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Taxing away M&A: Capital gains taxation and acquisition activity☆

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ABSTRACT

Capital gains taxation distorts the market for corporate control by imposing a cost on selling shareholders in acquisitions. This lock-in effect increases premiums required for deal completion preventing some M&As from taking place at all. We estimate the effect of capital gains taxation on the quantity of realized M&A deals and compute the deadweight loss related to taxing these transactions. We find that a one percentage point increase in the capital gains tax rate reduces acquisition activity by around 1% annually. For the United States, this implies unrealized synergy gains of $9.3 billion each year due to capital gains taxes.

1. Introduction

A well-functioning financial market, in particular the market for corporate control, is crucial for robust economic growth. Having the right owner and efficient performance monitoring can explain substantial differences in firm productivity (Braguinsky et al., 2015; Cole et al., 2016; Davis et al., 2014; Harris and Robinson, 2002; Li, 2013). An important potential impediment to an efficient allocation of ownership rights are capital gains taxes as they increase acquisition premiums

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demanded by target shareholders as a compensation for capital gains taxes which come due upon selling their shares. The target shareholders are locked-in because they have an incentive to defer the realization of capital gains taxes by holding on to their shares which inhibits changes in ownership.

The price-increasing nature of this lock-in effect has been well documented for stock prices and acquisition premiums (Ayers et al., 2003; Dai et al., 2008). This is informative with respect to the incidence of capital gains taxes as the upward pressure on prices implies that asset sellers are able to pass on the burden of capital gains taxes - at least partially - to buyers. However, the size of the price effect does not allow for an inference on the extent of distortions, i.e. the loss of beneficial changes in ownership which are prevented by the tax. A large price effect can be observed even though the distortions of the tax are negligible (i.e. when asset demand is very inelastic). Vice versa, a small price effect may coincide with substantial distortions (i.e. when asset demand is very elastic).[1] How large is the deadweight loss of takeovers which are not realized due to the distortive lock-in effect of capital gains taxes? In this paper, we address this question using a comprehensive dataset on domestic and international inter-corporate M&As to provide empirical evidence on the impact of corporate capital gains taxation on acquisition activity. Using appropriate choice and count regression models, we take into account that capital gains taxation affects both the M&A location choice and the overall number of observed deals. With regard to the location choice, the acquiring firm - after controlling for other determinants of location and target choice - favors the location with the lower capital gains tax rate because it faces a lower seller reservation price there. The aggregate number of deals may be affected because high corporate capital gains tax payments increase premium demands above potential acquirers' willingness to pay. In this case, seller companies prefer to retain their stock and some deals fail.

Our estimations are based on micro-level data from 29,546 M&A deals in North America, Asia and Europe in the period from 2002 until 2013. The M&A data is combined with international tax data including hand-collected information on corporate capital gains tax rates for M&As in the sample period.[2] We employ several empirical strategies to identify the quantity effect of capital gains taxation on acquisition activity. First, a number of large economies (e.g. United Kingdom, Germany, France, Italy) have implemented full or partial exemptions from corporate taxation for capital gains realized in M&As. Similar to an approach used by Baugh et al. (2018) and Fuest et al. (2018), the staggered implementation of these reforms over the sample period serves as a quasi-experiment in our empirical analysis which allows us to control for common confounding factors and unobserved firm- and location-specific effects. We test the identifying assumption of common pre-trends using the standard approach for generalized difference-in-difference estimations (e.g., see Fuest et al., 2018). Second, we exploit variation in the capital gains tax exposure across targets operating in different industries to further ensure that the estimated association between capital gains taxation and acquisition activity is caused by the lock-in effect on target shares. Then the effect of capital gains taxation is present for targets with high capital gains while it is absent for targets without capital gains. This additional variation allows us to filter out any unobserved factor that coincides with capital gains tax reforms. Finally, we note that changes in corporate capital gains tax rate should only affect M&A deals in which the selling party is incorporated. Contrasting the cases of corporate and non-corporate sellers, we find that corporate capital gains taxes affect M&A deals with corporate sellers only. This again points to capital gains tax reforms indeed driving our results rather than some omitted variable.

We employ a McFadden (1974) choice model to estimate how capital gains taxes affect the acquirers' choice of target location, taking the global number of M&As as given. A country with a high corporate capital gains tax rate exhibits a smaller number of M&As because acquirers choose other locations with a lower tax burden on capital gains and thus also a lower premium demanded by sellers. Using conditional logit and mixed logit regressions allows us to control for bilateral acquirer-target-country specific as well as firm-specific characteristics. From the choice model, we back out the own-region elasticity of the number of deals with respect to the capital gains tax rate for each country and thus determine the effect of capital gains taxation on the number of realized deals in a country. We find that, if a country decreases its corporate capital gains tax by one percentage point, the likelihood that a target firm of this country is chosen increases by 0.7%. To illustrate the magnitude of this effect, we note that the estimate implies that *ceteris paribus* the total volume of M&As in the United States would increase by 24% or $16.1 billion per year if U.S. corporate capital gains taxes on M&As were to be abolished. Using additional variation across target firms in capital gains tax exposure, we confirm that this effect is linked to the lock-in of target shares.

In a second estimation, we no longer take the overall number of M&A deals as given and implement an alternative estimation approach which allows the total number of deals to decrease with rising capital gains tax rates. We employ a Poisson pseudo-maximum-likelihood (PPML) estimator to analyze aggregate measures of M&As in a panel fixed effects framework. Individual deals are aggregated at the country-level. We find that a one percentage point decrease in a country's corporate capital gains tax rate raises the overall number of M&As in that location by about 1 percent per year. Using realized acquisition premiums as a proxy for potential synergy gains, we estimate the corresponding yearly gain in efficiency in the form of additionally realized synergies. For the United States, this efficiency gain is in the order of $9.3 billion.

[1] And asset supply is also somewhat elastic as a perfectly inelastic supply would preclude a distortive effect.

[2] Alternatively, considering the capital gains tax rate on individual investors would pose severe additional challenges to identification as the share of taxable domestic individual shareholders of listed firms has dwindled below 25% and for smaller open economies even less (Deutsche Bundesbank, 2014; Rosenthal and Austin, 2016). The domestic rate for individuals would therefore measure the applicable tax rate with substantial measurement error resulting in biased estimates. In contrast, the applicable capital gains tax rate is certain for inter-corporate deals as the selling shareholder is known.

The findings of this paper contribute to several literatures. Our analysis shows that capital gains taxation is indeed an important determinant of M&A activity and thus complements prior studies by Rossi and Volpin (2004), Erel et al. (2012), John et al. (2015), Cao et al., 2019 and Dessaint et al. (2017) who show that economic and institutional factors such as international trade integration, quality of accounting disclosure, shareholder protection, political uncertainty and labor market regulations have a substantial influence on domestic and cross-border M&As. By estimating the distortive effect of capital gains taxes on the efficient allocation of ownership rights we link to the research about the gains of industrial reorganization by means of M&As and more generally to the gains from leveraging ownership advantages. These benefits have been shown to result from increased productivity (Davis et al., 2014; Devos et al., 2009; Li, 2013), increased innovation activity (e.g. Stiebale, 2016), knowledge spillovers (e.g. Brennan and Cao, 1997; Bena and Li, 2014), enhanced corporate governance (e.g. Rossi and Volpin, 2004), as well as increased management efficiency (Manne, 1965; Instefjord, 1999; Wang and Xie, 2009) and management discipline (Instefjord, 1999; Lel and Miller, 2015; Sapra et al., 2014; Scharfstein, 1988).[3] Our analysis shows how the lock-in effect of capital gains taxation inhibits the realization of these benefits.

Moreover, our findings contribute to prior research on the role of taxation in the market for corporate control. For instance, earlier studies have analyzed investor-level tax differentials that incentivize over-investment in M&As to accommodate shareholder clienteles (Auerbach and Reishus, 1987; Ohrn and Seegert, 2019). We show that capital gains taxation affects the reservation price of corporate sellers and leads to a lock-in of corporate assets. This also relates our study to research examining the price effect of capital gains taxes in takeovers (Ayers et al., 2003; Huizinga et al., 2018) and capital market effects of corporate capital gains tax cuts (Edwards et al., 2004). At the aggregate level, the estimation allows for a comparison to Ayers et al. (2007), who find that time-series measures of acquisition activity on American stock exchanges are negatively related to changes in the U.S. federal capital gains tax rate on individual shareholders. Another strand of the literature investigates the role of profit taxes in the location of FDI (e.g. Devereux and Griffith, 1998) of which cross-border M&As are an important component. Arulampalam et al. (2019) specifically analyze M&As and study the effect of target and acquirer corporate income tax rates on the target location choice. We complement this literature by analyzing the impact of capital gains taxation of sellers in both domestic and cross-border M&As.

The paper is structured as follows. In Section 2 we use a stylized theoretical framework to illustrate the lock-in effect and derive the empirical specification to estimate it. Section 3 explains the empirical approach. We present the estimation results in Section 4 and quantify the shareholder loss in Section 5. Section 6 contains concluding remarks.

2. A Stylized Framework

The following framework serves to clarify the relationship between capital gains tax rates and inter-corporate acquisition activity via the lock-in effect and demonstrates how, depending on the nature of the underlying model, the tax effect can be estimated either by a multi-nominal logit regression or, alternatively, by a count regression at the aggregate level. In the former approach, all changes in the number of M&As are due to substituting one location for another and never due to additional acquirers at the extensive margin. In the latter approach changes in the number of M&As are always due to gaining or losing acquirers at the extensive margin and never due to substitution effects between locations.

First, we consider a choice model. A corporation that has decided to acquire another firm faces a choice between a set of potential target locations $i = 1, \ldots, l$. This is an assumption frequently used as a starting point in the empirical corporate finance literature. For instance, Harford (1999) argues that cash-rich firms are more likely to attempt acquisitions. Hanlon et al. (2015) and Edwards et al. (2016) show that foreign subsidiaries of U.S. multinationals engage in corporate acquisitions in order to make use of their locked-out cash due to repatriation tax costs. Both cases give plausible reasons why certain firms might exogenously become acquirers which then search for the best available target firm.

We first derive the acquisition price for each potential target location i which we denote by p_i. Suppose that the acquirer is looking for a target with a discounted pre-tax cash flow of d per share. In the absence of an acquisition, a corporate seller[4] of such a target earns a discounted after-tax cash flow of $\left(1-\tau_i^{CIT}\right)d$ per share. τ_i^{CIT} is the effective profit tax rate from the seller's perspective where the subscript indicates that the seller is taxable in the target location.[5] If the seller decides to dispose of the target, it receives p_i and pays capital gains taxes on the realized gains at a rate τ_i^{CG}. We normalize the initial acquisition price of the seller to zero, such that p_i is equal to the capital gain per share. The selling company accepts the deal offer only if p_i is above the reservation price $\tilde{p}_i$ which satisfies the following condition:

$$\left(1-\tau_i^{CG}\right)\tilde{p}_i = \left(1-\tau_i^{CIT}\right)d.$$

At $p_i = \tilde{p}_i$, the selling company is indifferent between accepting or rejecting the offer as the net revenue from selling is equal to the net cash flow from holding. An implicit assumption underlying this condition is that the seller reinvests the revenue from selling the target into an asset which generates an identical after-tax cash flow.[6] Moreover, we assume an

[3] Most of these benefits go to target shareholders. With respect to acquirer returns, empirical evidence is mixed (e.g. Agrawal et al., 1992; Fuller et al., 2002; Golubov et al., 2016; Li et al., 2018; Loughran and Vijh, 1997; Malmendier and Tate, 2008; Phalippou et al., 2015; Savor and Lu, 2009).

[4] We focus on corporate sellers because they represent by far the largest share in M&A deals.

[5] The effective tax rate generally corresponds to the corporate income tax rate since domestic inter-corporate dividends are usually exempt or credited while foreign dividends are exempt by many countries (except for the United States until 2017).

