measures of leverage

My main analysis covering long-term liabilities and whether to consider book or market value of equity in the denominator employs two leverage ratios. Byoun's (2008) measure of leverage does not take into account the explicit change in equity in the denominator, a key factor in determining the cost of effecting a change in leverage relative to the availability of repurchases. Using in addition, to further support my main results, Byoun's (2008) measure of leverage (*LeverageLD_TA*), my leverage measures are as follows:

$$LDLeverageBV = \frac{Long\ \ Term\ \ Debt}{Long\ \ Term\ \ Debt + Book\ \ Val\ \ of\ \ Equity + Pref\ \ Stock - Def\ \ Tax} \tag{5}$$

$$LDLeverageMV = \frac{Long\ \ Term\ \ Debt}{Long\ \ Term\ \ Debt + Market\ \ Val\ \ of\ \ Equity + Pref\ \ Stock - Def\ \ Tax} \tag{6}$$

$$LTDebt\_TA = \frac{Long\ \ Term\ \ Debt}{Total\ \ Assets} \tag{7}$$

4. Empirical analysis

4.1. Descriptive statistics

Descriptive statistics are reported in Table 4. Panel A presents, for the entire sample pre- and post-legalization, descriptive statistics for the main leverage measure *LDLeverageBV* (long-term debt deflated by the book value of equity). On average, leverage is 0.1952, and for the pre-and post-legalization periods, 0.2375 and 0.1891, respectively. Panel A further shows target leverage to be, on average, 0.1153, and the percentages of "*Above*" and "*Below*" target firms to be 44.25 and 55.75, respectively. The leverage change of these firms is, on average, 0.36 %, and for the pre-and post-legalization periods, 0.8 % and 0.3 %, respectively. Firms thus, on average, lower their leverage more in the post- than in the pre-legalization period.

The observations regarding leverage and changes in leverage reduction following the legalization of share repurchases should not be confused with this study's main research question, which concerns not the degree to which, but rather the speed at which, firms' adjustments to leverage converge on a target.

Panel B of Table 4 presents the descriptive statistics for *LDLeverageMV* (long-term debt deflated by the market value of equity) with the same complete pre- and post-legalization splits as Panel A. Compared to the earlier book value measure, average leverage increases from 0.1581 to 0.1656, and target leverage from 0.1384 to 0.1527 following the legalization of share repurchases. For market leverage, the summary statistics related to leverage and target leverage thus show opposite changes during the post- compared to the pre-legalization period.

4.2. Regression analysis

Table 5 shows the regression results using two of my main leverage measures, Panel A for *LDLeverageBV and* Panel B for *LDLeverageMV*. Column (1) of Panel A shows the regression results for Equation (3) without the legalization event and using

Table 4
Descriptive statistics.

Panel A: Long-term debt deflated by the book value of equity

	Full Sample				Before Legalization				After Legalization			
	Mean	Median	STD	N	Mean	Median	STD	N	Mean	Median	STD	N
LDLeverageBV	0.1952	0.1131	0.25	273,248	0.2375	0.1823	0.285	34,317	0.1891	0.1032	0.243	238,931
LDLeverageBV_lag	0.1916	0.1115	0.225	273,248	0.2302	0.175	0.227	34,317	0.1861	0.1022	0.225	238,931
Change_LDLeverageBV	0.0036	0	0.147	273,248	0.0081	0	0.204	34,317	0.003	0	0.137	238,931
Target Lev	0.1153	0.0904	0.104	273,248	0.1647	0.1316	0.14	34,317	0.1082	0.0869	0.095	238,931
TDE	−0.0760	−0.0160	0.193	273,248	−0.066	−0.0290	0.191	34,317	−0.078	−0.014	0.194	238,931
D^{above}	0.4425	0	0.497	273,248	0.4974	0	0.5	34,317	0.4347	0	0.496	238,931
D^{below}	0.5575	1	0.497	273,248	0.5026	1	0.5	34,317	0.5653	1	0.496	238,931
Legalization	0.8744	1	0.331	273,248	0	0	0	34,317	1	1	0	238,931

Panel B: Long-term debt deflated by the market value of equity

	Full Sample				Before Legalization				After Legalization			
	Mean	Median	STD	N	Mean	Median	STD	N	Mean	Median	STD	N
LDLeverageMV	0.1647	0.0812	0.203	251,166	0.1581	0.1018	0.175	28,944	0.1656	0.0773	0.206	222,222
LDLeverageMV_lag	0.1607	0.0764	0.2	251,166	0.1492	0.0905	0.172	28,944	0.1622	0.0738	0.204	222,222
Change_LDLeverageMV	0.0042	0	0.103	251,166	0.0091	0	0.086	28,944	0.0035	0	0.105	222,222
Target Lev	0.151	0.1250	0.127	251,166	0.1384	0.1133	0.118	28,944	0.1527	0.1274	0.128	222,222
TDE	−0.010	0.0175	0.164	251,166	−0.011	0.0075	0.142	28,944	−0.01	0.019	0.167	222,222
D^{above}	0.4275	0	0.495	251,166	0.4862	0	0.5	28,944	0.4199	0	0.494	222,222
D^{below}	0.5725	1	0.495	251,166	0.5138	1	0.5	28,944	0.5801	1	0.494	222,222
Legalization	0.8848	1	0.319	251,166	0	0	0	28,944	1	1	0	222,222

The sample consists of observations from 1980 to 2018 from Worldscope, excluding financials and utilities. This sample estimates the target leverage as predicted values from a cross-sectional regression using two key measures: long-term debt to equity (book value), and long-term debt to equity (market value). Once the target leverage is calculated, the TDE is calculated as the lagged leverage deviation from its target. Two panels indicate the results for both leverage measures and are shown for the full sample and separately for the pre and post-legalization periods.

Table 5
Main results.

Panel A: Long-term debt deflated by book value of equity		
	(1) $\Delta D_{ict}/A_{ict}$	(2) $\Delta D_{ict}/A_{ict}$
$TDE^{*}D^{above}$	0.261***	0.249***
	(0.007)	(0.025)
$TDE^{*}D^{below}$	0.612***	0.389***
	(0.007)	(0.012)
TDE^{*} D^{above*} Legalization		0.0146
		(0.024)
TDE^{*} D^{below} * Legalization		0.261***
		(0.013)
Legalization		0.00629***
		(0.002)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Clustered at Firm Level	Yes	Yes
N	273,248	273,248
# of firms	24,488	24,488
Adj. R^2	0.147	0.149

Panel B: Long term debt deflated by the market value of equity		
	(1) $\Delta D_{ict}/A_{ict}$	(2) $\Delta D_{ict}/A_{ict}$
TDE $*D^{above}$	0.418***	0.409***
	(0.004)	(0.010)
TDE $*D^{below}$	0.445***	0.310***
	(0.006)	(0.015)
TDE $*D^{above*}$ Legalization		0.00993
		(0.010)
TDE $*D^{below*}$ Legalization		0.148***
		(0.015)
Legalization		−0.0105***
		(0.002)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Clustered at Firm Level	Yes	Yes
N	251,166	251,166
# of firms	22,582	22,582
Adj. R^2	0.284	0.285

The table shows the estimated regression results of the equations $\Delta\frac{D_{ict}}{A_{ict}} = \alpha_1 + \alpha_2 TDE_{ict} * D_{ict}^{above} + \alpha_3 TDE_{ict} * D_{ict}^{below} + \delta_i + \gamma_t + \varepsilon_{ict}$ in column (1), and the results of $\Delta\frac{D_{ict}}{A_{ict}} = \alpha_1 + \alpha_2 Legalization_{ct} + \alpha_3 TDE_{ict} * D_{ict}^{above} + \alpha_4 TDE_{ict} * D_{ict}^{below} + \alpha_5 TDE_{ict} * D_{ict}^{above} * Legalization_{ct} + \alpha_6 TDE_{ict} * D_{ict}^{below} * Legalization_{ct} + \delta_i + \gamma_t + \varepsilon_{ict}$ in column (2). The former equation estimates the capital structure adjustment speed without, the latter estimates with the legalization of share repurchases. I use as leverage measures long-term debt to book value of equity in Panel A and long-term debt to market value of equity in Panel B, respectively. The variables are described in Table 1. The interaction terms, $TDE^{*}D^{above*}Legalization$ and $TDE\ ^{*}D^{below*}\ Legalization$, indicate the law change's asymmetric effect on two firms, one above and the other below optimal leverage. I include firm and year fixed effects in all regressions. The standard errors clustered by firm are in parentheses, and ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

LDLeverageBV as the leverage measure. The coefficients of this pooled sample, significant at the one percent level, show that above-target and below-target firms adjust their leverage by 26.1 percent and 61.2 percent, respectively, per year. The results in column (2), for the same sample and using the same leverage measure, but with the legalization event, staggered for each country, corresponding to the results for Equation (3). The coefficient of the interaction term with the share repurchase legalization event, 0.261, shows firms' leverage adjustment speed to improve by 67.1 % (=0.261/0.389) compared with the pre-legalization period. This is in line with my main hypothesis; the legalization of share repurchases prompts below-target firms to increase leverage towards a target more than in the pre-legalization period. The insignificant coefficient of above-target leverage implies that this effect is inconclusive for or not experienced by above-target firms.

Panel B of Table 5 reports the results of the same exercise, but with the market leverage measure related to long-term debt. Column (2) of Panel B shows the improved adjustment speed for below-target firms to be 47.7 % (=0.148/0.310), which is somewhat lower than the effect when the book value measure is used. Using *LDLeverageMV* instead of *LDLeverageBV* as the leverage measure results in a lower improvement in the post-legalization event adjustment speed. This is accounted for by the fact that *LDLeverageMV*, because it incorporates market perceptions of a company's valuation, cannot be as freely adjusted by firms as *LDLeverageBV*.

The regression results reported in Table A1, which correspond to those reported in Table 5, but using Byoun's (2008) measure, show post-legalization event target adjustment speed for below-target firms to improve by 63.6 % compared to the pre-legalization period. These results are significant at the one percent level.

The results of all three measures of leverage (using long-term debt, book valuation, and market valuation) show the leverage adjustment speeds for the pooled sample to improve significantly in the wake of the share repurchase legalization event. These results mostly align with three major findings of the Wang et al. (2021) study using actual repurchases. One, the authors show that below-target firms and firms that deviated more from their targets tended to repurchase more shares after the share repurchase legalization event. Two, the study maintains that below-target firms increase their absolute leverage by repurchasing shares after the practice has been legalized. These findings support my results since lower adjustment costs incentivize for firms to repurchase more shares to get closer to their target leverage. There, the authors claim that firms' (both above- and below-target) share repurchases reduce the distance to their target leverage. This result is harder to compare with my results as the respective studies compare different samples of firms and employ different methods. This result from the Wang et al. (2020) study is likely driven by below-target firms as share repurchases do not help above-target firms move towards a target leverage. That actual repurchases mechanically increase below-target firms' leverage by reducing the denominator raises the concern of selection bias. Using an unrestricted sample and expected adjustment cost framework, I show such improvements to be due to the change in expected adjustment cost. Improvements in below-target firms' adjustment speed can thus be seen directly regardless of their post-legalization event repurchase behavior.

