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Do personal taxes affect investment decisions and stock returns?

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Abstract

This paper studies the causal effects of personal investment taxes on stock returns and the financial decisions of companies. I exploit a change in legislation in 2013 which allowed stocks listed on the Alternative Investment Market, a sub-market of the London Stock Exchange, to be held in capital gains and dividend tax-exempt investment accounts for the first time. Using a difference-in-differences approach, I find that excess stock returns decreased by their pre-legislation change effective tax rate, and that firms adjusted their capital structure and increased their spending on dividends, capital, and labour, in-line with the 'traditional view' of corporate investment.

Key words: Personal investment taxes, cost of capital, dividend policy, capital structure, company investments.

JEL classification: G11, G12, G14, G32, G35, G50, H24.

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1. INTRODUCTION

Taxes are a fundamental part of the financial decision making process for both investors and companies. For risky investments, the tax rate on investment proceeds is often the only component which is known with certainty beforehand. Therefore, rational economic agents will mitigate their tax liability wherever possible through efficient tax planning. While this is well understood, there is a paucity of empirical evidence which is able to establish a causal link between the personal tax rate on investment proceeds, and the effect this has on an asset's returns (Poterba (2001), Graham (2003)). Moreover, recent studies looking at the effect of personal investment taxes on company investment decisions have found no effects (Yagan 2015), or seemingly conflicting effects (Moon (2022), Matray (2023)).

In this paper, I study how the tax rate faced by retail investors on the proceeds of their stock investments affects the equity cost of capital, and the payout and investment decisions of companies. I do this by exploiting a change in legislation in 2013 which allowed stocks listed on the Alternative Investment Market (AIM), a sub-market of the London Stock Exchange (LSE) designed for small growing companies, to be held in capital gains and dividend tax-exempt Individual Savings Accounts (ISAs) for the first time. Main market LSE stocks have always been eligible for ISAs, which therefore warrants their potential use as a control group. Using a difference-in-differences and factor model approach, I exploit the variation in taxation across both time and assets, and find that a reduction in capital gains and dividend taxes caused excess stock returns to decrease in-line with their pre-legislation change effective tax rate of 0.9 percentage points per month. In-line with the "traditional view" of corporate investment theory, I also find that the payout and investment decisions of AIM companies are highly responsive to changes in personal taxes, and estimate the following elasticities with respect to one minus the dividend tax rate: dividends (0.5), shares issued (0.2), debt (2.2), capital (1.8), total pay (0.5), and employees (1.4).

The main novelty of this paper is to provide the first causal evidence that personal

investment taxes jointly affect company decisions and stock returns by exploiting a unique quasi-natural experiment.[1] While time series descriptive evidence exists that personal investment taxes affect stocks returns, my findings provide the first causal evidence to compliment this evidence (Poterba and Summers (1984), Sialm (2009). By using a difference-in-differences methodology which compares AIM companies to a propensity score matched[2] Financial Times Stock Exchange All-Share Index (henceforth FTSE[3]) control group, I am able to identify the tax effect on stock returns, and therefore clearly demonstrate that taxes are capitalized into stock prices, in-line with the tax capitalization hypothesis of Brennan (1970) which assumes that stock returns efficiently adjust to reflect the tax burden faced by the marginal investor. This has been a considerable challenge in other settings due to endogeneity issues, since tax changes are often related to macroeconomic factors. By exploiting an exogenous change in personal tax treatment, which the clientele literature typically lacks, this paper also relates to studies which explore tax-driven investor behaviour, e.g. Miller and Modigliani (1961), Michaely et al. (1995), Graham and Kumar (2006), Feenberg and Poterba (1991), and Babina et al. (2021). Furthermore, while Yagan (2015) studies the real economic effects of the 2003 US dividend tax cut on privately held companies and finds no significant effects, my results provide supportive evidence that a decrease in both dividend and capital gains taxes caused my sample of publicly listed companies to increase both payouts and investments, in-line with the "traditional view" of corporate behaviour which assumes that personal taxes affect corporate investment decisions (Harberger (1962), Feldstein (1970), Poterba and Summers (1983)), as opposed to the "new view" which assumes that payout and investment decisions are determined solely by the retained earnings of companies (King (1977), Bradford (1981), Auerbach (1979)).