[6] This is equivalent to assuming perfect capital markets.

infinite life of the target and neglect any write-down of the target's shares. Though of simplifying nature, these assumptions allow us to isolate the lock-in effect. Assuming a reinvestment in shares, we abstract from any mode of payment effect that occurs if the deal triggers a change in the cash flow received by the seller.[7]

Since in our model the acquirer has the choice between targets in several locations it retains all the bargaining power and pays the reservation price of each seller.[8] The acquisition price is then given by

$$p_i = \tilde{p}_i = \frac{1-\tau_i^{CIT}}{1-\tau_i^{CG}} d,\ i = 1, \ldots, l. \tag{1}$$

p_i is equal to the expected discounted after-tax cash flow if and only if $\tau_i^{CG} = 0$. A positive capital gains tax rate raises the reservation price above the value of the after-tax cash flow of the target. More generally, the capital gains tax imposes an additional burden on the act of selling the target which *ceteris paribus* makes the deal less attractive from the seller's perspective.

Turning to the acquiring company, we assume that it has an ownership advantage (e.g. through better management or complementary technology) that enables it to increase the discounted cash flow from the target by Δ percent per share. In other words, Δ represents the synergy gain. The discounted after-tax return per share of the target from the acquirer's perspective is then given by $r = \left(1-\tau^A\right)d(1+\Delta)$ where τ^A is the effective tax rate for the acquiring firm. We define the payoff of the acquirer for making an acquisition in i as $v_i = r - p_i$. For a domestic acquisition, acquirer and seller face the same effective tax rate (i.e. $\tau^A = \tau_i^{CIT}$) such that both terms cancel out and may be dropped from the acquirer payoff. In cross-border acquisitions, τ^A may be increased by potential double taxation of cross-border dividends (see Feld et al., 2016; Huizinga and Voget, 2009). The territorial tax system applied in the majority of countries around the world usually prevents such double taxation such that $\tau^A = \tau_i^{CIT}$.[9] Note that we have assumed here that the acquirer receives a payoff in the form of dividends. If, in addition, the acquirer considers reselling the target later, capital gains taxes may again be relevant as the acquirer itself becomes a seller. This does not affect the results of a choice model where one conditions on acquirer characteristics (i.e. the acquirer capital gains tax rate is fixed). It might, however, be relevant when relaxing this assumption in a count model whose implications we discuss below.

Given a payoff v_i, assume for the moment that the acquirer can only make one acquisition. It will therefore only consider the optimal target firm within each location and then compare options across locations. It chooses i such that

$$v_i \geq v_j \forall j \in (1, \ldots, l). \tag{2}$$

From this discrete choice model we can derive the probability of the acquirer choosing a target in i which is given by

$$\Phi\left(v_i \geq v_j | \boldsymbol{x}, \boldsymbol{\tau^{CG}}\right) = \frac{\exp v_i\left(\boldsymbol{x}_i, \tau_i^{CG}\right)}{\sum_{j=1}^{l} \exp v_j\left(\boldsymbol{x}_j, \tau_j^{CG}\right)} \tag{3}$$

where $\boldsymbol{\tau^{CG}}$ is a vector of capital gains tax rates at all potential locations and $\boldsymbol{x}$ is a vector of other location-specific variables that may drive the location choice. *Ceteris paribus* an increase in τ_i^{CG} reduces the probability of a target location in i:

$$\frac{\partial \Phi}{\partial \tau_i^{CG}} = \frac{\left(\sum_{h \neq i} \exp v_h\left(\boldsymbol{x}_h, \tau_h^{CG}\right)\right) \exp v_i\left(\boldsymbol{x}_i, \tau_i^{CG}\right)}{\left(\sum_{j=1}^{l} \exp v_j\left(\boldsymbol{x}_j, \tau_j^{CG}\right)\right)^2} \frac{\partial v_i}{\partial \tau_i^{CG}} < 0. \tag{4}$$

Empirically, the choice model can be tested and quantified using a conditional logit model for the location choice of individual deals. One can extend the model to account for other location-specific characteristics beyond τ_i^{CIT} and τ_i^{CG}(e.g. differences in the pre-tax cash-flow d). This would not alter the sign of (4) which is solely driven by the lock-in effect of the capital gains taxes, but would merely impact the magnitude of the effect. Such differences can be accounted for in a conditional logit model.

An important assumption underlying the choice model is that the overall number of acquisitions is fixed and not affected by tax changes in individual locations. This appears less realistic for large markets such as the United States. An acquirer may not have a potential acquisition target outside the United States available and a high level of capital gains tax payments may thus ultimately prevent the acquisition which reduces the overall number of M&As. To address this, we relax the assumption of a fixed total number of acquisitions and move to a count model. We now assume that there is a multitude of acquisitions in each location by various firms. Conceptually, we describe the latter by a single representative acquirer which chooses between acquisition targets with different synergy gains Δ. The acquirer realizes all acquisition projects in location i with

[7] Such change in payout could potentially be related to a difference in tax treatment. See Auerbach and Reishus (1987) for a discussion of this effect for individual shareholders.

[8] Assigning the full bargaining power to the acquirer makes the model simple. Note, that the results of the theoretical analysis only rely on the acquirer having some degree of bargaining power but are independent of its exact distribution between selling and acquiring firm. In practice, the distribution of bargaining power depends on various factors (e.g. target scarcity, see Ahern, 2012) and determines how the merger gain is divided between the deal participants (Bradley et al., 1988) which is also relevant for the tax incidence in an M&A (Huizinga et al., 2012).

[9] Even if double taxation of cross-border dividends occurs, it is not related to the capital gains taxation in the seller country.

a positive return $v_i = r - p_i \geq 0$ where $r = \left(1-\tau^A\right)d(1+\Delta)$ and $p_i = \frac{1-\tau_i^{CIT}}{1-\tau_i^{CG}}d$. From this we can derive the cutoff level of synergy $\tilde{\Delta}_i$ such that any deal with $\Delta \geq \tilde{\Delta}_i$ is completed:

$$v_i \geq 0 \Longleftrightarrow \tilde{\Delta}_i \geq \frac{\phi_i}{1-\tau_i^{CG}} - 1 \text{ with } \phi_i = \frac{1-\tau_i^{CIT}}{1-\tau^A} \tag{5}$$

It is apparent from (5) that without capital gains taxation and no differences in seller and acquirer taxation (e.g. $\tau^A = \tau_i^{CIT}$, $\phi_i = 1$), we have $\tilde{\Delta}_i = 0$ such that all acquisitions with a positive gain are completed. In contrast, a positive capital gains tax rate requires strictly positive and sufficiently large synergy gains to compensate for the tax payment resulting from the deal.

In location i there exists a continuum of potential targets with synergy gains continuously distributed on the interval $\Delta \in \left(\underline{\Delta}_i, \tilde{\Delta}_i\right)$ following a cumulative distribution function F and a corresponding probability function f. Under the assumption that $\tilde{\Delta}_i$ is interior, all deals with $\Delta \geq \tilde{\Delta}_i$ are completed. We can thus define the number of deals in i as

$$N_i = \int_{\tilde{\Delta}_i}^{\tilde{\Delta}_i} \Delta' d\Delta = 1 - F\left(\tilde{\Delta}_i\right).$$

As long as F is continuously differentiable and strictly increasing, we can express the number of completed deals as a function of the corporate capital gains tax rate and a vector of covariates $\boldsymbol{x}$:

$$N_i = N_i\left(\tau_i^{CG}, \boldsymbol{x}_i\right) \tag{6}$$

Note that $\frac{\partial N_i(\tau_i^{CG}, \boldsymbol{x_i})}{\partial \tau_i^{CG}} = -f\left(\tilde{\Delta}\right)\frac{\partial \tilde{\Delta}_i}{\partial \tau_i^{CG}} < 0$ implies that an increase in the capital gains tax rate decreases the number of acquisitions. This is commonly referred to as the lock-in effect of capital gains taxation on market activity (e.g. Feldstein, Yitzhaki, 1978). Intuitively, the capital gains tax imposes a transaction cost that prevents some inter-corporate acquisition deals. Empirically, the effect of the capital gains tax on the number of acquisitions can be tested using a count model. One can also reformulate such a model so that N_i represents the total monetary volume of all completed deals. As the economic impact of M&As may well depend on the size rather than the count of the deals this is useful when measuring the response of acquisition activity to changes in the corporate capital gains tax rate.

As noted above, capital gains tax changes may have additional effects if domestic acquirers intend to resell the target firm. In this case, the negative effect of capital gains taxation on the number of M&A deals is reinforced because higher capital gains taxation does not only drive up the seller's reservation price but also decreases the acquirer's payoff, thus requiring an even higher synergy gain Δ for the deal to be completed.[10] We test this in an extension to the main empirical analysis. However, we also note that reselling of targets is rare in practice (only 2% of targets in our sample are resold).

3. Empirical identification

3.1. Corporate M&As and capital gains taxation

In order to study the effect of corporate capital gains taxation on M&As, we combine data on inter-corporate M&A deals in 30 OECD and EU countries with information on the taxation of gains realized by the sellers in these deals. Deal-level data for M&As are obtained from Bureau van Dijk's Zephyr database for the period 2002–2013. Our sample consists of M&As in which a corporation sold a controlling majority of shares (>50% voting power) in one of its domestic subsidiaries to the acquiring corporation.[11] We exclude deals with listed targets (< 3.9% of the sample, consistent with Erel et al. (2015)) because these deals often involve a substantial number of non-corporate sellers for which the corporate capital gains tax rate is not relevant.[12] In total, our sample comprises 29,546 acquisitions with a revealed volume of $1,066 billion. Table 2 reports the number and volume of deals by country of residence of the selling corporation. In most of these deals, the seller resided in one of the largest economies (i.e. United States, the United Kingdom, Japan and Germany) but a substantial number and volume of deals are completed in several smaller countries such as Finland and Sweden.

Information on capital gains taxation of these deals is hand-collected from the Tax Research Platform of the International Bureau of Fiscal Documentation (IBFD) as well as from the tax codes of the seller countries. We collect the tax rates applicable to capital gains realized by corporations when selling shares of substantial holdings in non-listed subsidiaries. The applicable tax rate is sometimes proportional to the general rate on corporate income and varies substantially across countries. Some governments apply the full corporate tax rate (e.g. Australia, Japan, United States) whereas others allow

[10] To see this, assume that the acquirer expects to resell the target at a gain of g_i and pays the same capital gains tax rate as the seller. Then $r = \left(1-\tau^A\right)d(1+\Delta) + \left(1-\tau_i^{CG}\right)g_i$and the cutoff level of synergy is $\tilde{\Delta}_i = \frac{\phi_i}{1-\tau_i^{CG}} - 1 - \frac{1-\tau_i^{CG}}{(1-\tau^A)d}g_i$ such that $\frac{\partial \tilde{\Delta}_i}{\partial \tau_i^{CG}} = \frac{\phi_i}{(1-\tau_i^{CG})^2} + \frac{1}{(1-\tau^A)d}g_i$.

[11] We do not consider companies selling foreign subsidiaries since these deals are taxed differently in some countries (e.g. Australia). In a robustness check we also include deals where seller and target reside in different countries and obtain qualitatively similar results. Statistics for these deals can be found in the Online Appendix.

[12] We have verified that the results are robust to including deals with listed targets.

Table 1
Corporate capital gains tax reforms.