My next analysis investigates whether the same incremental effect is observed at the individual country level. Table 6 reports the results of running the Equation (3) regression on each country of the sample. Based on the coefficient of the interaction term, $TDE^{*}D^{below*}Legalization$, leverage adjustment speed post-legalization event significantly improves in ten countries: Canada, China, Germany, Japan, Netherlands, Singapore, South Africa, South Korea, Switzerland, and Turkey. The impact of the share repurchase legalization is thus not driven by a few outliers, but prevalent across two-thirds of the sample's total countries at the individual level.

Table 6
Country-wise regression.

Country	TDE* D^{above*} Legalization	TDE* D^{below*} Legalization	TDE* D^{above}	TDE* D^{below}	Legalization	Obs.	# of Firms	R-Squared
Canada	0.104*	0.279***	0.150***	0.329***	0.0228**	30,020	4,084	0.155
	(0.056)	(0.091)	(0.054)	(0.090)	(0.011)			
China	−0.0201	0.0576*	0.353***	0.675***	0.0135***	41,226	4,936	0.258
	(0.017)	(0.032)	(0.016)	(0.030)	(0.002)			
Germany	0.0208	0.187***	0.228***	0.466***	0.00857*	17,795	1,364	0.2
	(0.027)	(0.037)	(0.023)	(0.034)	(0.004)			
Greece	−0.406***	0.0656	0.436***	0.570***	−0.00162	4,530	387	0.038
	(0.125)	(0.091)	(0.045)	(0.086)	(0.011)			
Israel	−0.253**	0.0175	0.480***	0.462***	0.011	5,032	608	0.099
	(0.115)	(0.154)	(0.110)	(0.148)	(0.012)			
Japan	0.0137**	0.279***	0.181***	0.243***	0.00144	90,040	5,161	0.2
	(0.007)	(0.012)	(0.007)	(0.011)	(0.001)			
Netherlands	0.0184	0.419***	0.320***	0.166**	0.00486	4,593	388	0.225
	(0.082)	(0.094)	(0.079)	(0.072)	(0.011)			
New Zealand	−0.373**	−0.27	0.849***	0.924***	−0.0672**	1,329	199	0.3
	(0.168)	(0.166)	(0.156)	(0.139)	(0.027)			
Singapore	−0.103**	0.284***	0.395***	0.395***	−0.0187***	10,279	915	0.257
	(0.053)	(0.092)	(0.051)	(0.092)	(0.007)			
South Africa	0.0593	0.197***	0.314***	0.474***	0.00249	7,048	710	0.204
	(0.060)	(0.067)	−0.049	−0.057	−0.006			
South Korea	−0.202	0.673***	0.525	0.201	0.0192	27,358	2,577	0.163
	(0.545)	(0.201)	−0.542	−0.199	−0.084			
Spain	0.608	−0.0643	−0.363	0.475***	0.0637	2,911	267	0.019
	(0.588)	(0.072)	−0.603	−0.059	−0.044			
Switzerland	0.157**	0.382***	0.126**	0.177**	0.00539	5,074	366	0.205
	(0.067)	(0.081)	(0.062)	(0.075)	(0.010)			
Taiwan	−0.0954	0.19	0.470***	0.662***	−0.0103	21,929	2,168	0.349
	(0.077)	(0.116)	(0.077)	(0.116)	(0.009)			
Turkey	−0.182*	0.306**	0.496***	0.524***	−0.00355	4,084	358	0.216
	(0.093)	(0.121)	(0.070)	(0.050)	(0.008)			

The table shows the estimated regression results of the equation $\Delta \frac{D_{ict}}{A_{ict}} = \alpha_1 + \alpha_2 Legalization_{ct} + \alpha_3 TDE_{ict} * D_{ict}^{above} + \alpha_4 TDE_{ict} * D_{ict}^{below} + \alpha_5 TDE_{ict} * D_{ict}^{above} * Legalization_{ct} + \alpha_6 TDE_{ict} * D_{ict}^{below} * Legalization_{ct} + \gamma_i + \varepsilon_{ict}$ for each country in the sample. The equation estimates the capital structure adjustment speed with the legalization of share repurchases, where the leverage measure is long-term debt to book value of equity. The variables are described in Table 1. γ_i is firm fixed effects. The interaction terms, $TDE^{*}D^{above*}$ *Legalization* and $TDE^{*}D^{below*}$ *Legalization*, indicate the law change's asymmetric effect on firms above and below optimal leverage. The leverage measure is long-term debt to book value of equity. I include firm and year fixed effects in all regressions. The standard errors clustered by firm are in parentheses, and ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

4.3. Use of dynamic panel models and GMM techniques to estimate the leverage-adjustment effect

My use of dynamic panel models and GMM techniques to estimate target leverage is an extension of Byoun (2008). When included as a regressor, the lagged explanatory variable helps to capture the effect of change in leverage over multiple periods, and also controls for omitted variable bias. I use the GMM (systems GMM) approach to address the endogeneity issue of the lagged explanatory variable correlating with the error term. As Arellano and Bover (1995) and Blundell and Bond (1998) observe, this approach involves two equations, the original level, and first-differenced. For instruments, the approach uses lagged difference for the original level and a lag level for the first-differenced equation.

This methodology has been employed by many recent finance studies, including Flannery and Hankins (2013), Bonaimé et al. (2014), and Halling et al. (2016). Following Flannery and Hankins (2013) and Bonaimé et al. (2014), I write the partial adjustment model for firms' leverage adjustment as:

$$LEV_{ict+1} - LEV_{ict} = \lambda(LEV^{*}_{ict+1} - LEV_{ict}) + \varepsilon_{ict+1} \tag{9}$$

where L_{ict} is the leverage of firm i in country c in year t, LEV^{*} is the target leverage, and λ is the capital structure adjustment speed. L^{*}_{i} can be further written as the estimated value from the equation:

$$LEV^{*}_{it+1} = \beta X_i \tag{10}$$

where X_i is a vector of firm-specific variables that determine the firm's target leverage. The vector consists of earnings before interest and taxes scaled by total assets, market to book, depreciation scaled by total assets, the natural log of total assets, fixed assets (net PPE) scaled by total assets, an indicator for positive research and development (R&D) expenses, R&D expense scaled by total assets, and the industry median debt ratio.

Substituting Equation (10) into Equation (9) yields:

$$LEV_{ict+1} - LEV_{ict} = \lambda((\beta X_i)_{ct+1} - LEV_{ict}) + \varepsilon_{ict+1}$$

$$LEV_{ict+1} = \lambda(\beta X_i)_{ct+1} - (1-\lambda)LEV_{ict} + \varepsilon_{ict+1}$$

which, after including firm and year fixed effects, can be written as:

$$LEV_{ict+1} = \lambda(\beta X_i)_{ct+1} - (1-\lambda)LEV_{ict} + \delta_i + \gamma_t + \varepsilon_{ict+1} \tag{11}$$

where δi and γ_t are firm and year fixed effects, respectively. I estimate the dynamic panel Equation (11) with systems GMM for each country and each year separately to obtain the estimated target leverage, against which I run the DID regressions as in the previous section to see whether the legalization of share repurchases has a meaningful impact on the expected cost reduction for below-target firms' capital structure adjustments.

Table 7 shows the DID estimated Equation (3) with the revised estimated target leverage value produced using a dynamic panel method that incorporates lagged leverage as an explanatory variable in the regression, which is solved using the systems GMM approach described above. Columns (1) and (2) present the results for two of my main leverage matrices, *LDLeverageBV* and *LDLeverageMV*.

The earlier conclusion that the legalization of share repurchases reduces expected leverage adjustment costs for below-target firms, leading to a significant increase in post-legalization leverage adjustment speeds, holds for the updated measure of target leverage. I find that independent of the measures used, legalizing share repurchases significantly reduces expected leverage adjustment costs for below-target firms. This analysis confirms that the results of my previous analysis using the target leverage calculated via the Ordinary Least Squares (OLS) approach outlined in Byoun (2008) are robust to employing a complicated dynamic panel and systems GMM approach.

4.4. Dynamic analysis

A parallel trend in DID analysis is a key assumption that implies that treatment and comparison groups' pre-treatment outcomes may differ in terms of levels but should follow similar trends. My research design compares the below-target firms' capital structure adjustment speeds post-legalization with their behavior during the pre-legalization period. The dynamic analysis shows that these firms exhibited no significant increase in capital structure adjustment speed until after the legalization of share repurchases.

For the dynamic model, I define five dummy variables, each equal to one if the year is the year before the legalization of share repurchases, the legalization year, the year after the legalization event, two years after the legalization event, more than two years after the legalization event, respectively. They are and zero otherwise. Replacing the legalization dummy in Equation (3) with these five dummies yields:

Table 7
Regression results using the GMM method.

	(1) $\Delta D_{ict}/A_{ict}$	(2) $\Delta D_{ict}/A_{ict}$
Legalization	−0.0141***	−0.0256***
	(0.003)	(0.003)
TDE*D^{above*} Legalization	0.0246	−0.0136
	(0.037)	(0.038)
TDE*D^{below*} Legalization	0.250***	0.181***
	(0.037)	(0.015)
TDE*D^{above}	0.303***	0.379***
	(0.032)	(0.037)
TDE*D^{below}	0.197***	0.130***
	(0.027)	(0.014)
Constant	0.0187***	0.0356***
	(0.005)	(0.009)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Clustered at firm level	Yes	Yes
Observations	237,527	222,577
Number of companyid	22,840	21,937
R-squared	0.149	0.086