	Year	Type	$\Delta\tau^{CG}$
Germany	2002	General exemption	-38.9
Portugal	2002	50% exemption for substantial holdings	-18.7
United Kingdom	2002	Exemption for substantial holdings	-30.0
Sweden	2003	General exemption	-28.0
Italy	2004	General exemption	-19.0
Ireland	2004	Exemption for substantial holdings	-20.0
Finland	2004	Exemption for substantial holdings	-29.0
Slovenia	2007	50% Exemption for substantial holdings	-23.5
Norway	2004	Exemption for substantial holdings	-28.0
France	2006	Reduction of tax rate from 19% to 8%	-11.0
Turkey	2006	Exemption regime abolished	+30.0
Iceland	2009	General Exemption	-18.0

This table summarizes the corporate capital gains tax reforms in our sample. $\Delta\tau^{CG}$ is the percentage point change in the corporate capital gains tax rate that resulted from the respective reform. Germany: From 2004 onward, 5% of the gains is added back to the taxable income. Sweden: Excluding non-substantial holdings on the stock market. Italy: 95% exemption from 2008 onward. France: 95% exemption for substantial holdings from 2007 onward. Turkey: In 2006, Turkey replaced its participation exemption with a new regime that required firms to keep capital gains in a reserve fund for at least 5 years in order not to be taxed. Iceland: Restricted to substantial holdings from 2011 onward. Source: IBFD.

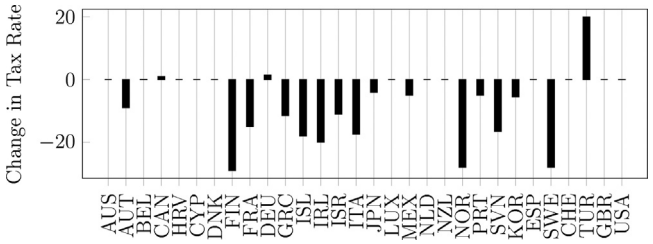

Fig. 1. Capital gains tax reforms This figure displays the accumulated corporate capital gains tax rate changes in the sample period 2002–2013. Changes in the corporate capital gains tax rate refer to changes in the rate charged on capital gains realized by corporations when selling non-listed subsidiaries.

for partial exemption (e.g. Canada, Portugal) or fully exempt capital gains from taxation (e.g. New Zealand). Preferential treatment is often limited to gains realized from selling substantial holdings (e.g. Netherlands, Ireland) which is particularly relevant for firms holding controlling majorities in other companies. Since the beginning of the century, many European countries have cut corporate capital gains tax rates for substantial holdings. Table 1 provides an overview of these tax reforms. Besides the United Kingdom and Germany, who abolished capital gains taxation for corporations in 2002, the group of reforming countries includes Italy and France as well as several Scandinavian countries. The timing and magnitude of the tax cuts differed across reforming countries. We exploit this staggered implementation of the reforms in our identification strategy. A potential concern is that the reform timing is related to M&A activity. In the Online Appendix we provide a brief history of the tax reforms in our sample which reveals that their timing was unlikely to be related to pre-reform M&A dynamics. Rather, the reforms were based on the desire to generally align the treatment of inter-corporate dividends (which were exempt) and capital gains. The differences in timing are driven by election cycles and differences in the legislative process. Fig. 1 displays the changes in corporate capital gains tax rates for all countries in our sample.[13] The resulting tax rates in 2013 after these reforms are listed in Table 2.

We note that a small fraction of our sample comprises M&A deals where sellers received stock of the acquiring company instead of cash payments. These so-called stock-for-stock deals are often classified as tax-free deals since gains may be deferred until the new stock is finally sold. While these deals are not immediately affected by capital gains taxes, we include them in our sample for two reasons. First, capital gains tax changes might affect the mode of payment in the sense that high capital gains tax rates incentivize some acquirers to pay in stock rather than cash (Ayers et al., 2004). If this behavior is reversed by capital gains tax cuts, we would overestimate the lock-in effect of these reforms on M&As when excluding stock-for-stock deals because part of the measured increase in cash deals might be a replacement of stock-for-stock deals. Second, sellers in stock-for-stock deals might still sell the new stock quickly to generate revenue and would then also be affected by corporate capital gains taxation. In a robustness check, we exclude stock-for-stock deals to verify that these are not driving our results.

[13] Note that for the United Kingdom, Germany and Portugal, the changes displayed refer to changes that occurred after the implementation of substantial capital gains tax exemption reforms in 2002.

Table 2
Corporate M&As, 2002–2013.

	Number of deals	Deal volume in bn US$		Corporate capital gains tax rate, 2013
		Revealed	Total	
Australia	1,093	45.69	67.58	30.00
Austria	329	8.83	54.84	25.00
Belgium	456	10.84	53.15	0.04
Canada	810	31.60	57.53	20.27
Croatia	67	0.32	0.52	20.00
Cyprus	55	2.88	3.60	20.00
Denmark	724	13.84	66.35	0.00
Finland	1,126	8.53	57.84	0.00
France	1,695	57.30	227.45	4.33
Germany	2,263	62.22	322.20	1.48
Greece	171	2.92	5.37	26.00
Iceland	48	0.88	3.26	0.00
Ireland	120	7.02	11.54	0.00
Israel	118	5.10	6.68	25.00
Italy	1,181	65.28	122.77	1.57
Japan	2,144	44.19	89.72	42.00
Luxembourg	31	2.88	7.44	0.00
Mexico	58	5.98	10.21	30.00
Netherlands	1,619	39.80	261.90	0.00
New Zealand	166	4.91	10.31	0.00
Norway	870	16.55	51.79	0.00
Portugal	218	11.03	22.69	12.50
Slovenia	39	0.60	1.80	8.50
South Korea	209	13.39	15.38	24.20
Spain	1,216	45.51	125.49	0.00
Sweden	1,507	25.13	92.58	0.00
Switzerland	633	11.81	108.33	0.00
Turkey	237	22.39	30.14	20.00
United Kingdom	4,458	162.55	306.80	0.00
United States	5,884	335.81	823.10	39.28
Total	29,545	1,066	3,018.35	

This table presents the number and volume of deals with corporate sellers per country from 2002 to 2013 as recorded in the Zephyr database. Listed targets and targets not residing in the country of the seller are excluded. Data is trimmed at the 1st and 99th percentile according to deal value. The deals are assigned to the country of residence of the seller company. The revealed deal volume is the sum of reported deal values. The total deal volume is obtained by multiplying the average revealed deal volume per deal (where reported) in each country with the number of deals observed in this country.

3.2. Micro-level evidence

In the first part of our analysis, we identify the impact of corporate capital gains taxation on acquisition activity via the location choice of acquirers. We relate the estimation to equation (3) and reformulate this expression in an empirical setting to obtain the probability that an acquirer f chooses target location i at time t:

$$\Phi\left(v_{ift} \geq v_{jft} | \boldsymbol{x}_{1ft}, \tau_{1t}^{CG}, \ldots, \boldsymbol{x}_{lft}, \tau_{lt}^{CG}\right) = \frac{\exp\left(v_{ift}\right)}{\sum_{j=1}^{l} \exp\left(v_{jft}\right)} \tag{7}$$

where v_{ift} is the value of this choice to the acquirer. We model v_{ift} as a function of the corporate capital gains tax rate in i as well as a large number of other variables that determine the location choice in M&A deals such as acquirer characteristics, target-location-specific variables and characteristics of the relation between acquirer and target location:

$$v_{ift} = \gamma \tau_{it}^{CG} + \boldsymbol{\beta} \boldsymbol{x}_{ift} + \boldsymbol{\phi_i} + \boldsymbol{\phi_f} + \boldsymbol{\phi_t} + \epsilon_{ift} \tag{8}$$

τ_{it}^{CG} is the tax rate applicable to capital gains realized by corporations when selling shares in substantial holdings. $\boldsymbol{x}_{ift}$ is a vector of time-varying control variables, $\boldsymbol{\phi_i}$ is a set of location-fixed effects that controls for any time-invariant characteristic of a location, $\boldsymbol{\phi_f}$ are acquirer-fixed effects and $\boldsymbol{\phi_t}$ indicate time-fixed effects. Following McFadden (1974), both the coefficient of interest γ and the other parameters, $\boldsymbol{\beta}$, can be estimated in a conditional logit regression on the sample of deals.

In this setting, identification of the lock-in effect of capital gains taxation relies on the exogenous within-country variation in the capital gains tax rate that is driven by the staggered implementation of tax exemptions for M&As in various countries. In order to maintain causality, one needs to make sure that these reforms are not endogenous to M&A activity (e.g. via an omitted variable bias). In our model specification, we control for a large range of factors that have been identified in the extant literature to affect takeover dynamics and may also be correlated with capital gains tax reforms.

Importantly, we control for changes in industry regulation that may affect M&As (see Dessaint et al., 2017; Mitchell and Mulherin, 1996) by including time-varying industry- and country-specific indices (3-digit SIC) for the strength of regulation as well as an indicator for the ease of laying off workers. We follow Rossi and Volpin (2004) and include annual GDP growth to account for macroeconomic conditions in the target country. Furthermore, we use an index for audit and reporting quality to control for institutional quality which has been shown to drive M&A activity (see Rossi and Volpin, 2004; Erel et al., 2012). The index exhibits variation over time based on a comprehensive survey among business executives in a large number of countries and is closely related in concept to the legal indices developed by López de Silanes et al. (1998) and Djankov et al. (2008). In addition, we control for other determinants of institutional quality such as judicial independence and the restrictiveness of credit market regulation. Finally, we include trade openness (i.e. the logarithm of the sum of exports and imports as a percentage of GDP) in the regression model to control for a country's degree of integration with international product markets. Additional controls include the standard income tax rate (τ^{CIT}) for corporations, GDP, inflation, the size of the stock market, the amount of credit provided to firms (see Di Giovanni, 2005), and the size of the service sector. In line with previous research, we lag the macroeconomic variables by one year to reflect that the decision makers' information set is based on completed rather than contemporaneous periods and to mitigate potential endogeneity problems. Since Arulampalam et al. (2019) find that the effect of profit taxes for cross-border M&As can vary with the acquirer's tax system, we also include an interaction of the corporate income tax rate and a dummy that is equal to one when the acquirer country has a worldwide tax system with a credit for foreign taxes and a higher tax rate than the potential target country.

While target-location-specific characteristics are a key factor in determining location choice, the relationship between the target and acquirer location may also be important. Following Feld et al., 2016 we include a set of bilateral acquirer-target-country controls comprising the distance between the two location's capitals as well as dummies indicating a common language, a common border, a former colonial relationship, and whether the acquirer and the potential target location are or were the same country. The latter indicator captures the home bias in the location choice.

The target-country fixed effects in our model account for unobserved country characteristics that may drive location choice. The underlying assumption of this approach is that the preferences captured by these fixed effects are the same for each acquirer. This might be restrictive given that acquirers vary substantially in their acquisition objectives, capability and performance (e.g. Moeller et al., 2004; Arikan and Stulz, 2016; Bird et al., 2017). We thus exploit the detailed micro-level information in our M&A data to control for heterogeneity in the location choice with respect to acquirer-specific characteristics. For example, M&As usually constitute a high fixed cost investment (see Jovanovic and Rousseau, 2002), part of which is related to the administrative burden which differs across countries. While this would deter acquisitions by small firms, larger acquirers are likely to be less affected. We therefore allow the time-invariable preference towards individual locations to vary with the size of the acquirer, that is, we add the interactions between the target-country fixed effects and the logarithm of acquirer total assets in the last available year prior to the acquisition as an additional set of control variables.

After controlling for the full set of location-specific factors, any remaining omitted variable must be systematically related to both corporate capital gains tax exemptions for M&As and takeover dynamics in different years and different countries to cause endogeneity. We address this potential concern by exploiting additional variation in capital gains accumulation across target industry sectors over time. Griffin and Stulz, 2001 and Bekaert et al., 2009 show that corporate stock returns are strongly correlated within industries and systematically vary across sectors. Sellers of targets operating in industries with a stronger increase in firm value prior to the deal are likely to realize a higher level of capital gains upon deal completion. They are thus more negatively affected by the capital gains tax rate than sellers of targets in industries with smaller gains. Such within-location variation in the impact of capital gains taxation allows us to single out any endogeneity resulting from unobserved events that coincide with changes in the corporate capital gains tax rate. We implement this strategy by including the interaction of sector-level capital gains with the corporate capital gains tax rate as a proxy for capital gains tax exposure of the target in our choice value model

$$v_{ift} = \gamma_1 \tau_{it}^{CG} + \gamma_2 \tau_{it}^{CG} \times CG_{ft} + \boldsymbol{\beta x}_{ift} + \boldsymbol{\phi_i} + \boldsymbol{\phi_f} + \boldsymbol{\phi_t} + \epsilon_{ift}. \tag{9}$$

CG_{ft} is the median capital gain at the deal announcement in the industry in which the target operates (2-digit SIC). We follow Ayers et al. (2003) and compute the 5-year and 3-year maximum gain. In this model, the coefficient of the interaction (γ_2) captures the lock-in effect of capital gains taxation as the size of the capital gains tax rate only becomes relevant if there exist locked-in capital gains. Hence, it is identified not only from variation in the capital gains tax rate but also from variation in the accumulated capital gains of the target.

Acquirers might not only be heterogeneous with respect to their preferences for certain locations, but might also differ in their response to the capital gains tax rate itself, that is, the independence of irrelevant alternatives (IIA) assumption might be violated. Most importantly, acquirers may differ in the level of synergy gains they expect from buying a particular firm. To account for this, we relax the assumption of a uniform response to capital gains tax rates and estimate a mixed logit model as described by Train (2009) which allows the estimates of γ in specification (7) as well as of γ_1 and γ_2 in specification (9) to vary across acquirers. Unlike the conditional logit model, results of a mixed logit model are also consistent when the IIA assumption does not hold.

3.3. Aggregate acquisition activity

Having identified the lock-in effect of capital gains taxation on the acquirer's location choice, we relax the assumption of a fixed number of overall acquisitions and turn to the effect of corporate capital gains tax rates on the level of M&A activity within a location. This approach implies that changes in the number of M&As derive from additional acquirers at the extensive margin in contrast to the previous logit approach, in which the extensive margin is fixed and changes in the number of M&As are due to acquirers substituting one target location for another. In this way, the two approaches represent the polar cases and the corresponding estimates provide bounds for the actual effect. See also Guimaraes et al. (2003) who show how a discrete choice model can be rewritten in the conditional logit framework of McFadden (1974) as a Poisson count model that relates the number of deals in a particular location to its characteristics. In the second part of our analysis, we thus estimate a reduced form of expression (6), aggregating the number of deals at the country-level. We model the number and volume of acquisitions as a non-linear function of the corporate capital gains tax rate and a range of control variables:

$$N_{it} = exp\left(\mathbf{x}'_{\mathbf{it}}\beta\right) \text{ with } \mathbf{x}'_{\mathbf{it}}\beta = \gamma\tau_{it}^{CG} + \boldsymbol{\beta}\boldsymbol{z_{it}} + \boldsymbol{\phi_i} + \boldsymbol{\phi_t} + \epsilon_{it} \tag{10}$$

where N_{it} denotes the number or total value of acquisitions in country i at time t, τ_{it}^{CG} is the corporate capital gains tax rate and $\boldsymbol{z}_{it}$ denotes the vector of location-specific control variables described for the choice model above. $\boldsymbol{\phi_i}$ and $\boldsymbol{\phi_t}$ are country- and year-fixed effects, respectively. The model is estimated using the Poisson pseudo-maximum-likelihood (PPML) estimator proposed by Silva and Tenreyro (2006).[14] Note that the various corporate capital gains tax reforms presented in Table 1 provide the source of within-country variation necessary to identify γ in the aggregated model. Because of the staggered implementation of capital gains tax cuts across countries, those countries without a tax cut serve as a control group in this setting (see Dessaint et al., 2017 or Cao et al., 2019 for similar applications in the context of M&As). Similar to Fuest et al. (2018), we test the identifying assumption of common pre-trends by an event study approach regressing the dependent variable on a set of dummies indicating pre- and post-reform years.

Our final estimation approach exploits the fact that the corporate tax reforms providing the source of variation in our estimations should generally not affect acquisitions where the seller is not incorporated.[15] We test this using the number of deals that involve an unincorporated seller as a control group in a pooled regression. Using M&A deals with non-corporate sellers as a comparison group we can test whether our results are driven by any unobserved events that coincide with corporate capital gains tax changes and affect M&A activity (e.g. regulatory measures providing incentives for corporate investment, economic shocks driving corporate consolidation, etc.).

We estimate a PPML model of the following form

$$\begin{aligned} N_{ikt} &= exp\left(\mathbf{x}'_{\mathbf{ikt}}\beta\right) \\ \text{with } \mathbf{x}'_{\mathbf{ikt}}\beta =& \gamma_1\tau_{it}^{CG} + \gamma_2\tau_{it}^{CG} \times CORPS_k + \gamma_3 CORPS_k \\ &+ \boldsymbol{\beta}\boldsymbol{z_{it}} + \boldsymbol{\alpha}\boldsymbol{z_{it}} \times CORPS_k + \boldsymbol{\phi_i} + \boldsymbol{\phi_t} + \boldsymbol{\phi_i} \times CORPS_k + \boldsymbol{\phi_t} \times CORPS_k + \epsilon_{ikt} \end{aligned} \tag{11}$$

where N_{ikt} indicates the number of deals in country i at time t for seller type k. With regard to the seller type we sort deals into two groups. $CORPS_k = 1$ indicates deals with sellers that are fully liable for corporate capital gains taxes (type-*C* deals). $CORPS_k = 0$ indicates those deals that are mainly affected by individual taxation (type-*I* deals), that is, the sellers include individuals or entities for whom corporate taxation is not applicable. $\boldsymbol{z_{it}}$, $\boldsymbol{\phi_t}$ and $\boldsymbol{\phi_i}$ are the same sets of controls and fixed effects as in the country-level regression above.

In equation (11), γ_1 captures the effect of changes in the corporate capital gains tax rate on M&As involving sellers that are not liable to pay corporate income tax. Since these deals are not subject to the lock-in effect of *corporate* capital gains taxation, γ_1 picks up indirect effects of reforms in corporate capital gains taxation on deals with non-corporate sellers as well as other events that coincided with the capital gains tax rate change and also influenced acquisition activity. γ_2 measures the effect of corporate capital gains tax changes on the number of deals involving only sellers which are directly affected. Consistent with a lock-in effect on acquisition activity, we expect γ_2 to be negative. Country-specific and time-specific differences in the level of acquisition activity are captured by the interaction of $CORPS_k$ with the corresponding fixed effects. Level differences across seller types are measured by γ_3.

3.4. Data

Deal-level information is collected from Bureau van Dijk's Zephyr database. An important advantage of Zephyr is that it contains detailed seller characteristics for each deal. Such information is critical to identify the deals associated with

[14] See Fally (2015) for a feasible implementation of fixed effects in the PPML model.

[15] Non-corporate sellers such as sole proprietors and most partnerships formed by natural persons pay individual income tax but no corporate income tax on realized gains from the sale of shares.

Table 3
Summary statistics.

	Obs.	Mean	Std. Dev.	Min	Max
τ^{CG}	886,380	13.110	13.775	0	42.1
τ^{CIT}	886,380	28.374	7.278	10	42.1
GDP	886,380	26.855	1.587	23.093	30.375
Growth	886,380	2.073	2.878	-9.132	11.113
Inflation	886,380	2.868	3.959	-5.205	52.851
Trade	886,380	4.310	0.502	3.009	5.853
Stock Market	886,380	0.737	0.495	0.080	3.264
Credit	860,160	1.018	0.471	0.002	3.122
Service Sector	843,120	67.911	14.125	0.561	87.470
Audit Quality	886,380	5.586	0.635	3.952	6.532
Tax Credit	886,380	0.267	0.443	0	1
Industry Regulation	871,650	0.131	0.595	0.000	6.000
Start-up Time	886,380	19.207	19.793	0.500	138.000
Judicial Independence	856,834	7.246	1.818	2.333	9.597
Ease of Hiring	856,834	6.786	2.542	2.200	10.000
Credit Market Regulation	856,834	9.044	0.977	4.667	10.000
Contiguity	843,840	0.074	0.262	0	1
Language	843,840	0.128	0.334	0	1
Colony	843,840	0.075	0.263	0	1
Distance	843,840	8.045	1.184	2.951	9.885
Home	886,380	0.037	0.188	0	1
Total Assets	358,230	38.823	5.178	8.517	44.145

corporate capital gains tax payments while excluding deals with individual shareholders as sellers.[16] We use the seller's legal form and name to establish whether it is liable for a corporation tax according to the regulations of the country it is registered in.[17] For the analysis of corporate capital gains tax rates on total acquisition activity, we aggregate the number and total value of deals by country and year according to the residence of the selling firm and the completion date of the deal. Using the completion date avoids a bias of our estimate caused by timing issues when corporations anticipate tax changes and announce deals in advance. Where the completion date is not available in Zephyr, we compute it by taking the median number of days between announcement and completion across the deals with available data in the same year and country and adding this duration to the announcement date provided.[18]

Information on the industry-level variation in capital gains accumulation that we exploit in our research design is obtained from CRSP. Following Ayers et al. (2003), we compute for each firm contained in CRSP the maximum capital gain over 3 and 5 years as a share of the original price by dividing the difference between the current price and the 3-year or 5-year low price by the latter. We take the median within each industry (2-digit SIC code) and month and assign it to each target according to the announcement date of the deal and the corresponding target industry. The median capital gains in our sample for individual SIC divisions can be found in the Online Appendix. The majority of targets operate in an industry of the services and manufacturing division for which we estimate a median 3-year gain of 49.07% and 52.24%, respectively, which is within the range of figures obtained by Ayers et al. (2003).

Macroeconomic controls were obtained from the World Banks's World Development Indicators Database. The audit and reporting quality indicator is an index provided by the Global Competitiveness Report conducted by the World Economic Forum. A full list of variables used in the analysis is presented in Table A.1 in the Appendix.

Summary statistics for the main variables are displayed in Table 3. In the Online Appendix, we provide additional summary statistics to validate that the various treatment and control observations in our empirical analysis are comparable. For instance, we show that countries with and without capital gains tax exemptions for corporate M&As do not significantly differ in terms of size of their economy, economic growth, trade openness and capital market size. Furthermore, for the comparison group approach where we compare deals with incorporated and unincorporated sellers, we show that these deals are similar in terms of acquirer and target size as well as in terms of acquirer and target profitability.

[16] Moreover, as pointed out by Erel et al. (2015), Zephyr's coverage of acquisitions outside the stock market is superior to alternative databases. This is convenient as, for reasons explained below, we expect acquisitions of non-listed targets to be particularly affected by corporate capital gains taxes. See Bollaert and Delanghe (2015) for a detailed analysis of data quality in Zephyr.

[17] For some deals no seller information is available. It is reasonable to assume that in this case the sellers comprise mainly individual shareholders and we therefore exclude these deals.

[18] We conduct a robustness check by computing the time between announcement and completion using nearest neighbor matching. In particular, we take the power-distance weighted average over the five closest deals regarding announcement within the same country. Results are presented in the Online Appendix.

4. Empirical results

4.1. Micro-level evidence

Table 4 presents the results of the first part of the empirical analysis based on a multi-nominal choice model. The dependent variable is equal to one if a location i is the actual location of the chosen target and equal to zero if a location

Table 4
Multi-nominal choice model.