The table shows the estimation results of the equation $\Delta\frac{D_{ict}}{A_{ict}} = \alpha_1 + \alpha_2 Legalization_{ct} + \alpha_3 TDE_{ict} * D_{ict}^{above} + \alpha_4 TDE_{ict} * D_{ict}^{below} + \alpha_5 TDE_{ict} * D_{ict}^{above} * Legalization_{ct} + \alpha_6 TDE_{ict} * D_{ict}^{below} * Legalization_{ct} + \delta_i + \gamma_t + \varepsilon_{ict}$, where TDE_{ict} measures the distance to the target leverage and the target is estimated using a dynamic panel/GMM approach. I estimate the dynamic panel equation $LEV_{ict+1} = \lambda(\beta X_i)_{ct+1} - (1-\lambda)LEV_{ict} + \delta_i + \gamma_t + \varepsilon_{ict+1}$, to calculate the target leverage. LEV_{ict} and LEV_{ict+1} are leverage measures that use either book or market leverage with long-term debt at time t + 1 and t for country c at time t. X_i is a vector of firm-specific variables that determine the firms' target leverage. δ_t and ω_i are the year and firm fixed effects. Using a lagged leverage measure in the explanatory variables improves the target estimation. The endogeneity issue of the lagged explanatory variable correlating with the error term is overcome by estimating the equation with the GMM (systems GMM) approach. Column (1) shows the results using leverage measured using long-term debt and the book value of equity, column (2) the same using long-term debt and market value of equity. The standard errors clustered by firm are in parentheses, and ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

$$\begin{aligned}\Delta\frac{D_{ict}}{A_{ict}} = {} & \alpha_1 + \alpha_2 Before_{ct}^{1yr} + \alpha_3 After_{ct}^{0} + \alpha_4 After_{ct}^{1yr} + \alpha_5 After_{ct}^{2yr} + \alpha_6 After_{ct}^{2yrs+} + \alpha_7 TDE_{ict} * D_{ict}^{above} + \alpha_8 TDE_{ict} * D_{ict}^{below} \\ & + \alpha_9 TDE_{ict} * D_{ict}^{above} * Before_{ct}^{1yr} + \alpha_{10} TDE_{ict} * D_{ict}^{above} * After_{ct}^{0} + \alpha_{11} TDE_{ict} * D_{ict}^{above} * After_{ct}^{1yr} + \alpha_{12} TDE_{ict} * D_{ict}^{above} \\ & * After_{ct}^{2yrs} + \alpha_{13} TDE_{ict} * D_{ict}^{above} * After_{ct}^{2yrs+} + \alpha_{14} TDE_{ict} * D_{ict}^{below} * Before_{ct}^{1yr} + \alpha_{15} TDE_{ict} * D_{ict}^{below} * After_{ct}^{0} \\ & + \alpha_{16} TDE_{ict} * D_{ict}^{below} * After_{ct}^{1yr} + \alpha_{17} TDE_{ict} * D_{ict}^{below} * After_{ct}^{2yrs} + \alpha_{13} TDE_{ict} * D_{ict}^{below} * After_{ct}^{2yrs+} + \delta_i + \gamma_t + \varepsilon_{ict} \end{aligned} \quad (8)$$

When the regression is estimated for two of my main leverage matrices, all the coefficients of dummies that interact with below target firms are significant except the ones that indicate the year before the legalization of share repurchases. Results are reported in Table 8. Columns (1) and (2) show the results for the main leverage measures *LDLeverageBV* and *LDLeverageMV*, respectively, to be in line with the predictions. The coefficients of interaction terms related to below-target firms are significant at 1 % except for $TDELDBV*D^{below}*Before^{1yr}$. These results confirm that capital structure adjustment speed exhibited no significant increase before the year in which share repurchases were legalized and that subsequent to legalization, the resulting reduction in the expected cost of capital structure adjustment led below-target firms to improve their adjustment speed.

5. Robustness tests

5.1. Adoption and adoption years

I explore whether my results are more pronounced when the legalization year is replaced by the adoption year. I define the adoption year as the year in which share repurchases are expected to increase abruptly following the legalization of share repurchases. I use the Securities Data Company (SDC) database to identify each country's open market share repurchase announcement and cross-check these with Worldscope's data on actual share repurchases. When share repurchase intensity, measured as total per year share repurchases in a particular market divided by the previous year's total book value, increases abruptly, I note the corresponding adoption year.

Fig. 1 plots the average share repurchase intensity for the share repurchase legalization and adoption years. Table A2 reports the same information in table format for four years before and four years after share purchase legalization. The three columns on the left in Table A2 show the legalization and adoption years for each country represented in the sample. I analyze the statistical significance of these breakpoints with the Chow test for structural breaks with the null hypothesis that

Table 8
Dynamic analysis.

	$\Delta D_{ict}/A_{ict}$ (1)	$\Delta D_{ict}/A_{ict}$ (2)
$TDE^{*}D^{above*}Before^{1yr}$	0.0286	0.0615
	(0.032)	(0.052)
$TDE^{*}D^{above*}After^{0}$	0.0536**	0.0764***
	(0.026)	(0.017)
$TDE^{*}D^{above*}After^{1yr}$	0.0494	0.0845
	(0.030)	(0.072)
$TDE^{*}D^{above*}After^{2yrs}$	0.0825***	0.132***
	(0.026)	(0.019)
$TDE^{*}D^{above*}After^{2yrs+}$	0.0502***	0.0427***
	(0.016)	(0.007)
$TDE^{*}D^{below*}Before^{1yr}$	0.0239	0.0374
	(0.021)	(0.029)
$TDE^{*}D^{below*}After^{0}$	0.204***	0.197***
	(0.048)	(0.027)
$TDE^{*}D^{below*}After^{1yr}$	0.0887***	0.130***
	(0.017)	(0.020)
$TDE^{*}D^{below*}After^{2yr}$	0.248***	0.269***
	(0.031)	(0.034)
$TDE^{*}D^{below*}After^{2yrs+}$	0.193***	0.168***
	(0.010)	(0.009)
$Before^{1yr}$	0.0103***	0.0165***
	(0.003)	(0.003)
$After^{0}$	0.0038	−0.00169
	(0.003)	(0.002)
$After^{1yr}$	0.0112***	−0.00116
	(0.003)	(0.002)
$After^{2yrs}$	0.0039	−0.0185***
	(0.003)	(0.002)
$After^{2yrs+}$	0.0072***	−0.00594***
	(0.002)	(0.001)
$TDE^{*}D^{above}$	0.203***	0.362***
	(0.023)	(0.009)
$TDE^{*}D^{below}$	0.395***	0.237***
	(0.012)	(0.013)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Clustered at firm level	Yes	Yes
N	273,248	251,166
# of firms	24,488	22,582
Adj. R^2	0.152	0.291

The table shows the estimated regression results of the equation $\Delta\frac{D_{ict}}{A_{ict}} = \alpha_1 + \alpha_2 Before_{ct}^{1yr} + \alpha_3 After_{ct}^{0} + \alpha_4 After_{ct}^{1yr} + \alpha_5 After_{ct}^{2yr} + \alpha_6 After_{ct}^{2yrs+} + \alpha_7 TDE_{ict} * D_{ict}^{above} + \alpha_8 TDE_{ict} * D_{ict}^{below} + \alpha_9 TDE_{ict} * D_{ict}^{above} * Before_{ct}^{1yr} + \alpha_{10} TDE_{ict} * D_{ict}^{above} * After_{ct}^{0} + \alpha_{11} TDE_{ict} * D_{ict}^{above} * After_{ct}^{1yr} + \alpha_{12} TDE_{ict} * D_{ict}^{above} * After_{ct}^{2yrs} + \alpha_{13} TDE_{ict} * D_{ict}^{above} * After_{ct}^{2yrs+} + \alpha_{14} TDE_{ict} * D_{ict}^{below} * Before_{ct}^{1yr} + \alpha_{15} TDE_{ict} * D_{ict}^{below} * After_{ct}^{0} + \alpha_{16} TDE_{ict} * D_{ict}^{below} * After_{ct}^{1yr} + \alpha_{17} TDE_{ict} * D_{ict}^{below} * After_{ct}^{2yrs} + \alpha_{13} TDE_{ict} * D_{ict}^{below} * After_{ct}^{2yrs+} + \delta_i + \gamma_t + \varepsilon_{ict}$ The variables are described in Table 1. δ_t and γ_i are year and firm fixed effects, respectively. Columns (1) and (2) show the results for the leverage measures, long-term debt to book value of equity and long-term debt to market value of equity, respectively. The standard errors clustered by firm are in parentheses, and ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

there is no structural break at the identified break date. The Wald statistics being higher than the critical value, I can reject the null hypothesis and confirm that identified break dates and adoption years are statistically significant for each country.

I next run the same regressions with the adoption year using my primary leverage measure, *LDLeverageBV*. Table A3 shows that the leverage adjustment speed of below-target firms that adopt share repurchases increases significantly, by 62.9 % (=0.256/0.407) compared to the pre-adoption period. This incremental speed of adjustment is mostly at the same level as that associated with the legalization event (67.1. %). Differences emerge when individual countries are analyzed, as shown in Table A4. Leverage adjustment speed increases significantly relative to the pre-adoption period for below-target firms in 13 countries compared to 10 when the legalization event is considered. Firms' post-adoption leverage adjustment speed increases significantly relative to the pre-adoption period in Canada, China, Germany, Greece, Israel, Japan, South Korea, Netherlands, Singapore, South Africa, Switzerland, Taiwan, and Turkey. Further, compared with the legalization analysis, the interaction term $TDE^{*}D^{below*}Adaption$ results in improved coefficients for six countries: China, Greece, Israel, South Korea, Taiwan, and Turkey.

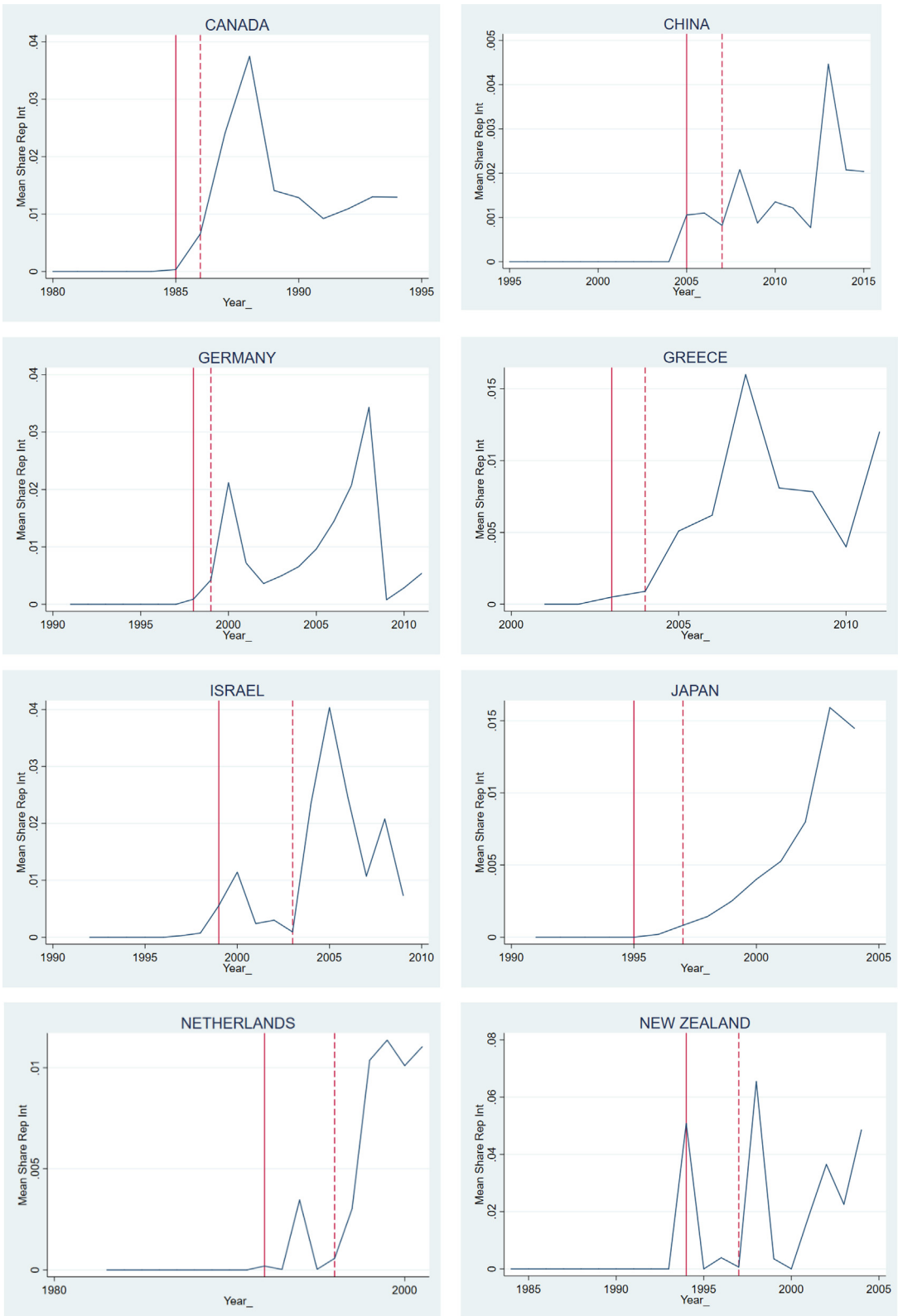
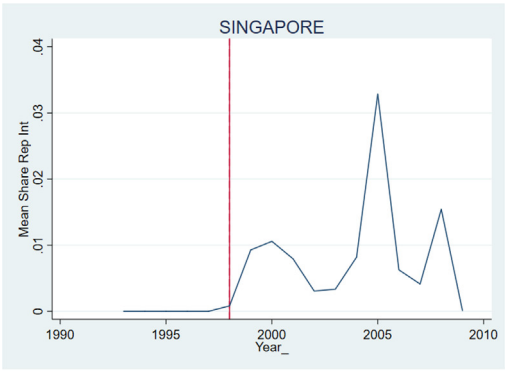
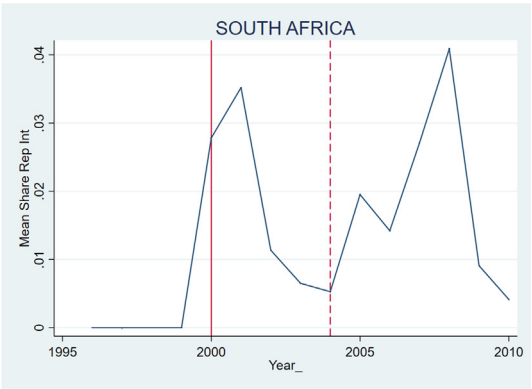
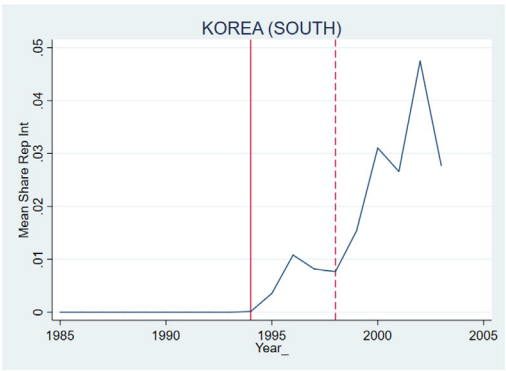
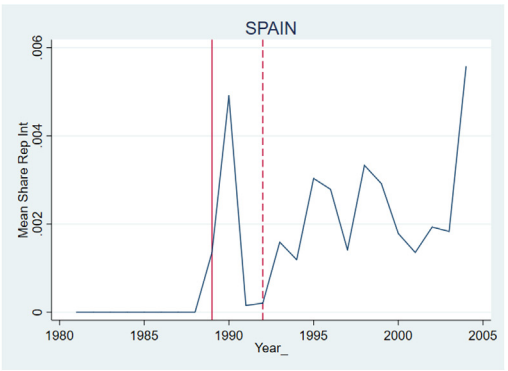


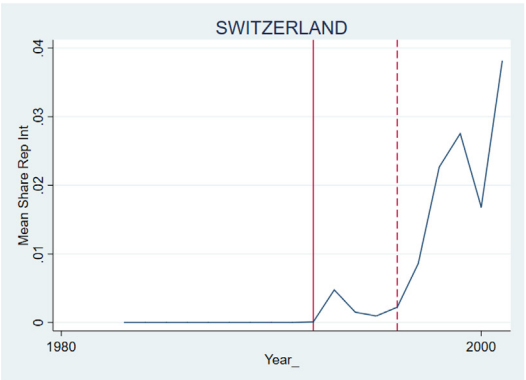
Fig. 1. Defining the adoption years. The figure graphically represents the legalization and adoption of share repurchases for each country. The solid line shows the legalization event, the dashed line shows the adoption year of share repurchases. The break dates were calculated by identifying when the intensity of share repurchases increased abruptly, using the Chow test for structural breaks; with the null hypothesis, there is no structural break at the identified break date.

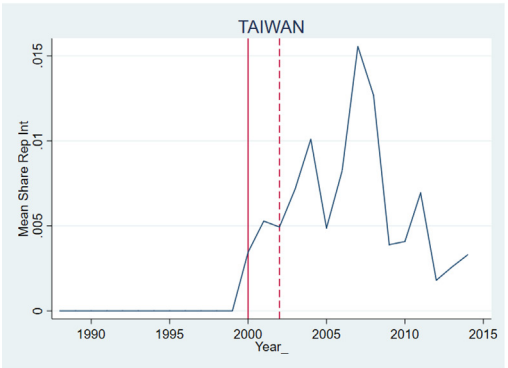












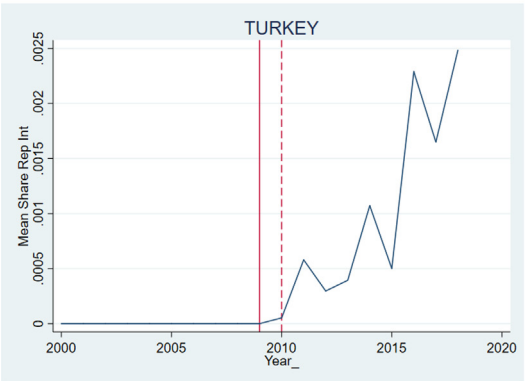


Fig. 1 (*continued*)

5.2. Trimmed sample analyses with only five each pre- and post-legalization/adoption years

Using a small, equal number of years (five) pre- and post-legalization/adoption, I analyze how firms in individual countries responded to the legalization event. This analysis enables me to alleviate interferences resulting from intermittent incidents likely to have occurred over the full study period, the long 39-year period from 1980 to 2018. In addition, it allows me to directly compares the effect of adoption with that of legalization.

Table A5 shows the regression analyses of legalization and adoption for the trimmed sample. Leverage adjustment speed improves significantly for below-target firms post-legalization compared to pre-legalization in nine countries: Canada, China, Germany, Greece, Japan, Singapore, Switzerland, Taiwan, and Turkey. However, post-adoption compared to pre-adoption, leverage adjustment speed improves significantly for below-target firms in 12 countries: Canada, China, Germany, Greece, Israel, Japan, South Korea, Netherlands, Singapore, Switzerland, Taiwan, and Turkey. Of these, six countries (China, Israel, Netherlands, South Korea, Switzerland, and Turkey) show improved coefficients compared to the legalization analysis. Two key conclusions can be drawn from the trimmed sample. One, the effect of legalization/adoption is robust to analysis using a small, equal number of years around the legalization/adoption event. Two, considering adoption instead of legalization has a meaningful effect in most countries and provides stronger results.

6. Do share repurchases affect financing behavior?

Before legalization of share repurchases, below-target firms primarily met their leverage adjustment needs by drawing debt. However, issuing debt can exacerbate agency conflicts and incurs interest costs. I thus expect to see below-target firms shift away from debt towards share repurchases upon their legalization.

In addition, I test whether there is a change in equity issuance, another way of adjusting leverage. Because it only further lowers leverage, it is unlikely to be useful to below-target firms before or after the legalization of share repurchases. Hence, I do not expect the legalization of share repurchases to have any significant impact on equity issuance by below-target firms.

test this paradigm by estimating the following model:

$$Y_{ict} = \alpha_0 + \alpha_1 * Legalization_{ct} + \beta X_{ict} + \delta_i + \gamma_t + \varepsilon_{ict} \quad (12)$$

where Y_{ict} is the total debt or equity issuance of firm i in country c; X_{ict} is a vector of control variables that predicts debt or equity issuance, including total assets, net sales, net income, leverage, return on assets (RoA), sales growth, earnings before interest and tax (EBIT) to sales, property, plant, and equipment to net sales (PPE) to sales, quick ratio, and market share; and δ_i and γ_t are firm and year-fixed effects, respectively.

Table 9 reports regression results for Equation (12) for the below-target firms. Column (1) shows the below-target firms' debt issuance to decline significantly, by 1.5 %, but equity issuance to exhibit no impact subsequent to the legalization of share repurchases. Consistent with the previous discussion, I interpret this result to suggest that below-target firms perceive share repurchases as a low-cost substitute for debt in adjusting leverage, and therefore confirm my main argument, that firms tend to switch to new low-cost solutions to adjust their capital structure more effectively.

7. Cross-sectional analysis

My cross-sectional analysis investigates three channels—tax, institutional quality, and restrictions on share repurchases—by which country-level features influence reductions in the cost of capital structure adjustment following the legalization of share repurchases.

7.1. Taxation and effectiveness of share repurchases on capital structure adjustment

Repurchases are taxed as capital gains, and dividends as ordinary income. One explanation for different capital structure adjustment speeds could thus be the tax difference between capital gains and ordinary income. In countries with higher tax differences, share repurchases are more tax-efficient than dividends as a way of distributing payouts. I calculate, separately for the 15 countries in my sample, the average tax difference between capital gains and ordinary income for each of the post-legalization years from the share repurchase legalization year to 2018, and arrange the countries in ascending order of post-legalization tax difference. China has a post-legalization median tax difference of 6.79 % in this sorted list. I then divide my sample into two sub-samples: countries in which post-legalization tax difference is lower, and those in which it is higher, than China's. Countries with a tax imputation system that falls into the sub-sample of higher tax differences are included in the sub-sample of countries with low tax differences. Under an imputation system, tax is collected first as "company tax," and shareholder dividends are credited with these "company tax" payments, termed imputation credits. The effect of a tax difference between capital gains and ordinary income, and thus the incentive for companies to choose share repurchases over dividends, is lower in these countries. Two of the countries in my sample with tax imputation systems, New Zealand and Spain, are included in the sub-sample with a lower tax difference between capital gains and ordinary income. My first sub-sample, of countries with lower tax differences, includes Singapore (0 %), Taiwan (0 %), South Africa (1.95 %), Japan (3.44 %), Greece (5.06 %), New Zealand (6.42 % imputed), and Spain (8.38 % imputed), the second sub-sample, of countries

Table 9
Debt and equity issuance.