	(1) Conditional Logit	(2) Conditional Logit: Interaction with Size	(3) Conditional Logit	(4) Conditional Logit	(5) Mixed Logit	(6) Mixed Logit: Interaction with Size	(7) Mixed Logit	(8) Mixed Logit
τ^{CG}	-0.007**	-0.010**	-0.003	-0.005	-0.007**	-0.013***	-0.002	-0.003
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)
$\tau^{CG} \times CG3Y$			-0.005***				-0.006***	
			(0.002)				(0.002)	
$\tau^{CG} \times CG5Y$				-0.002*				-0.004*
				(0.001)				(0.002)
Audit Quality	0.321***	0.170	0.308***	0.313***	0.312***	0.180*	0.303***	0.306***
	(0.070)	(0.103)	(0.069)	(0.069)	(0.071)	(0.106)	(0.070)	(0.070)
Growth	0.002	-0.017	0.005	0.003	-0.000	-0.020	0.004	0.002
	(0.012)	(0.017)	(0.011)	(0.012)	(0.012)	(0.017)	(0.012)	(0.012)
Trade	0.327	0.013	0.228	0.293	0.404	-0.009	0.288	0.351
	(0.295)	(0.435)	(0.296)	(0.296)	(0.303)	(0.441)	(0.304)	(0.303)
Credit	0.081	-0.100	0.077	0.089	0.085	-0.104	0.078	0.093
	(0.112)	(0.164)	(0.112)	(0.112)	(0.113)	(0.168)	(0.113)	(0.113)
GDP	0.029	1.259*	0.049	0.080	-0.169	1.051	-0.150	-0.102
	(0.476)	(0.748)	(0.476)	(0.477)	(0.487)	(0.763)	(0.487)	(0.488)
Stock Market	-0.208**	-0.101	-0.207**	-0.207**	-0.206**	-0.094	-0.206**	-0.206**
	(0.093)	(0.139)	(0.093)	(0.094)	(0.096)	(0.143)	(0.096)	(0.096)
Inflation	-0.015**	-0.037***	-0.015**	-0.015**	-0.018***	-0.039***	-0.018***	-0.017**
	(0.007)	(0.012)	(0.007)	(0.007)	(0.007)	(0.012)	(0.007)	(0.007)
Service Sector	0.001	-0.001	0.001	0.001	0.001	-0.001	0.000	0.000
	(0.002)	(0.004)	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)
τ^{CIT}	-0.009	-0.019*	-0.009	-0.010	-0.010	-0.021**	-0.011*	-0.012*
	(0.006)	(0.010)	(0.006)	(0.006)	(0.007)	(0.010)	(0.007)	(0.007)
$\tau^{CIT} \times$ Tax Credit	0.014***	0.005	0.014***	0.014***	0.003	0.002	0.003	0.003
	(0.003)	(0.005)	(0.003)	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)
Start-up Time	0.001	0.001	0.001	0.001	0.000	0.001	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Jud. Independence	0.103***	0.069*	0.099***	0.101***	0.114***	0.079*	0.110***	0.111***
	(0.027)	(0.039)	(0.026)	(0.027)	(0.028)	(0.041)	(0.028)	(0.028)
Ease of Hiring	0.020	0.013	0.017	0.019	0.019	0.014	0.016	0.018
	(0.021)	(0.029)	(0.021)	(0.021)	(0.021)	(0.030)	(0.021)	(0.021)
Credit Market Reg.	-0.033	-0.070*	-0.042	-0.035	-0.050*	-0.079*	-0.059**	-0.054*
	(0.029)	(0.040)	(0.029)	(0.029)	(0.030)	(0.041)	(0.030)	(0.030)
Industry Regulation	-0.149**	-0.222***	-0.149**	-0.150**	-0.152**	-0.231***	-0.152**	-0.152**
	(0.072)	(0.079)	(0.073)	(0.073)	(0.073)	(0.081)	(0.073)	(0.074)
Contiguity	-0.464***	-0.197*	-0.459***	-0.461***	-0.415***	-0.147	-0.411***	-0.411***
	(0.102)	(0.110)	(0.102)	(0.102)	(0.100)	(0.103)	(0.100)	(0.100)
Language	0.438***	0.166	0.432***	0.433***	0.397***	0.155	0.392***	0.393***
	(0.099)	(0.137)	(0.099)	(0.099)	(0.098)	(0.130)	(0.098)	(0.099)
Colony	0.594***	0.537***	0.597***	0.598***	0.504***	0.417***	0.508***	0.507***
	(0.079)	(0.120)	(0.079)	(0.079)	(0.078)	(0.117)	(0.078)	(0.078)
Distance	-0.892***	-0.974***	-0.892***	-0.891***	-0.985***	-1.116***	-0.985***	-0.985***
	(0.036)	(0.043)	(0.036)	(0.036)	(0.039)	(0.048)	(0.039)	(0.039)
Home	2.520***	2.299***	2.521***	2.522***	2.471***	2.189***	2.472***	2.472***
	(0.077)	(0.075)	(0.077)	(0.077)	(0.080)	(0.076)	(0.079)	(0.079)
Observations	714,766	297,430	712,105	712,105	714,766	297,430	712,105	712,105
Pseudo LL	-25,982	-11,936	-25,897	-25,800	-25,906	-11,894	-25,821	-25,824

This table reports the results of estimating a multi-nominal choice model where the dependent variable is equal to one if a location i is the actual location of the chosen target and equal to zero if a location is a counterfactual target location. *CG3Y* and *CG5Y* are the median maximum capital gains in the industry in which the target operates (2-digit SIC) at the deal announcement relative to the 3 and 5 years, respectively, prior to the deal announcement. Regressions (1) to (4) use a conditional logit model with target-country fixed effects (not reported). Regression (2) adds the interactions of target-country fixed effects with the logarithm of total assets in the acquirer as reported in the last available year prior to the acquisition as additional controls. Regressions (5) to (8) repeat regressions (1) to (4) using a mixed logit model where the coefficient for the capital gains tax rate is randomized. All regressions include country-fixed effects. Robust standard errors (adjusted for clustering at the acquirer-location-industry level) are provided in parentheses. Stars behind coefficients indicate the significance level, *** 10%, ** 5%, * 1%.

is a counterfactual target location. To account for a potential correlation of the target choice within industries and acquirer locations, we report cluster-robust standard errors.[19] Column (1) displays the results of a conditional logit regression.[20] We find a significant and negative coefficient of -0.007 for the corporate capital gains tax rate, which translates into a semi-elasticity of -0.7%. Thus, a one percentage point increase in the capital gains tax rate in a potential target country reduces the probability to observe an acquisition there by 0.7%. Using derivations by Schmidheiny and Brülhart (2011) and Cameron and Trivedi (2005), this implies, for instance, that the abolition of capital gains taxation of inter-corporate acquisitions in the United States (39.28% in 2013, including state taxes) would increase the number of acquisitions taking place there by 24%. We note that not all of these additional acquisitions may generate synergy gains as a cut in capital gains tax rates might exacerbate a tax differential between dividend payments and capital gains which distorts payout policies and leads to inefficient over-investment in M&As whose proceeds are taxed at capital gains tax rates (see Auerbach and Reishus, 1987; Ohrn and Seegert, 2019). This is less likely for corporate sellers as inter-corporate dividends are usually exempt from taxation such that a capital gains tax cut would reduce rather than increase the tax differential.

In column (2), we add the interactions of the target location-fixed effects and the acquirer size as additional controls (coefficients are presented in the Online Appendix). The coefficient on the corporate capital gains tax rate remains significant and increases in magnitude to -0.01 (i.e. a semi-elasticity of -1.0%). This points to a potential omitted variable bias when not controlling for acquirer specific characteristics.

In columns (3) and (4) we add the interactions between the corporate capital gains tax rate and the 3-year and 5-year capital gain in the industry that the target operates in. In this specification, the coefficient for the interaction term captures the direct impact of capital gains taxation on the location choice via the lock-in effect on seller shares as the size of the capital gains tax rate only becomes relevant if there exist locked-in capital gains. The estimated coefficient for the interaction term is significantly negative, which implies that the association of capital gains taxation and takeover dynamics is indeed caused by a lock-in of seller shares in targets with high capital gains accumulation.

Aside from the corporate capital gains tax rate, we find inflation, corporate taxation and distance to have a significant and negative effect on M&A activity. High inflation may deter M&A activity, since it is associated with greater uncertainty. The negative coefficient on the corporate tax rate expresses the well-known negative effect of corporate taxation on FDI.[21] Distance increases transaction costs and thus decreases the likelihood to observe FDI. The indicators Home and Colony also proxy for transaction costs: Acquiring a target in the acquirer location facilitates the transfer of ownership for various reasons (legal, language, culture, etc.). To a lesser extent, the same argument applies to acquisitions in former colonies. Consistent with prior studies, industry regulation reduces the probability of locating in a particular country while an increase in institutional quality, as measured by the audit and reporting quality index and the judicial independence index, has a positive impact on takeover dynamics.

In column (5) to (8) of Table 4, we apply a mixed logit estimator following Train (2009, p. 138). In this approach, the vector of coefficients for τ^{CG} is allowed to be random, such that one can relax the assumption of independence of irrelevant alternatives (IIA). Apart from the different estimation approach the specifications in columns (5) to (8) are identical to the ones in columns (1) to (4), respectively, in terms of covariates and the computation of standard errors. We report the average coefficient obtained from simulating the maximum likelihood as a benchmark. The coefficient obtained in column (5) is similar to that for the conditional logit estimation and suggests that the average probability for an M&A deal to take place in a particular location increases by 0.7% per percentage point decrease in the corporate capital gains tax rate.

Applying a mixed logit approach does not affect the results but the estimated coefficients are larger when we include the interaction of acquirer characteristics and target location-fixed effects (compare columns (2) and (6)). The estimated average coefficient of -0.013 in column (6) implies a semi-elasticity of 1.29%. In the Online Appendix, we illustrate the variation in estimated coefficients by simulating specific values for each acquirer for specification (5) following Train (2009, p. 256). The estimated standard deviation in the coefficients is highly significant which suggests that randomizing the coefficient of τ^{CG} is indeed a valid approach.[22]

4.2. Country-level aggregation

When turning to the analysis of aggregate M&A activity, we first test the identifying assumption of common pre-trends using an event study design as in Fuest et al. (2018) and regress the dependent variable (number of M&A deals) on a set of dummies indicating pre- and post-reform periods.[23] This allows us to compare M&A activity in countries that have imple-

[19] In particular, we allow for clustering on the location-industry level (double-digit SIC code) of the acquirer. Adjusting for clustering on the country choice level is not a feasible option because this leads to inconsistent estimates of the corresponding variance-covariance matrix such that cluster-robust standard errors cannot be computed (Cameron and Miller, 2011). As suggested by Cameron and Miller (2015) we include country fixed effects to absorb within-alternative clustering while allowing for standard errors clustered on the acquirer-location-industry level.

[20] We also ran the model without any control variables except for the fixed effects and have again obtained significant coefficient estimates for the corporate capital gains tax rate of similar size.

[21] Consistent with Arulampalam et al. (2019) it is neutralized in cross-border acquisitions if the acquirer uses a world-wide tax system with a foreign tax credit as indicated by the positive coefficient for $\tau^{CIT} \times$ Tax Credit.

[22] In the Online Appendix, we plot the Kernel density simulated coefficients.

[23] For a description of the estimation model see the notes to Fig. 2. Schmidheiny and Siegloch (2019) discuss the implementation of event studies when the treatment varies in strength in more detail.