	(1) Debt issuance	(2) Equity issuance
Legalization	−1.504***	1.357
	(0.266)	(0.871)
Total_Assets	2.948***	16.80***
	(0.331)	(1.513)
Net_Sales	−2.528***	−16.67***
	(0.311)	(1.920)
Net_Income	0.438***	0.105
	(0.089)	(0.300)
Leverage	0.376***	−0.208***
	(0.014)	(0.038)
RoA	−0.207***	0.795***
	(0.020)	(0.119)
Sales_Growth	0.0346***	0.228***
	(0.004)	(0.049)
Ebit_to_sales	0.00575	0.0665**
	(0.005)	(0.029)
PPE_to_Sales	0.000141	−0.00304
	(0.000)	(0.002)
Quick_Ratio	−0.00452	0.839**
	(0.035)	(0.394)
Market_Share	−1.465	−1.174
	(1.503)	(2.748)
Constant	−13.80***	−10.18
	(4.835)	(22.840)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Clustered at firm level	Yes	Yes
N	73,487	72,232
R-squared	0.127	0.13

The table shows the change of expected debt and equity issuances of below-target frims following the legalization of share repurchases. The table estimates the equation $Y_{ict} = \alpha_0 + \alpha_1 * Legalization_{ct} + \beta X_{ict} + \delta_i + \gamma_t + \varepsilon_{ict}$, for below-target firms. Y_{ict} is the change of debt or equity issuances of firm i in country c at time t, X_{ict} a vector of control variables that predicts debt or equity issuances. The standard errors clustered by firm are in parentheses, and ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

with a higher average tax difference between capital gains and ordinary income, Canada (6.72 %), Netherlands (17.31 %), Israel (18.4 %), Turkey (19.44 %), Germany (19.5 %), South Korea (31.5 %), and Switzerland (33.1 %).

Table 10 presents the sub-sample regressions of the low tax difference and high tax difference groups using four of my main leverage metrics. Results are shown with respect to each main measure, *LDLeverageBV,* and *LDLeverageMV*. Column (1) presents countries with low, and column (2) those with high, tax differences for *LDLeverageBV*. Columns (3) and (4) are the same for *LDLeverageMV*. It can be seen that capital adjustment speed increases more after the legalization of share repurchases for (below-target) firms in the group with a larger than in the group with a lower tax difference between capital gains and ordinary income. In column (4), for example, the effect of share repurchase legalization when the tax difference is high is 67.9 % (=0.220/0.324), and in column (3), 51.0 % (=0.130/0.255). Overall, a higher tax difference between capital gains and ordinary income during the post-legalization years encourages firms to make greater use of share repurchases, which is reflected in improved capital structure adjustment speeds.

7.2. Institutional quality and effectiveness of share repurchases on capital structure adjustment

Ellahie and Kaplan (2021) show that counties with weaker institutions tend to pay out more of their current earnings to reduce agency conflicts and attract new investors, which can make initiating a dividend stream costly. An instrument like share repurchases, which entails no attendant commitments, fits such contexts well, reducing agency conflicts and simultaneously facilitating capital structure adjustment.

I use normalized institutional quality from Ellahie and Kaplan (2021) to divide the sample into subgroups of high institutional quality and low institutional quality countries. Ellahie and Kaplan (2021) obtain data for 85 countries from the World Bank's Worldwide Governance Indicator data set and sum four measures of control—corruption, regulatory quality, the rule of law, and government effectiveness—to arrive at an institutional quality measure. The authors normalize this score

Table 10
The impact of share repurchases and tax rates.

	(1) Low Tax Difference $\Delta D_{ict}/A_{ict}$	(2) High Tax Difference $\Delta D_{ict}/A_{ict}$	(3) Low Tax Difference $\Delta D_{ict}/A_{ict}$	(4) High Tax Difference $\Delta D_{ict}/A_{ict}$
	Long term debt deflated by book value of assets		Long term debt deflated by market value of assets	
Legalization	0.00654*	−0.00259	−0.0138***	−0.0142***
	(0.004)	(0.007)	(0.002)	(0.004)
TDE*D^{above}* Legalization	0.0355	−0.0139	0.00254	−0.0162
	(0.040)	(0.038)	(0.012)	(0.020)
TDE*D^{below}* Legalization	0.255***	0.280***	0.130***	0.220***
	(0.014)	(0.026)	(0.016)	(0.028)
TDE*D^{above}	0.195***	0.290***	0.410***	0.440***
	(0.043)	(0.036)	(0.012)	(0.019)
TDE*D^{below}	0.341***	0.399***	0.255***	0.324***
	(0.012)	(0.024)	(0.015)	(0.027)
Constant	−0.0408***	−0.011	0.00705	0.0373***
	(0.011)	(0.007)	(0.005)	(0.009)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Clustered at firm level	Yes	Yes	Yes	Yes
Observations	138,066	93,956	132,407	85,961
Number of companyid	9,807	9,745	9,358	9,101
R-squared	0.119	0.164	0.28	0.311

The table shows the regression results of the equation $\Delta\frac{D_{ict}}{A_{ict}} = \alpha_1 + \alpha_2 Legalization_{ct} + \alpha_3 TDE_{ict} * D_{ict}^{above} + \alpha_4 TDE_{ict} * D_{ict}^{below} + \alpha_5 TDE_{ict} * D_{ict}^{above} * Legalization_{ct} + \alpha_6 TDE_{ict} * D_{ict}^{below} * Legalization_{ct} + \delta_i + \gamma_t + \varepsilon_{ict}$, with the variables defined as usual and the regressions estimated on sub-samples to show countries' tax differences. Columns (1) and (2) compare countries in the low and high halves. They indicate the results when the sub-samples are analysed based on the country's tax difference between capital gains, to which share repurchases are subject, and ordinary income, to which dividends are subject. Column (1) shows the results of the first half, with low tax difference, column (2) the same for the second half, countries with high tax difference. Columns (3) and (4) make the same comparison as columns (1) and (2) using long-term debt to market value of equity as the leverage measure. The interaction terms TDE*D^{above}*Legalization and TDE*D^{below}* Legalization capture the effect of share repurchase legalization for the above- and below-target firms compared to the pre-legalization period. The standard errors clustered by firm are in parentheses, and ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

such that zero signifies countries with the poorest quality and one with the countries with the highest quality institutions. Japan (with normalized institutional quality of 0.76) being the median when the countries are arranged in ascending order, I assign countries with a value below 0.76 (including China (0.38), Turkey (0.46), South Africa (0.62), South Korea (0.65), Greece (0.66), Taiwan (0.7), and Israel (0.76)) to the low institutional quality group and countries with a value above 0.76 (including Spain (0.84), Germany (0.93), Canada (0.96), Switzerland (0.97), Netherlands (0.99), New Zealand (0.99), and Singapore(1.00)) to the high institutional quality group.

Table 11 presents the sub-sample regressions of the low and high institutional quality groups. Column (1) presents the countries with low institutional quality, column (2) those with high institutional quality for *LDLeverageBV*. Columns (3) and (4) show the same for the measure *LDLeverageMV*.

It can be seen that regardless of the measure, the speed of capital structure adjustment improves for (below-target) firms in both groups after the legalization of share repurchases, the effect being stronger, however, for the low-institutional-quality than for the high-institutional-quality sub-sample.

When counties' institutional quality is weak, managers attempt to minimize firm-level agency conflicts and attract future sources of external capital by distributing a portion of current earnings as dividends (Ellahie and Kaplan, 2021). Share repurchases help below-target firms avoid continuously adjusting rigid dividends to move leverage towards a target, and their use minimizes agency conflicts as well. These benefits accrue especially to firms in countries in which institutional quality is poor. As can be seen, for example, in columns (3) and (4), respectively, the incremental effect for (below-target) firms through share repurchases is 60.9 % (=0.207/0.340) for countries with lower, and 42.9 % (=0.143/0.333) for countries with higher institutional quality, reflecting greater improvement in leverage adjustment speeds in the lower than in the higher institutional quality group.

7.3. Restrictions on share repurchases and their effect on capital structure adjustment

The impact of expected reductions in the cost of capital structure adjustment on below-target firms is likely to be lower in the face of greater restrictions on the use of share repurchases in the wake of their legalization. To determine whether greater post-legalization restrictions on share repurchases lead (below-target) firms to perceive the legalization event to be less effective, I perform a sub-sample analysis comparing the post-legalization leverage adjustment behavior of firms in two groups, one with lower and one with higher restrictions on share repurchases.

Firms in countries with a maximum 10 % volume restriction on share repurchases (including Canada (5 % of total shares), Germany (10 % of total shares), Greece (10 % of total shares), Singapore (10 % of total shares), and Turkey (10 % of total

Table 11
The impact of share repurchases and institutional quality.

	(1) Lower Inst Quality $\Delta D_{ict}/A_{ict}$	(2) Higher Inst Quality $\Delta D_{ict}/A_{ict}$	(3) Lower Inst Quality $\Delta D_{ict}/A_{ict}$	(4) Higher Inst Quality $\Delta D_{ict}/A_{ict}$
	Long term debt deflated by book value of assets		Long term debt deflated by market value of assets	
Legalization	0.00569	−0.00536	−0.0136***	−0.0196***
	(0.004)	(0.007)	(0.002)	(0.004)
TDE*D^{above}*Legalization	−0.102***	0.108	−0.00425	0.019
	(0.038)	(0.080)	(0.021)	(0.021)
TDE*D^{below}*Legalization	0.242***	0.184***	0.207***	0.143***
	(0.038)	(0.028)	(0.029)	(0.033)
TDE*D^{above}	0.405***	0.161**	0.460***	0.401***
	(0.035)	(0.081)	(0.021)	(0.021)
TDE*D^{below}	0.526***	0.424***	0.340***	0.333***
	(0.036)	(0.025)	(0.028)	(0.032)
Constant	−0.0430**	−0.0235*	−0.00621	0.0383***
	(0.017)	(0.014)	(0.017)	(0.008)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Clustered at firm level	Yes	Yes	Yes	Yes
Observations	111,207	72,001	100,400	65,239
Number of companyid	11,744	7,583	10,599	7,064
R-squared	0.16	0.138	0.329	0.288

The table shows the regression results of the equation $\Delta\frac{D_{ict}}{A_{ict}} = \alpha_1 + \alpha_2 Legalization_{ct} + \alpha_3 TDE_{ict} * D_{ict}^{above} + \alpha_4 TDE_{ict} * D_{ict}^{below} + \alpha_5 TDE_{ict} * D_{ict}^{above} * Legalization_{ct} + \alpha_6 TDE_{ict} * D_{ict}^{below} * Legalization_{ct} + \delta_i + \gamma_t + \varepsilon_{ict}$, with the variables defined as usual, the regressions are estimated on sub-samples to show the differences in countries' institutional quality. Columns (1) and (2) compare countries in the low and high halves. Column (1) shows the results of the first half, lower institutional quality, column (2) shows the same for the second half, countries with high institutional quality. Columns (3) and (4) make the same comparison of columns (1) and (2), using long term debt to market value of equity as the leverage measure. The interaction terms *TDE*D^{above}*Legalization* and *TDE*D^{below}*Legalization* capture the effect of share repurchase legalization for the above- and below-target firms compared to the pre legalization period. The standard errors clustered by firm are in the parentheses, and ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

Table 12
The impact of share repurchases and restrictions on share repurchases.

	(1) Lower Restrictions $\Delta D_{ict}/A_{ict}$	(2) Higher Restrictions $\Delta D_{ict}/A_{ict}$	(3) Lower Restrictions $\Delta D_{ict}/A_{ict}$	(4) Higher Restrictions $\Delta D_{ict}/A_{ict}$
	Long term debt deflated by book value of assets		Long term debt deflated by market value of assets	
Legalization	0.0168***	−0.0103**	−0.0190***	−0.0211***
	(0.002)	(0.004)	(0.002)	(0.003)
TDE*D^{above}*Legalization	0.0455	−0.0521**	−0.178***	−0.164***
	(0.036)	(0.025)	(0.005)	(0.007)
TDE*D^{below}*Legalization	0.304***	0.187***	0.309***	0.182***
	(0.016)	(0.027)	(0.006)	(0.008)
TDE*D^{above}	0.228***	0.301***	0.571***	0.586***
	(0.038)	−0.022	(0.006)	(0.010)
TDE*D^{below}	0.361***	0.445***	0.256***	0.335***
	(0.014)	(0.024)	(0.007)	(0.012)
Constant	−0.0446***	−0.0073	0.0222***	0.0425***
	(0.011)	(0.007)	(0.005)	(0.009)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Cluster at firm level	Yes	Yes	Yes	Yes
Observations	201,947	71,301	185,215	63,519
Number of companyid	16,992	7,496	15,567	6,966
R-squared	0.158	0.142	0.356	0.332

The table shows the regression results of the equation $\Delta\frac{D_{ict}}{A_{ict}} = \alpha_1 + \alpha_2 Legalization_{ct} + \alpha_3 TDE_{ict} * D_{ict}^{above} + \alpha_4 TDE_{ict} * D_{ict}^{below} + \alpha_5 TDE_{ict} * D_{ict}^{above} * Legalization_{ct} + \alpha_6 TDE_{ict} * D_{ict}^{below} * Legalization_{ct} + \delta_i + \gamma_t + \varepsilon_{ict}$, with the variables defined as usual, and the regressions are estimated on sub-samples to show the differences in restrictions on share repurchases. Columns (1) and (2) compare countries in the low and high halves. Column (1) shows the results of the first half, low restricted countries, column (2) the same for the second half, high restricted countries. The interaction terms *TDE*D^{above}*Legalization* and *TDE*D^{below}*Legalization* capture the effect of share repurchase legalization for the above- and below-target firms compared to the pre-legalization period. The standard errors clustered by firm are in parentheses, and ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

shares), and Netherlands (10 % of total shares)) are classified as the high restrictions group. I classify my low restrictions group as countries with no volume restrictions, South Africa, Taiwan, Spain, New Zealand, Switzerland, Israel, Japan, and South Korea.[4]

In Table 12, column (1) presents countries with low and column (2) those with high restrictions for *LDLeverageBV*, and columns (3) and (4) show the same for the measure *LDLeverageMV*.

As can be seen from the matrices, (below target) firms in countries with greater post-legalization restrictions on share repurchases tend to rely on them less to reduce the expected cost, which results in a concomitant reduction in the speed, of capital structure adjustment. For example, the incremental effect of share repurchases for countries with lower restrictions is 84.2 % (=0.304/0.361) (column (1)) and for countries with higher restrictions 42.02 % (=0.187/0.445) (column (2)). For both groups, however, the impact of share repurchases on below-target firms' speed of adjusting leverage towards a target remains significant. The changes in adjustment speed following the legalization event reflect the differing restrictions on the two groups.

8. Conclusion

I analyze using Byoun's (2008) framework, how the change in expected cost affects below-target firms' adjustment of leverage to a target. Wang et al.'s (2020) identification methodology that considers the legalization of open market share repurchases in 15 international markets an exogenous shock to below-target firms' expected cost of increasing leverage, which became available in many markets only in the 1980 s and gradually in other international markets, enables me to provide causal evidence related to the framework proposed by Byoun (2008). Specifically, I compare below- and above-target firms' changes in capital structure adjustment speed before and after the legalization of open market share repurchases. Increasing leverage prior to legalization was costly for below-target firms due to the stickiness of initiating dividends and agency costs associated with drawing debt. The ability to buy back shares on the open market reduces the cost of adjusting capital structure to a target for below- but not for above-target firms.

In a pooled sample, I observe a significant increase in below-target firms' leverage adjustment speed from the pre- to the post-legalization period, attributable to the reduced cost of adjustment afforded by the availability of share repurchases. These findings are consistent with Wang et al. (2021), who show that firms begin to repurchase shares as soon as permitted, and these actual repurchases reduce the distance to a target more quickly. With a broader sample and expected adjustment cost framework, I find this target adjustment to be insignificant, or the significance to not be robust, for above-target firms, for which share repurchases provide no expected cost reduction show stock repurchases to be more cost-effective in target adjustments for below- than for above-target firms. Byoun (2008) showed the speed of adjustment towards a target to improve for below-target firms with deficits and above-target firms with surpluses as the cost of adjustment for those firms declines. In the exact cost of adjustment context, my findings are consistent with the author vis-à-vis whether those firms have access to share repurchases.

My results are robust to measuring the reference target leverage via a more advanced dynamic panel plus GMM approaches. Validation and robustness tests that accompany this study show that the legalization of share repurchases results in below-target firms reducing their reliance on debt to increase leverage. In addition, there is a lag between the legalization of share repurchases and their adoption. Share repurchases as a means of reducing leverage is reflected in my regression results being stronger when using adoption year (i.e., the year in which share repurchases begin to be widely used) than when using legalization year.

I find market differences to significantly affect how much the expected cost reduction propagates to the incremental capital structure adjustment speed of below-target firms. Below-target firms' speed of adjustment increases in markets in which the tax differences between capital gains and ordinary income are greater, institutions weaker, and restrictions on share repurchases lower than in other markets.

Overall, my study is consistent with previous literature, including Byoun (2008), Zhou et al. (2016), and Banerjee et al. (1999), in providing support for the idea that firms' adjustment speed improves in expected low-friction environments in which the benefit is sufficiently great to justify the cost of adjusting leverage to a target.

Declaration of Competing Interest

The author declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgement

None.

[4] Israel, Japan, and South Korea have average daily volume restrictions, but they are higher at 25% and reasonable to include in the low-restricted group than in the high-restrictions group.

Appendix A

See Table A1–A5.

Table A1
Regressions using the Byoun (2008) measure of leverage.

	$\Delta D_{ict}/A_{ict}$ (1)	$\Delta D_{ict}/A_{ict}$ (2)
TDE $*D^{above}$	0.399***	0.376***
	(0.009)	(0.014)
TDE $*D^{below}$	0.521***	0.330***
	(0.011)	(0.017)
TDE $*D^{above*}$ Legalization		0.0261
		(0.016)
TDE $*D^{below*}$ Legalization		0.210***
		(0.02)
Legalization		−0.00480***
		(0.001)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Clustered at Firm Level	Yes	Yes
N	286,913	286,913
# of firms	25,047	25,047
Adj. R^2	0.213	0.215

The table shows the estimated regression results of the equations $\Delta\frac{D_{ict}}{A_{ict}} = \alpha_1 + \alpha_2 TDE_{ict} * D_{ict}^{above} + \alpha_3 TDE_{ict} * D_{ict}^{below} + \delta_i + \gamma_t + \varepsilon_{ict}$ in column (1), and the results of $\Delta\frac{D_{ict}}{A_{ict}} = \alpha_1 + \alpha_2 SRL_{ct} + \alpha_3 TDE_{ict} * D_{ict}^{above} + \alpha_4 TDE_{ict} * D_{ict}^{below} + \alpha_5 TDE_{ict} * D_{ict}^{above} * SRL_{ct} + \alpha_6 TDE_{ict} * D_{ict}^{below} * SRL_{ct} + \delta_i + \gamma_t + \varepsilon_{ict}$ in column (2). The former equation estimates the capital structure adjustment speed without legalization of share repurchases, the latter the same with legalization. The leverage measure is the Byoun (2008) measure, long-term debt divided by total assets. The variables are described in Table 3. The interaction terms, TDE $*D^{above*}$ Legalization and TDE $*D^{below*}$ Legalization, indicate the law change's asymmetric effect on above- and below-target firms. The standard errors clustered by firm are in parentheses, and ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

Table A2
Share repurchases around the legalization year.