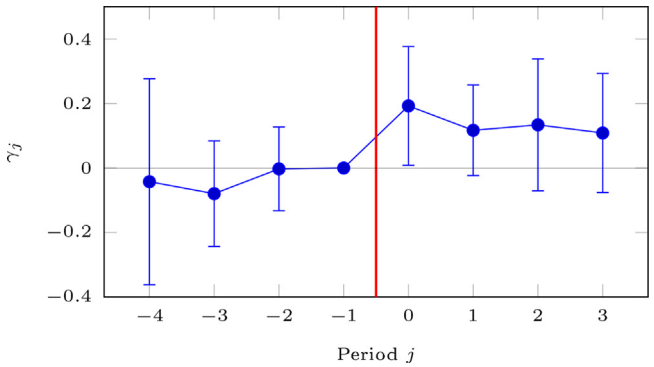

Fig. 2. Common pre-trend This table plots the coefficient estimates $\gamma_j, j \in [-4, 3]$ and the corresponding 90% confidence intervals of a generalized difference-in-differences PPML model that takes the following form: $ln(N_{it}) = \sum_{j=-5}^{4} \gamma_j D_{it}^j + \boldsymbol{\beta z_{it}} + \boldsymbol{\phi_i} + \boldsymbol{\phi_t} + \epsilon_{it}$ where N_{it} is the number of M&As in country i in year t in which a corporate seller disposes of shares in a target firm. The dummy variables D_{it}^j indicate if in country i in year t a capital gains tax cut has taken place j periods ago. The tax cuts correspond to the capital gains tax rate reductions listed in Table 1. γ_{-1} is normalized to zero such that all effects are measured relative to the year directly preceding the treatment. The event dummies are binned up at the endpoints (D_{it}^{-5} and D_{it}^4): for example, the dummy D_{it}^4 takes the value one in year t if the cut in capital gains tax rate occurred four or more years ago. The binning up is necessary due to treatments taking place at different points in time and endpoint estimates are not plotted. $\boldsymbol{\phi_i}$ and $\boldsymbol{\phi_t}$ are the same set of fixed effects as in specification (10).

mented a capital gains tax cut to the control group of countries which have not implemented such tax cuts.[24] Fig. 2 plots the estimated coefficients. Neither the individual pre-reform coefficients nor their sum are significantly different from zero (χ^2 of 0.75) and we cannot reject joint insignificance of all coefficients (χ^2 of 0.15). Thus, we cannot reject the assumption of common pre-trends which validates our research design. In the post-reform periods we observe a positive effect which we explore in the regression analysis below.

In Table 5 we present the results of the second part of our empirical analysis using the Poisson pseudo-maximum-likelihood (PPML) estimator and the number of M&A deals aggregated at the seller-country level as the dependent variable. Column (1) presents the results of our main specification. We obtain a negative and significant coefficient for τ^{CG}. A 1 percentage point decrease in the corporate capital gains tax rate increases the number of M&As by about 1% per year. This result is robust to adding further control variables in column (2). Throughout the specifications, standard errors are corrected for clustering at the country level, except for column (3), where we follow Cameron and Miller (2015) and obtain standard errors using the score wild bootstrap method developed by Kline and Santos (2012) to demonstrate that our estimation result does not suffer from inappropriate cluster adjustment over a small number of clusters.

In addition to corporate capital gains taxes, audit and reporting quality, global economic integration and economic growth all increase the level of M&A activity. For instance, the results suggest that an increase in our index for audit quality by 1 point, which approximately resembles the institutional improvements in Turkey between 2006 and 2012, increases M&A activity by 85.52%.

In column (4) we verify that the results are not driven by countries that position themselves as a preferable location for holding companies. Potential candidates in our sample are Cyprus, Ireland, Luxembourg, Malta, the Netherlands and Switzerland because of their lack of substantial Controlled Foreign Company (CFC) rules and the dividend and capital gains tax exemption granted.[25] While these countries have low tax rates for corporate capital gains, the factors that actually raise acquisition activity there may be unrelated to taxation. This could induce a downward bias in our estimate. We thus re-estimate the model excluding the countries cited above. The coefficient for τ^{CG} remains significantly negative with very similar point estimates.

If our results capture a quantity effect of corporate capital gains taxes, we should be able to observe this in both the count and volume of M&A deals. To verify this, we re-estimate our results using aggregated deal values as the dependent variable. The results are presented in column (5). Again the coefficient for the capital gains tax rate is significantly negative. With a magnitude of -0.014 in our main specification, it suggests that decreasing the corporate capital gains tax rate by one percentage point raises the total volume of acquisitions by 1.39% per year. As the effects on the number and the volume of M&As are similar, the quantity effect of corporate capital gains taxation appears to be homogeneous across size classes. Thus, the results regarding the quantity of the lock-in effect caused by corporate capital gains taxes cannot simply be explained by a change in the size of M&A deals.

[24] Countries which implemented their reform at another point in time are effectively also part of the control group such that early treatments serve as a control group for late treatments and vice versa.

[25] Smith (2011) reviews the relevant rules in these countries in more detail.

Table 5
Corporate capital gains tax and acquisition activity.

	(1) Full Sample	(2) Full Sample	(3) Bootstrap	(4)w/o Holding Locations	(5)Deal Value
τ^{CG}	-0.010***	-0.011***	-0.011***	-0.012***	-0.014***
	(0.003)	(0.004)	(-2.003)	(0.004)	(0.005)
Audit Quality	0.618***	0.443***	0.443***	0.390***	0.370**
	(0.163)	(0.113)	(2.793)	(0.130)	(0.148)
Growth	0.038***	0.040***	0.040**	0.040***	0.011
	(0.012)	(0.014)	(2.373)	(0.015)	(0.020)
Trade	1.428**	1.310**	1.310**	1.544***	0.436
	(0.621)	(0.591)	(1.353)	(0.568)	(1.141)
Credit	0.122	0.058	0.058	0.121	-0.803***
	(0.121)	(0.126)	(0.407)	(0.120)	(0.246)
GDP	-0.828	-0.889	-0.889	-0.601	3.136***
	(1.293)	(1.060)	(-0.774)	(0.996)	(1.116)
Stock Market	0.213	0.178	0.178	0.277*	0.456**
	(0.166)	(0.148)	(1.063)	(0.167)	(0.222)
Inflation	-0.020**	-0.021**	-0.021	-0.019**	-0.048***
	(0.009)	(0.008)	(-1.375)	(0.009)	(0.014)
Service Sector	0.008	0.006	0.006	0.011	0.060**
	(0.013)	(0.014)	(0.454)	(0.015)	(0.025)
τ^{CIT}	0.010	0.010	0.010	0.018*	0.005
	(0.013)	(0.011)	(0.778)	(0.011)	(0.023)
Start-up Time		-0.001	-0.001	-0.002	0.004
		(0.002)	(-0.498)	(0.001)	(0.003)
Jud. Independence		0.169***	0.169***	0.187***	0.074
		(0.056)	(2.444)	(0.055)	(0.073)
Ease of Hiring		-0.034	-0.034	-0.031	0.042
		(0.033)	(-0.946)	(0.038)	(0.059)
Credit Market Reg.		0.072**	0.072*	0.088***	-0.003
		(0.028)	(1.618)	(0.026)	(0.053)
Observations	333	313	313	266	313
No. of countries	30	29	29	24	29
Pseudo LL	-1,453	-1,310	-1,422	-1,137	-7.006e+07

Estimation with PPML. The dependent variable in columns (1)-(4) is the number of M&A deals per year and country in which a corporate seller disposes of shares in a target firm residing in the same country. Regression (3) repeats regression (2) and computes standard errors using the score wild bootstrap method proposed by Kline and Santos (2012). Wald test t-statistics for this approach are reported in parentheses. In regression (4) countries which are referred to as preferred holding locations are excluded. Regression (5) uses as dependent variable the sum of all values of M&A deals per year and country in which a corporate seller disposes of shares in a target firm residing in the same country. All regressions include target-country- and year-fixed effects. Robust standard errors (adjusted for clustering at the country level) are provided in parentheses for Regressions (1), (2), (4) and (5). Stars behind coefficients indicate the significance level, *** 10%, ** 5%, * 1%.

4.3. Comparison group approach

Table 6 reports the results of the final part of our analysis. We compare the evolution of acquisition activity between individual and corporate sellers. In column (1), we report the results of a regression including only the corporate capital gains tax rate and time and location specific fixed effects as well as their interactions with the seller-type indicators *CORPS*. As expected, the coefficient of $\tau^{CG} \times CORPS$ is negative and significant. This suggests that corporate capital gains taxation has a negative effect on the number of acquisitions involving corporate sellers relative to the number of acquisitions involving sellers which are not liable for corporate income taxation.

Our findings are robust to including the full set of control variables as well as their interaction with the seller-type indicator in column (2). The estimated semi-elasticity for inter-corporate acquisition activity with respect to a percentage point change in the corporate capital gains tax rate (i.e. $\gamma_1 + \gamma_2$ from specification (11)) is -0.011 (p-value 0.003), which is similar to our benchmark estimates reported in Table 5. In columns (3) and (4), we verify that this result is consistent across various sample specifications. We first exclude all stock-for-stock deals in column (3) thus reducing the sample to deals with cash payments which are directly affected by capital gains taxation. In column (4) we relax the sample restriction on sellers disposing their domestic subsidiaries and extend the sample to also include deals where a firm sells a foreign subsidiary. In both specifications the coefficient for $\tau^{CG} \times CORPS$ is significant and negative with an estimated semi-elasticity of -0.014 and -0.012 in regressions (3) and (4), respectively.

Throughout the various specifications in Table 6, the estimated coefficient for τ^{CG}, which captures the effect of corporate capital gains taxation on deals involving primarily individual sellers, is small and not significant. This indicates that these deals are not affected by reductions in the corporate capital gains tax rate. Given that deals with individual sellers are affected by changes in the macro-economic environment as well as policy adjustments unrelated to corporate taxation, this

Table 6
Comparison group approach.

	Full Sample		Only Cash Payments	Including Foreign Sellers
	(1)	(2)	(3)	(4)
τ^{CG}	0.008	0.003	0.003	0.003
	(0.008)	(0.007)	(0.006)	(0.007)
$\tau^{CG} \times CORPS$	-0.016**	-0.013**	-0.014**	-0.012*
	(0.009)	(0.006)	(0.006)	(0.006)
CORPS	0.628	-40.356	-38.499	-55.223
	(0.340)	(51.025)	(54.019)	(56.827)
Control variables	No	Yes	Yes	Yes
Observations	720	626	626	626
No. of countries	30	29	29	29
Pseudo LL	-3,002	-2,311	-2,257	-2,326

Estimation with PPML. The dependent variable is the number of M&A deals per year, country and seller type. Regressions (2) to (4) also include macro-level controls presented in Table A.2 in the Appendix. Column (1) and (2) only include deals in which the seller disposes of shares in a target firm residing in the same country. Regression (3) restricts the sample of regression (2) to deals with cash payments. Column (4) presents the results of a regression including also deals with foreign sellers. All regressions include seller-type specific year fixed effects and seller-type specific country-fixed effects. Robust standard errors (adjusted for clustering at the country-level) are provided in parentheses. Stars behind coefficients indicate the significance level, *** 10%, ** 5%, * 1%.

finding reassures us of the causality in our empirical findings as it links the effect of cuts in the corporate capital gains tax rate directly to the behavior of corporate sellers.

Finally, the estimated coefficients for *CORPS* in Table (6) capture general level differences between the number of deals with and without individual sellers. Since country-specific and time-specific level differences are already captured in the interaction with *CORPS* and the corresponding fixed effects, it is not surprising that the estimated coefficient for *CORPS* is insignificant or even negative when conditioning on macro-economic variables in columns (2) to (4).

4.4. Robustness and extensions

In this section we present a range of additional tests and extensions to verify the robustness of our estimation results. Columns (1a-b) to (3a-b) of Table 7 contain several sample checks based on the main analysis. In a first step, we note that our baseline specification also includes deals that are exclusively paid through stock-for-stock transfers. In many countries these deals allow the seller company to defer the realization and thus also the taxation of capital gains until the shares received in compensation are eventually sold. As a consequence, such deals are generally less affected by capital gains taxation than deals that involve some sort of cash payment. As noted above, there are several reasons to still include these deals in our main analysis. Nevertheless, the results should not be driven by such transactions. We thus exclude them in columns (1a-b) and re-estimate the choice and count models using our main specification. Again, we obtain negative and significant coefficients of a very similar magnitude.

In a second check, we add deals with foreign sellers: a corporate seller resident in country *A* sells shares in a subsidiary resident in country *B*. These transactions have been excluded since many countries - differing from the case where the seller and its subsidiary are resident in the same country - do not tax capital gains from these deals (e.g. Australia, Turkey). Furthermore, multinational enterprises have various possibilities to avoid taxation (e.g. through holding companies). Results from a robustness check including deals with foreign sellers are reported in columns (2a-b) of Table 7. The estimated coefficients remain negative and significant and decrease only slightly in magnitude. The latter observation may reflect that these deals are indeed less affected by corporate capital gains taxation.

In columns (3a-b) of Table 7, we include industry shocks and the long-term interest rate as additional control variables which are only available for a limited number of countries in our sample. Following Ayers et al. (2007), industry shocks are defined as the standard deviation in value added growth across eight sectors within a country to account for sector specific shocks that may increase acquisition activity by triggering sector specific consolidation. Including both variables leaves the capital gains tax rate coefficient virtually unchanged.

We conducted two extensions to the main analysis for which results are presented in the Online Appendix. First, we repeat the analysis of aggregate M&A activity on the country-industry-level to account for the observation that a large part of acquisition activity is driven by shifts within specific industries (see Mitchell and Mulherin, 1996). Disaggregating the country-level deal count to 3-digit U.S. SIC code industry cells within each country, we estimate coefficients for the corporate capital gains tax rate that are very similar to those in the baseline estimations described above. An ad-

Table 7
Robustness checks.

	Only Cash Payments		Including Foreign Sellers		Additional Controls	
	(1a) Mixed Logit	(1b) Poisson (Country)	(2a) Mixed Logit	(2b) Poisson (Country)	(3a) Mixed Logit	(3b) Poisson (Country)
τ^{CG}	-0.014***	-0.011***	-0.009***	-0.009***	-0.010**	-0.011**
	(0.004)	(0.004)	(0.003)	(0.003)	(0.005)	(0.004)
Audit Quality	0.182*	0.422***	0.141*	0.368***	0.015	0.463***
	(0.109)	(0.112)	(0.073)	(0.104)	(0.183)	(0.164)
Growth	-0.023	0.040***	-0.018	0.023*	-0.004	0.034**
	(0.017)	(0.014)	(0.012)	(0.012)	(0.030)	(0.016)
Trade	-0.034	1.258**	0.316	1.228**	0.736	1.724***
	(0.452)	(0.589)	(0.314)	(0.548)	(0.687)	(0.589)
Credit	-0.177	0.026	-0.006	0.050	-0.256	-0.012
	(0.176)	(0.118)	(0.118)	(0.115)	(0.321)	(0.197)
GDP	1.083	-0.850	1.330**	-0.350	2.376**	-2.364
	(0.782)	(1.039)	(0.539)	(1.041)	(1.211)	(2.086)
Stock Market	-0.063	0.190	-0.036	0.083	-0.230	0.314*
	(0.145)	(0.151)	(0.086)	(0.119)	(0.257)	(0.180)
Inflation	-0.043***	-0.022***	-0.017**	-0.015**	-0.035**	-0.028*
	(0.012)	(0.008)	(0.008)	(0.008)	(0.016)	(0.015)
Service Sector	-0.002	0.007	0.001	0.004	-0.034	0.009
	(0.004)	(0.014)	(0.003)	(0.013)	(0.033)	(0.023)
Start-up Time	0.001	-0.001	0.000	-0.001	-0.000	0.001
	(0.002)	(0.002)	(0.001)	(0.001)	(0.003)	(0.004)
Jud. Independence	0.093**	0.174***	0.060**	0.135***	0.115**	0.146***
	(0.042)	(0.056)	(0.030)	(0.051)	(0.052)	(0.044)
Ease of Hiring	0.012	-0.032	0.034	-0.026	-0.052	-0.088*
	(0.031)	(0.033)	(0.022)	(0.029)	(0.046)	(0.050)
Credit Market Reg.	-0.074*	0.071**	-0.034	0.063**	-0.125*	0.039
	(0.043)	(0.028)	(0.029)	(0.027)	(0.072)	(0.033)
τ^{CIT}	-0.023**	0.009	-0.013*	0.007	-0.006	0.002
	(0.010)	(0.011)	(0.007)	(0.010)	(0.013)	(0.013)
$\tau^{CIT} \times$ Tax Credit	0.002		0.006*		0.002	
	(0.005)		(0.003)		(0.006)	
Contiguity	-0.151		-0.170**		-0.010	
	(0.104)		(0.077)		(0.111)	
Language	0.167		0.310***		-0.100	
	(0.132)		(0.094)		(0.154)	
Colony	0.414***		0.349***		0.672***	
	(0.119)		(0.078)		(0.132)	
Distance	-1.112***		-0.919***		-1.092***	
	(0.048)		(0.035)		(0.059)	
Home	2.182***		1.802***		2.269***	
	(0.077)		(0.065)		(0.078)	
Regulation	-0.214**		-0.187**		-0.282**	
	(0.083)		(0.073)		(0.114)	
Industry Shock					0.032	-1.279
					(0.059)	(1.084)
Interest Rate					-1.722	0.096***
					(1.282)	(0.034)
n	285,098	313	396,537	313	144,252	170
Countries	29	29	29	29	29	22
Pseudo LL	-11,491	-1,282	-23,562	-1,348	-7,196	-655

This table reports robustness checks. Each group of regressions (1a,b), (2a,b) and (3a,b) repeat the benchmark regressions (6) in Table 4 and (2) in Table 5. The first group of regressions (1a,b) excludes all deals whose payment was conducted exclusively in stock-for-stock transfers. The second group of regressions (2a,b) adds deals where corporate sellers sold a foreign target to the benchmark specification. Regressions (3a,b) include within-industry shocks and the interest rate as additional controls. Robust standard errors are provided in parentheses. All regressions include country-fixed effects. Robust standard errors (adjusted for clustering at the acquirer-location-industry level for columns a and at the country level for columns b) are presented in parentheses. Stars behind coefficients indicate the significance level, *** 10%, ** 5%, * 1%.

vantage of the industry-level regression is that we can explicitly control for various factors that drive takeover dynamics within sectors. To begin with, we augment the fixed-effects model above by including industry-fixed effects as well as U.S. SIC division specific year fixed effects to account for differential time trends within sectors. Furthermore, we include country-industry-year-specific controls: growth of unit labor costs, the respective industry's contribution to overall labor

productivity, growth in employment and growth in employment compensation. Our estimation results are robust to these adjustments.

Second, we run a bilateral count regression model in the spirit of Di Giovanni (2005) where we relate the number and total value of deals, N_{ijt}, with sellers located in country i and acquirers located in country j (i.e., $i = j$ for domestic deals) to both the corporate capital gains tax rate in the seller country and in the acquirer country. This allows us to test whether corporate capital gains taxes also affect the number of completed M&As via the capitalization into the acquirer's reservation price, in addition to the lock-in effect on the seller's reservation price. We find no such effect with the estimated coefficient for the acquirer's capital gains tax rate being small and insignificant while they remain significantly negative for the seller's capital gains tax rate. This probably reflects, that reselling is not an empirically relevant phenomenon in our sample with only 2% of targets being resold.

5. Distortive effects of the capital gains tax

The above estimates measure the distortive effect of capital gains taxes on the efficient allocation of ownership rights in terms of M&As which are inhibited by the tax. To assess the magnitude of this effect, we use the estimates to quantify the impact of a full abolition of corporate capital gains taxation for M&As in the four countries that had relatively high capital gains tax rates during the sample period: Australia, Canada, Japan and the United States. We approach this in two steps. First, we use the elasticity estimates from the benchmark regressions above to determine the expected change in total deal volume within a country and industry sector following a reduction in the corporate income tax rate on gains realized in M&As. Second, we calculate the amount of synergies forgone based on premiums in similar transactions. Premiums are a good proxy for the efficiency gain which can be realized by the change in ownership as Li (2013) found a close correspondence between premiums paid and additional productivity gains achieved in the wake of an acquisition.

Deals are assigned to the following sectors according to the target SIC code: Mining and Construction (1000–1799), Manufacturing (2000–3999), Finance, Insurance and Real Estate (6000–6799) and Services (7000–8999). The change in the volume of deals following a capital gains tax exemption in sector s in location i is $\Delta N_{is} \times \overline{DV}_{is}$ where $\overline{DV}_{is}$ is the average deal size in this sector and ΔN_{is} is the expected change in the number of M&As that follows from the estimated elasticities. The mean semi-elasticity of location i with respect to a tax change there, $\bar{\epsilon}_i$, is derived from the mixed logit estimation in column (5) of Table 4 following Guimaraes et al. (2003) and Schmidheiny and Brülhart (2011).[26] It captures the effect of capital gains taxation on the location choice. If one assumes that the outside option for acquirers is instead not to pursue a deal at all, the elasticity is directly obtained from the coefficient estimate for the capital gains tax rate in our PPML model (column 2, Table 5). The change in the number of M&As that results from a tax cut with a magnitude of $d\tau_i^{CG}$ is given by $\Delta N_{is} = \bar{N}_{is} \times \left(\exp\left(\bar{\epsilon}_i \times d\tau_i^{CG}\right) - 1\right)$ where $\bar{N}_{is}$ is the average number of deals per year in sector s of location i.[27] We consider a full exemption of capital gains from corporate taxation at the rates applied in 2013 which was 30% in Australia, 20.27% in Canada, 42% in Japan and 39.28% in the United States (including state taxes).

The results of this simulation are presented in Table 8a. An abolition of corporate capital gains taxation in the United States would have raised the annual volume of completed M&As there by around $16.1 billion if one only considers the effect of deal relocation (see Panel (i)). This figure increases substantially, if one also takes into account that a high capital gains taxation might lead to some deals not being realized at all (see Panel (ii)). Then, the volume of forgone M&A deals in the United States is estimated to amount to around $34.4 billion annually. The overall effect for the other countries ranges from a volume of $1.1 billion in forgone deals in Canada to $4.4 billion in Japan. The magnitude of the effect reflects that these countries have smaller capital markets and less potential for M&As than the United States.

To compute the value of unrealized synergy gains from these forgone deals, we use data on M&A premiums from Zephyr. Noting that the value of a deal is a function of the premium π (as a percentage of the market value) paid by the acquirer and the underlying market value m and is given by $DV = (1 + \pi)m$, we can express the synergy gain as a share of the overall deal value by $g = \frac{\pi m}{DV} = \frac{\pi}{1+\pi}$. The acquisition premium π of a deal is obtained from Zephyr and is defined as the deal value less the market price of the target one day prior to the announcement divided by the latter. As an estimate of the expected acquisition premium, we use the average within each country and sector, $\bar{\pi}_{is}$. The average approximated synergy gain per deal ranges from $US 8.53 million in Australia to $US 38.5 million in the United States.[28] These figures are at the lower end of prior estimates which probably reflects that our data also includes a large number of smaller M&A deals.[29] Using these gains, the annual value of forgone synergy gains in country i and sector s is given by $\Delta N_{is} \times \overline{DV}_{is} \times \bar{g}_{is}$.

[26] As shown by Guimaraes et al. (2003) and Schmidheiny and Brülhart (2011), the change in the expected number of deals in a country i with respect to a one percentage point change in the capital gains tax rate for a particular deal f can be expressed as $\epsilon_{if} = \left(1 - \hat{\Phi}_{if}\right)\hat{\gamma}_f$ where $\hat{\Phi}_{if}$ is the predicted probability for the acquisition of a target in location i and $\hat{\gamma}_f$ is the estimated coefficient of τ_{it}^{CG} for deal f. $\hat{\Phi}_{if}$ and $\hat{\gamma}_f$ are obtained from the mixed logit estimation. The mean elasticity of location i is then given by $\bar{\epsilon}_i = \left(1 - \bar{\hat{\Phi}}_i\right)\bar{\hat{\gamma}}_i$.