Country	T-4	T-3	T-2	T-1	T	T + 1	T + 2	T + 3	T + 4	Leg/ Year	Adop/ Year	Test Stat/ P-Val
Canada	0	0	0	0	0.0003	0.0066	0.0241	0.0375	0.0141	1985	1986	25.2634 /0.0001
China	0	0	0	0	0.0011	0.0011	0.0008	0.0021	0.0009	2005	2007	80.3876 /0.0000
Germany	0	0	0	0	0.0009	0.0043	0.0212	0.0072	0.0036	1998	1999	21.5569 /0.0006
Greece	0	0	0	0	0.0005	0.0009	0.0051	0.0062	0.016	2003	2004	28.625 /0.0001
Israel	0	0	0	0	0.0071	0.012	0.0023	0.0024	0.0012	1999	2003	45.3100 /0.0000
Japan	0	0	0	0	0	0.0002	0.0008	0.0014	0.0025	1995	1997	58.5483 /0.0000
Netherlands	0	0	0	0	0.0002	0	0.0035	2.9E-05	0.0006	1992	1996	218.9352 /0.0000
New Zealand	0	0	0	0	0.0509	0	0.0039	0.0006	0.0655	1994	1997	62.4475 /0.000
Singapore	0	0	0	0	0.0008	0.0093	0.0106	0.0079	0.0031	1998	1998	51.1099 0.0000
South Africa	0	0	0	0	0.0278	0.0352	0.0114	0.0065	0.0053	2000	2004	43.6656 0.0000
South Korea	0	0	0	0	0.0001	0.0036	0.0108	0.0082	0.0077	1994	1998	42.1545 0.0000
Spain	0	0	0	0	0.0014	0.0049	0.0002	0.0002	0.0016	1989	1992	12.8464 0.0290
Switzerland	0	0	0	0	0	0.0079	0.0022	0.0008	0.00304	1992	1996	59.9387 0.0000
Taiwan	0	0	0	0	0.0035	0.0053	0.0049	0.0072	0.0101	2000	2002	25.3322 0.0001
Turkey	0	0	0	0	0	0.0006	0.0003	0.0004	0.0011	2009	2010	118.6812 0.0000

The table shows the actual share repurchases around the legalization event for each country, where the legalization year is indicated by T and minus year indicates the respective pre and post-legalization years. Actual share repurchase intensity is measured using the total per year share repurchases in a particular market divided by the previous year's total book value of shares for the entire market. When share repurchase intensity increases abruptly, I identify that year as the adoption year. The break date is estimated using the Chow test for structural breaks, with the null hypothesis, there is no structural break at the identified break date, and shown in the column *Test Stat/P-Val*.

Table A3
Regressions using adoption year.

	(1) $\Delta D_{ict}/A_{ict}$
$TDE^{*}D^{above}$	0.245***
	(0.019)
$TDE^{*}D^{below}$	0.407***
	(0.010)
$TDE^{*}D^{above*}$Adoption	0.0209
	(0.019)
$TDE^{*}D^{below*}$ Adoption	0.256***
	(0.012)
Legalization	0.00422*
	(0.002)
Firm fixed effects	Yes
Year fixed effects	Yes
Clustered at Firm Level	Yes
N	273,248
# of firms	24,488
Adj. R^2	0.15

The table shows the primary analysis regression results using adoption year instead of legalization year. The equation is of the form: $\Delta\frac{D_{ict}}{A_{ict}} = \alpha_1 + \alpha_2 Adoption_{ct} + \alpha_3 TDE_{ict} * D_{ict}^{above} + \alpha_4 TDE_{ict} * D_{ict}^{below} + \alpha_5 TDE_{ict} * D_{ict}^{above} * Adoption_{ct} + \alpha_6 TDE_{ict} * D_{ict}^{below} * Adoption_{ct} + \delta_i + \gamma_t + \varepsilon_{ict}$. The variables have their usual meaning, and $Adopt_{ct}$ is the adoption year of country c at time t. The leverage measure is long-term debt to book value of equity. The interaction terms $TDE^{*}D^{above*}$ *Adoption* and $TDE^{*}D^{below*}$ *Adoption* show the asymmetric effect of share repurchase legalization on above- and below-target firms. The standard errors clustered at firm level are in parentheses, and ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

Table A4
Regressions using adoption year for individual countries.

Country	$TDE^{*}D^{above*}$ Adoption	$TDE^{*}D^{below*}$ Adoption	$TDE^{*}D^{above}$	$TDE^{*}D^{below}$	Adoption	Obs.	#of Firms	R-Squared
Canada	0.128**	0.217***	0.127***	0.393***	0.038***	30,020	4,084	0.155
	(0.050)	(0.080)	(0.048)	(0.079)	(0.009)			
China	−0.0353*	0.0814**	0.367***	0.652***	0.013***	41,226	4,936	0.259
	(0.021)	(0.037)	(0.020)	(0.036)	(0.002)			
Germany	−0.004	0.167***	0.247***	0.488***	0.0052	17,795	1,364	0.199
	(0.028)	(0.037)	(0.023)	(0.032)	(0.004)			
Greece	−0.334**	0.322**	0.412***	0.309**	−0.0048	4,530	387	0.033
	(0.159)	(0.139)	(0.123)	(0.134)	(0.013)			
Israel	0.0424	0.0362***	0.0396	−0.287**	−0.0305	5,032	608	0.1
	(0.100)	(0.006)	(0.073)	(0.127)	(0.020)			
Japan	0.0362***	0.246***	0.163***	0.284***	0.00524***	90,040	5,161	0.2
	(0.006)	(0.011)	(0.006)	(0.010)	(0.001)			
Netherlands	0.0396	0.330***	0.306***	0.279***	0.0194	4,593	388	0.228
	(0.073)	(0.100)	(0.062)	(0.077)	(0.013)			
New Zealand	−0.287**	(0.204)	0.758***	0.853***	(0.031)	1,329	199	0.299
	(0.127)	(0.147)	(0.101)	(0.114)	(0.020)			
Singapore	−0.00803	0.165***	0.304***	0.532***	−0.00943**	10,279	915	0.257
	(0.030)	(0.050)	(0.029)	(0.048)	(0.004)			
South Africa	−0.0275	0.159**	0.385***	0.536***	0.00332	7,048	710	0.205
	(0.072)	(0.068)	(0.045)	(0.056)	(0.007)			
South Korea	0.096	0.704***	0.236	0.229***	0.000	27,358	2,577	0.169
	(0.265)	(0.057)	(0.258)	(0.055)	(0.038)			
Spain	1.476	−0.167	−1.271	0.588***	0.145	2,911	267	0.034
	(1.617)	(0.118)	(1.626)	(0.104)	(0.090)			
Switzerland	0.148***	0.268***	0.143***	0.304***	0.00974	5,074	366	0.204
	(0.050)	(0.063)	(0.041)	(0.051)	(0.007)			
Taiwan	−0.0693	0.200***	0.442***	0.655***	−0.0151***	21,929	2,168	0.35
	(0.043)	(0.055)	(0.044)	(0.055)	(0.005)			
Turkey	−0.119*	0.359***	0.451***	0.510***	−0.00885	4,084	358	0.214
	(0.068)	(0.127)	(0.064)	(0.048)	(0.009)			

The table shows the primary analysis regression results using adoption year instead of legalization year for the individual countries. The equation is of the form: $\Delta\frac{D_{ict}}{A_{ict}} = \alpha_1 + \alpha_2 Adoption_{ct} + \alpha_3 TDE_{ict} * D_{ict}^{above} + \alpha_4 TDE_{ict} * D_{ict}^{below} + \alpha_5 TDE_{ict} * D_{ict}^{above} * Adoption_{ct} + \alpha_6 TDE_{ict} * D_{ict}^{below} * Adoption_{ct} + \delta_i + \varepsilon_{ict}$. The variables have their usual meaning, and $Adoption_{ct}$ is the adoption year of country c at time t. The leverage measure is long-term debt to book value of equity. The interaction terms $TDE^{*}D^{above*}$ *Adoption* and $TDE^{*}D^{below*}$ *Adoption* show the asymmetric effect of share repurchases adoption on above- and below-target firms. The standard errors clustered by firm are in parentheses, and ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

Table A5
Regressions with equal pre and post years.

Panel A: Legalization (equal years)

Country	TDE* D^{above*} Legalization	TDE* D^{below*} Legalization	TDE* D^{above}	TDE* D^{below}	Legalization	Obs.	#of Firms	R-Squared
Canada	0.119	0.177*	0.311***	0.417***	0.0118	1,629	300	0.239
	(0.088)	(0.105)	(0.084)	(0.093)	(0.013)			
China	0.0528**	0.0564*	0.447***	0.808***	0.0162***	14,172	2,413	0.315
	(0.021)	(0.033)	(0.017)	(0.026)	(0.002)			
Germany	0.065	0.213***	0.352***	0.653***	0.0196***	5,752	964	0.309
	(0.042)	(0.049)	(0.038)	(0.042)	(0.006)			
Greece	0.073	1.437***	0.634***	−0.777*	−0.0092	414	138	0.394
	(0.185)	(0.455)	(0.172)	(0.440)	(0.014)			
Israel	−0.05	−0.0931	0.675***	0.651***	0.0243*	481	134	0.369
	(0.199)	(0.157)	(0.189)	(0.154)	(0.013)			
Japan	−0.0324***	0.111***	0.305***	0.507***	−0.00236	20,091	3,172	0.271
	(0.009)	(0.015)	(0.011)	(0.015)	(0.002)			
Netherlands	−0.017	0.134	0.590***	0.230***	−0.00613	1,063	189	0.249
	(0.070)	(0.085)	(0.055)	(0.065)	(0.013)			
New Zealand	−0.06	−0.15	0.922***	1.028***	−0.0394	132	43	0.716
	(0.155)	(0.221)	(0.174)	(0.186)	(0.025)			
Singapore	−0.057	0.175*	0.538***	0.667***	−0.00314	1,779	442	0.366
	(0.072)	(0.101)	(0.049)	(0.103)	(0.009)			
South Africa	0.201**	0.142	0.348***	0.594***	0.0138	2,502	553	0.282
	(0.097)	(0.090)	(0.092)	(0.073)	(0.008)			
South Korea	−0.015	0.021	0.365***	0.405***	0.0970***	1,375	302	0.063
	(0.149)	(0.095)	(0.116)	(0.087)	(0.023)			
Spain	3.678	−0.208	−3.216	0.617***	0.275*	499	102	0.087
	(2.317)	(0.211)	(2.342)	(0.144)	(0.147)			
Switzerland	0.16	0.209***	0.181**	0.327***	0.0084	959	146	0.229
	(0.105)	(0.080)	(0.081)	(0.067)	(0.012)			
Taiwan	0.051	0.419***	0.671***	0.767***	0.0182	3,364	1,255	0.462
	(0.099)	(0.119)	(0.099)	(0.115)	(0.011)			
Turkey	−0.294**	0.426***	0.686***	0.612***	−0.00381	2,544	324	0.296
	(0.147)	(0.157)	(0.110)	(0.069)	(0.010)			

Panel B: Adoption (equal years)

Country	TDE* D^{above*} Adoption	TDE* D^{below*} Adoption	TDE* D^{above}	TDE* D^{below}	Adoption	Obs.	#of Firms	R-Squared
Canada	0.225***	0.159**	0.235***	0.464***	0.0450***	2126	363	0.26
	(0.060)	(0.079)	(0.061)	(0.074)	(0.009)			
China	0.0309	0.100***	0.472***	0.815***	0.0116***	15,133	2677	0.32
	(0.025)	(0.036)	(0.021)	(0.030)	(0.002)			
Germany	0.0218	0.193***	0.366***	0.671***	0.0154**	5993	988	0.27
	(0.046)	(0.050)	(0.037)	(0.041)	(0.006)			
Greece	0.0334	0.252*	0.564***	0.568***	0.0128	1202	294	0.37
	(0.153)	(0.140)	(0.150)	(0.133)	(0.011)			
Israel	0.273**	0.567***	0.387***	0.239**	0.0192	1377	436	0.40
	(0.118)	(0.140)	(0.112)	(0.121)	(0.012)			
Japan	0.00189	0.109***	0.268***	0.524***	0.00558***	23,690	3384	0.27
	(0.008)	(0.015)	(0.011)	(0.015)	(0.002)			
Netherlands	0.0451	0.371***	0.468***	0.496***	0.000311	1545	277	0.35
	(0.087)	(0.105)	(0.076)	(0.097)	(0.018)			
New Zealand	0.162	−0.249	0.716***	0.870***	−0.0101	206	60	0.59
	(0.197)	(0.290)	(0.129)	(0.187)	(0.025)			
Singapore	−0.0571	0.175*	0.538***	0.667***	−0.00314	1779	442	0.37
	(0.072)	(0.101)	(0.049)	(0.103)	(0.009)			
South Africa	0.0123	0.142	0.493***	0.653***	0.00462	2968	579	0.25
	(0.142)	(0.091)	(0.062)	(0.077)	(0.010)			
South Korea	0.14	0.567***	0.234**	0.413***	0.0496**	3322	798	0.182
	(0.130)	(0.067)	(0.106)	(0.054)	(0.021)			
Spain	−1.105	−0.227	1.182***	0.900***	0.0221	676	109	0.07
	(0.678)	(0.145)	(0.357)	(0.098)	(0.037)			
Switzerland	0.286***	0.239***	0.199***	0.444***	0.0288***	1319	220	0.342
	(0.071)	(0.072)	(0.057)	(0.050)	(0.009)			

Taiwan	−0.044	0.301***	0.611***	0.836***	−0.0110**	5584	1421	0.47
	(0.044)	(0.063)	(0.046)	(0.065)	(0.005)			
Turkey	−0.126*	0.458***	0.544***	0.581***	−0.0107	2659	330	0.26
	(0.073)	(0.155)	(0.082)	(0.069)	(0.011)			

Panel A of the table shows the regression results of a trimmed dataset that includes only five years before and five years after the legalization event. It estimates the equation $\Delta\frac{D_{ict}}{A_{ict}} = \alpha_1 + \alpha_2 SRP_{ct} + \alpha_3 TDE_{ict} * D_{ict}^{above} + \alpha_4 TDE_{ict} * D_{ict}^{below} + \alpha_5 TDE_{ict} * D_{ict}^{above} * SRP_{ct} + \alpha_6 TDE_{ict} * D_{ict}^{below} * SRP_{ct} + \delta_i + \varepsilon_{ict}$, for individual countries, with variables having their usual meanings. The variable SRP is either the legalization event or adoption event. The leverage measure is long-term debt to book value of equity. The interaction terms $TDE^{*}D^{above*}$*Legalization (or Adoption)* and $TDE^{*}D^{below*}$*Legalization (or Adoption)* capture the effect of share repurchase legalization *(or Adoption)* for above- and below-target firms compared to the pre-legalization period. Panel A shows the results for legalization, Panel B the results for adoption, as the event that reduced the cost of leverage adjustment. The standard errors clustered by firm are in parentheses, and ***, **, and * denote significance at the 1 %, 5 %, and 10 % levels, respectively.

References

Anand, A., 2015. The Future of Poison Pills in Canada: Are Takeover Bid Reforms Needed? McGill Law J./Revue de droit de McGill 61 (1), 1–29.
Arellano, M., Bover, O., 1995. Another look at the instrumental variable estimation of error-components models. J. Econ. 68 (1), 29–51.
Banerjee, S., Heshmati, A., Wihlborg, C., 1999. The Dynamics of Capital Structure: Citeseer.
Bhana, N., 2007. The market reaction to open market share repurchases announcements: The South African experience. Invest. Anal. J. 36 (65), 25–36.
Blundell, R., Bond, S., 1998. Initial conditions and moment restrictions in dynamic panel data models. J. Econ. 87 (1), 115–143.
Bonaimé, A.A., Öztekin, Ö., Warr, R.S., 2014. Capital structure, equity mispricing, and stock repurchases. Finance 26, 182–200.
Brav, A., Graham, J.R., Harvey, C.R., Michaely, R., 2005. Payout policy in the 21st century. J. Financ. Econ. 77 (3), 483–527.
Byoun, S., 2008. How and when do firms adjust their capital structures toward targets? J. Financ. 63 (6), 3069–3096.
Chua, J.M., 2011. Corporate governance and earnings management before share repurchase announcements in Singapore. Singapore Management University (Singapore),
Comment, R., Jarrell, G.A., 1991. The relative signaling power of Dutch-auction and fixed-price self-tender offers and open-market share repurchases. J. Financ. 46 (4), 1243–1271.
Cook, D.O., Tang, T., 2010. Macroeconomic conditions and capital structure adjustment speed. Finance 16 (1), 73–87.
Davies, P., Hopt, K., Nowak, R., & van Solinge, G., 2013. Corporate boards in law and practice: a comparative analysis in Europe: OUP Oxford.
Dittmar, A.K., 2000. Why do firms repurchase stock. J. Bus. 73 (3), 331–355.
Dizkırıcı, A.S., 2013. Stock Repurchasing in Turkey. Int. J. Bus. Soc. Sci. 4 (11), 76–81.
Drousia, A., Episcopos, A., Leledakis, G.N., 2019. Market reaction to actual daily share repurchases in Greece. Q. Rev. Econ. Finance 74, 267–277.
Ellahie, A., Kaplan, Z., 2021. Show me the money! Dividend policy in countries with weak institutions. J. Account. Res. 59 (2), 613–655.
Fama, E.F., French, K.R., 2002. Testing trade-off and pecking order predictions about dividends and debt. Rev. Financ. Stud. 15 (1), 1–33.
Faulkender, M., Flannery, M. J., Hankins, K. W., Smith, J. M., 2008. Do adjustment costs impede the realization of target capital structure. Paper presented at the AFA 2008 New Orleans meetings paper.
Flannery, M.J., Hankins, K.W., 2013. Estimating dynamic panel models in corporate finance. Finance 19, 1–19.
Flannery, M.J., Rangan, K.P., 2006. Partial adjustment toward target capital structures. J. Financ. Econ. 79 (3), 469–506.
Grullon, G., Michaely, R., 2002. Dividends, share repurchases, and the substitution hypothesis. J. Financ. 57 (4), 1649–1684.
Guay, W., Harford, J., 2000. The cash-flow permanence and information content of dividend increases versus repurchases. J. Financ. Econ. 57 (3), 385–415.
Halling, M., Yu, J., Zechner, J., 2016. Leverage dynamics over the business cycle. J. Financ. Econ. 122 (1), 21–41.
Hamouda, F., 2018. Stock repurchase and Arab Spring empirical evidence from the MENA region. J. Financ. Data Sci. 4 (1), 29–43.
Harris, M., Raviv, A., 1991. The theory of capital structure. J. Financ. 46 (1), 297–355.
Hovakimian, A., Opler, T., Titman, S., 2001. The debt-equity choice. J. Financ. Quant. Anal., 1–24
Isa, M., Lee, S.-P., 2014. Market reactions to share repurchase announcements in malaysia. Asian Acad. Manage. J. Account. Financ. 10 (1).
Iyer, S.R., Rao, R.P., 2017. Share repurchases and the flexibility hypothesis. J. Financ. Res. 40 (3), 287–313.
Jacob, M., Jacob, M., 2013. Taxation, dividends, and share repurchases: Taking evidence global. J. Financ. Quant. Anal., 1241–1269
Jagannathan, M., Stephens, C.P., Weisbach, M.S., 2000. Financial flexibility and the choice between dividends and stock repurchases. J. Financ. Econ. 57 (3), 355–384.
Kayhan, A., Titman, S., 2007. Firms' histories and their capital structures. J. Financ. Econ. 83 (1), 1–32.
Kim, E.H., 1978. A mean-variance theory of optimal capital structure and corporate debt capacity. J. Financ. 33 (1), 45–63.
Kim, J., Schremper, R., Varaiya, N.P., 2005. Open market repurchase regulations: A cross-country examination. Corporate Finance Rev. 9, 29–38.
Kraus, A., Litzenberger, R.H., 1973. A state-preference model of optimal financial leverage. J. Financ. 28 (4), 911–922.
Lainez, J.A., Jarne, J.I., Callao, S., 1999. The Spanish accounting system and international accounting harmonization. Eur. Account. Rev. 8 (1), 93–113.
Leary, M.T., Roberts, M.R., 2005. Do firms rebalance their capital structures? J. Financ. 60 (6), 2575–2619.
Lee, Y.-G., Jung, S.-C., Thornton Jr, J.H., 2005. Long-term stock performance after open-market repurchases in Korea. Glob. Financ. J. 16 (2), 191–209.
Lemmon, M.L., Roberts, M.R., Zender, J.F., 2008. Back to the beginning: persistence and the cross-section of corporate capital structure. J. Financ. 63 (4), 1575–1608.
Moser, W.J., 2007. The effect of shareholder taxes on corporate payout choice. J. Financ. Quant. Anal. 42 (4), 991–1019.
Myers, S.C., Majluf, N.S., 1984. Corporate financing and investment decisions when firms have information that investors do not have (0898-2937). Retrieved from.
Myers, S.C., 1984. Capital structure puzzle (0898-2937). Retrieved from.
NBK Capital, 2009. Kuwait in Focus. Retrieved from http://content.argaam.com.s3-eu-west-1.amazonaws.com/20a3d2c4-6693-4b14-9665-c397c8295b0a.pdf.
Rajan, R.G., Zingales, L., 1995. What do we know about capital structure? Some evidence from international data. J. Financ. 50 (5), 1421–1460.
Sabri, N., 2003. Using treasury repurchase shares to stabilize stock markets.
Scott, J.H., 1977. Bankruptcy, secured debt, and optimal capital structure. J. Financ. 32 (1), 1–19.
Van Holder, T., Van de Kerckhove, J., Heyman, D., 2015. The effect of share repurchases in Belgium and the Netherlands. University of Ghent. Unpublished Master Thesis.
Wang, Z., Yin, Q.E., Yu, L., 2021. Do Share Repurchases Facilitate Movement Towards Target Capital Structure? International Evidence. International Evidence (June 13, 2021).
Wang, L.-H., Lin, C.-H., Fung, H.-G., Chen, H.-M., 2013. An analysis of stock repurchase in Taiwan. Int. Rev. Econ. Financ. 27, 497–513.
Wang, Z., Yin, Q.E., Yu, L., 2020. Real effects of share repurchases legalization on corporate behaviors. J. Financ. Econ.
Zhou, Q., Tan, K.J.K., Faff, R., Zhu, Y., 2016. Deviation from target capital structure, cost of equity and speed of adjustment. Finance 39, 99–120.