[27] For smaller changes in the tax rate, the change in the number of deals could have been approximated by $\bar{N}_{is}\bar{\epsilon}_i$.

[28] In the Online Appendix we provide more details on the synergy gain per deal broken down by country and industry sector.

[29] For example, for a sample of U.S. mergers Bradley et al. (1988) report average synergy gains of $US 117.11 million while Barraclough et al. (2013) estimate average synergy gains per deal of up to $US 1,198.2 million based on option prices.

Table 8
Distortions of the capital gains tax This table displays the results of simulating a full exemption of gains from selling shares in inter-corporate M&As for Australia, Canada, Japan and the United States, respectively. Table (a) displays the resulting increase in deal volume per year. Table (b) displays the estimated forgone synergy gains if these deals are not realized.

(a) Estimated volume of unrealized deals (in million US$)

	Panel (i): Relocation of Deals				Panel (ii): Failed Deals			
	Australia	Canada	Japan	United States	Australia	Canada	Japan	United States
Finance, Insurance and Real Estate	231.77	154.26	554.24	2,230.63	376.05	246.16	949.93	4,752.16
Manufacturing	233.07	125.17	895.67	4,636.47	378.16	199.74	1,535.11	9,877.61
Mining and Construction	224.62	112.88	29.19	676.91	364.46	180.12	50.03	1,442.10
Services	469.95	228.72	835.68	4,547.26	762.51	364.97	1,432.30	9,687.56
Other	231.21	94.06	294.74	4,050.85	375.14	150.10	505.17	8,630.00
Total	1,390.62	715.09	2,609.52	16,142.12	2,256.32	1,141.09	4,472.54	34,389.43

(b) Unrealized synergy gains (in million US$)

	Panel (iii): Relocation of Deals				Panel (iv): Failed Deals			
	Australia	Canada	Japan	United States	Australia	Canada	Japan	United States
Finance, Insurance and Real Estate	17.33	33.71	81.13	530.03	29.02	55.43	143.74	1,166.78
Manufacturing	37.45	38.12	196.82	1,238.80	62.70	62.67	348.73	2,727.06
Mining and Construction	44.05	22.64	4.42	147.48	73.75	37.22	7.84	324.66
Services	38.10	56.83	183.83	1,113.22	58.66	46.79	140.83	2,638.97
Other	35.04	28.46	79.48	1,198.79	63.79	93.42	325.70	2,450.61
Total	171.97	179.76	545.68	4,228.32	287.92	295.53	966.84	9,308.08

Table 8 b presents the simulated annual synergy gains forgone due to capital gains taxation in inter-corporate M&A deals for Australia, Canada, Japan and the United States. The simulated unrealized synergy gains are substantial, most notably in Japan and the United States where corporate sellers face particularly high tax rates. If we only consider unrealized synergy gains in a particular country due to targets in alternative locations being preferred by acquirers, our estimates suggest that a full exemption of capital gains from corporate M&A deals would generate an efficiency gain in the market for corporate control of $0.55 billion per year in Japan and $4.2 billion per year in the United States (see Panel (iii)). Alternatively, one could assume that the outside option for acquirers is not to pursue a deal at all instead of acquiring a target in another location. The unrealized synergies are presented in Panel (iv) and are substantially larger. They amount to $9.3 billion per year in the United States. The actual value of unrealized gains is expected to be somewhere between the estimates in Panels (iii) and (iv), as these represent the polar cases (see Schmidheiny and Brülhart, 2011). The figure in Panel (iv) is more applicable to the extent that not acquiring any target at all is the most viable outside option in many cases.

A limitation of these computations is that we do not observe the actual distribution of synergy gains across realized and unrealized M&A deals but use the average across realized deals as an imperfect proxy. To the extent that capital gains tax cuts on the corporate level would allow deals with lower acquirer payoffs to be realized, the synergy gains from these additional deals might be smaller than the average pre-reform synergy gains. In this case, our estimations would provide an upper bound of the potential synergy gain from exempting inter-corporate M&A deals from capital gains taxation.

6. Conclusion

The lock-in effect of capital gains taxes and its upward pressure on asset prices have been known for some time. However, evidence about the induced distortions due to inhibiting an efficient allocation of ownership rights had been lacking as the price effects identified in the literature are not informative about the potential size of deadweight losses. To address this, we investigate the extent to which corporate capital gains taxes prevent ownership changes by means of mergers and acquisitions and the corresponding value of synergy gains which are not realized as a consequence. Modeling the acquirer's choice at the firm level by a conditional logit or mixed logit specification, we find that a decrease in a country's corporate capital gains tax rate by one percentage point increases the likelihood to observe a target in that country by 0.7 percent. The results are robust to controlling for unobserved confounding factors and heterogeneity in the effect across acquiring firms.

The firm-level estimates from the conditional choice model are by definition conservative because they implicitly take the global number of acquisitions as given. This is no longer the case when analyzing more aggregate measures of M&A activity at the country-level by means of fixed-effect Poisson regressions. Then our estimates imply that a one percentage point reduction in the capital gains tax rate increases the number of M&As by 1 percent. This finding is robust to changing the measure of M&A activity from the number of acquisitions to the total deal value of acquisitions, which slightly increases the size of the estimated semi-elasticity to -1.4.

Based on these results, we estimate the unrealized efficiency gains from M&As which are inhibited by corporate capital gains taxes. For example, we consider a decrease of the United States tax rate on corporate capital gains (39.28% in 2013) to zero. Simulated for the period 2002–2013, this would imply gains in the order of $4.2 billion per year in the United States when taking the global number of M&As as fixed and only considering the substitution effect of the capital gains taxation on the location choice of the acquirer (i.e., in the conditional logit framework). This figure rises to $9.3 billion per year when taking into account that the capital gains tax may also affect the global number of acquisitions (i.e., in the PPML framework).

Our results imply that corporate capital gains tax reductions may be self-financing to a certain degree as has previously been suggested for the case of shareholder taxation (e.g. Feldstein et al., 1980). Although the increase in acquisition activity may not fully compensate for the revenue loss, in particular if capital gains are fully exempt, potential efficiency gains would still raise government revenue from taxing higher corporate profits and shareholder returns.

Appendix

Table A.1
Variables.

Variable	Description	Source
GDP	Lagged logarithm of GDP in constant (2005) US$	WDI
Growth	Lagged annual GDP growth in %	WDI
Credit	Lagged domestic credit to private sector as a share of GDP	WDI
Stock Market	Lagged market capitalization of listed firms as a share of GDP	WDI
τ^{CIT}	Top statutory corporate income tax rate	IBFD
Trade	Lagged logarithm of the trade ratio	WDI
Audit Quality	Strength of auditing and reporting standards index (1–7, best)	Global Competitiveness Report
Tax Credit	Dummy variable, equal to one if the acquirer country has a world-wide tax system with a foreign tax credit, acquirer and target location are different countries and the corporate income tax rate is higher in the acquirer location than in the target location	IBFD
Inflation	Lagged inflation	WDI
Service Sector	Value added of services in % of GDP	WDI
Start-up Time	Number of days needed to start a business	World Bank
Judicial Independence	Indicator for judicial independence (0–10, highly independent)	Index of Economic Freedom
Ease of Hiring	Ease of hiring index (0–10, very easy)	Index of Economic Freedom
Credit Market Regulation	Indicator for credit market regulation (0–10, strongly deregulated)	Index of Economic Freedom
Interest Rate	Interest rate on national government securities	OECD
Industry Shock	Standard deviation in value added growth across 8 sectors	WDI
Total Assets	Logarithm of total assets of the acquirer in the last available year prior to the deal, thousand US$	Bureau van Dijk
Contiguity	Dummy indicating whether the acquirer and the target location share a common border	CEPII GeoDist Database
Language	Dummy indicating whether the acquirer and the target location share a common official language	CEPII GeoDist Database
Colony	Dummy indicating whether the acquirer and the target location have ever been in a colonial relationship	CEPII GeoDist Database
Distance	Logarithm of the simple distance between the capitals of the acquirer and the target location, km	CEPII GeoDist Database
Home	Dummy indicating whether the acquirer and the target location are or have been the same country	CEPII GeoDist Database
Regulation	Indicator for regulation (0–6, strongly regulated)	OECD
Prod. Growth Contribution	Industry contribution to growth in business sector labor productivity, employment based	OECD
Employment Growth	Annual growth in total number of employees in the sector	OECD
Compensation	Annual growth in the compensation per employee in the sector	OECD
Unit Labor Cost Growth	Annual growth in unit labor costs in the sector, employment based	OECD

Table A.2
Comparison group approach: control variables.

	Full Sample (2)	Only Cash Payments (3)	Including Foreign sellers (4)
Audit Quality	-0.042	-0.147	-0.157
	(0.218)	(0.228)	(0.216)
Audit Quality × *CORPS*	0.485**	0.569**	0.512**
	(0.215)	(0.224)	(0.213)
Growth	0.046*	0.044*	0.038
	(0.023)	(0.026)	(0.025)
Growth × *CORPS*	-0.006	-0.005	-0.014
	(0.025)	(0.028)	(0.027)
Trade	0.018	-0.117	0.013
	(0.889)	(0.957)	(0.900)
Trade × *CORPS*	1.292*	1.375*	1.201*
	(0.670)	(0.726)	(0.725)
Credit	-0.707**	-0.781**	-0.689*
	(0.330)	(0.312)	(0.354)
Credit × *CORPS*	0.765***	0.807***	0.725**
	(0.274)	(0.263)	(0.314)
GDP	-1.927	-1.805	-1.937
	(1.886)	(2.002)	(2.031)
GDP × *CORPS*	1.038	0.956	1.588
	(1.597)	(1.688)	(1.788)
Stock Market	0.439	0.508*	0.507*
	(0.270)	(0.297)	(0.281)
Stock Market × *CORPS*	-0.260	-0.318	-0.415
	(0.307)	(0.333)	(0.318)
Inflation	-0.017	-0.019	-0.017
	(0.015)	(0.014)	(0.014)
Inflation × *CORPS*	-0.004	-0.003	0.001
	(0.013)	(0.013)	(0.012)
Service Sector	-0.002	0.006	0.011
	(0.022)	(0.024)	(0.023)
Service Sector × *CORPS*	0.009	0.001	-0.006
	(0.017)	(0.018)	(0.018)
τ^{CIT}	0.028**	0.022	0.024*
	(0.014)	(0.014)	(0.013)
τ^{CIT} × *CORPS*	-0.017	-0.013	-0.018
	(0.014)	(0.015)	(0.013)
Start-up Time	0.007	0.007	0.007
	(0.004)	(0.004)	(0.004)
Start-up Time × *CORPS*	-0.008**	-0.007**	-0.007**
	(0.004)	(0.004)	(0.003)
Jud. Independence	0.073	0.064	0.059
	(0.072)	(0.075)	(0.067)
Jud. Independence × *CORPS*	0.097**	0.110**	0.077
	(0.049)	(0.051)	(0.051)
Ease of Hiring	-0.105	-0.145	-0.128
	(0.103)	(0.106)	(0.102)
Hiring Restrictiveness × *CORPS*	0.071	0.113	0.103
	(0.092)	(0.094)	(0.092)
Credit Market Reg.	-0.036	-0.034	-0.016
	(0.083)	(0.082)	(0.077)
Credit Market Reg. × *CORPS*	0.108	0.105	0.077
	(0.068)	(0.068)	(0.065)

This table reports coefficient estimates for the control variables and their interactions with the seller-type indicator used in the regressions of columns (2) to (4) in Table 6. Robust standard errors (adjusted for clustering at the country-level) are provided in parentheses. Stars behind coefficients indicate the significance level, *** 10%, ** 5%, * 1%.

Supplementary material

Supplementary material associated with this article can be found, in the online version, at 10.1016/j.euroecorev.2020.103505

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