[1] Compared to IRAs in the US, ISAs have no withdrawal penalties before retirement, and withdrawals are not liable for income tax. In 2013, ISAs exempted investors from a 37.5% and 28% dividend and capital gains tax, and over three million adults in the UK owned a Stocks and Shares ISA (around 6% of the adult population) with a total market value of approximately £200 billion ($300 billion). I apply £1 = $1.5 in this paper.

[2] The propensity score covariates used are firm size, age, sector, book-to-market ratio, and market beta.

[3] The FTSE All-Share Index is the most comprehensive stock index of the main market LSE.

My setting differs from Yagan (2015) (and other related studies) in a number of important dimensions which can help to explain our differing results. Firstly, in comparison to the dividend tax changes in the US, the tax cut under consideration in my setting was more likely viewed as a permanent tax cut since it equalised the tax treatment of AIM stocks with that of main market stocks. This is especially important as equity prices are forward looking, and since company investment decisions can take many years to pay off, companies might not pursue new investments if they do not view the tax cut as permanent. Secondly, in comparison to Yagan (2015)'s sample of privately owned companies, my sample consists of younger, publicly listed companies, who will be less financially constrained, have less concentrated ownership structures, and have a higher propensity to issue new equity to fund growth, which are all important determinants of company investment decisions (Korinek and Stiglitz (2009), Chetty and Saez (2010)). Thirdly, if the share of capital gains tax-liable investors is more than dividend tax-liable investors, or if returns from capital gains are a lot more than from dividends, then the effects of both a capital gains and dividend tax cut together will be larger than from just a dividend tax cut, as discussed in Moon (2022).

My first finding is that excess AIM stock returns permanently decreased after the legislation change, and by a magnitude which the data does not reject as equalling the average monthly effective tax rate of AIM stocks in the decade before the tax cut, 0.9 percentage points. Looking deeper into the heterogeneity within AIM stocks, this result is further reinforced by showing that AIM stocks with the highest and the lowest effective tax rates in the decade before the tax cut experienced commensurate falls in their excess stock returns in the decade after. The result holds when using multiple factor model specifications, and a more powerful difference-in-differences set-up, which ensures that the results are not being driven by the control group. My results support the theoretical model of Brennan (1970), and the empirical findings of Poterba and Summers (1984) who study the relationship between dividends and stock price movements during different tax regimes, and find

that *"tax changes can affect security returns"*, and Sialm (2009) who shows that US investors were compensated for their dividend tax burden between 1912 and 2006. My results compliment these earlier findings which used time-series regressions by providing causal evidence that taxes influence stock returns, and therefore they address concerns that the correlation between taxes and stock returns is being driven by endogenous macroeconomic factors.

My second finding is that after the legislation change, dividend paying AIM companies increased their dividends by 40% compared with their payout level before, an elasticity with respect to one minus the dividend tax rate of 0.55. This is very close to the elasticity estimated by Chetty and Saez (2005) and Yagan (2015) for the 2003 US dividend tax cut, and by Matray (2023) for a 2013 French dividend tax increase. My second finding is therefore inline with Chetty and Saez (2005), Desai and Jin (2011), Matray (2023), and Bilicka et al. (2023) who find that the payout policy of companies is influenced by the tax-based preferences of their shareholders. My study differs from these related papers in two main ways. Firstly, I explore the effects of the tax cut on the equity cost of capital, and secondly I study the effects of a large complete elimination of dividend taxes, not just a reduction. Also, unlike Chetty and Saez (2005) who study short run effects, I can make comparisons to a group of companies which did not receive a tax cut during the sample period and therefore provide longer-term causal evidence, an advantage that their setting does not provide. In contrast to Desai and Jin (2011), my focus is on retail investors whereas their focus is on institutional investors.

My third finding is that AIM companies also responded to the tax cut by issuing both more equity and debt. On average, compared to the matched control group, the number of shares issued and the ratio of debt to pre-reform assets for AIM companies increased by 13% and 14 percentage points respectively. The new equity issuance was dominated by cash constrained companies, whereas the debt issuance was more widespread. Both of these decisions can be explained by the tax cut which resulted in a lower equity cost of capital, and therefore higher stock prices. These results provide further evidence that the capital

structure decision of companies is affected by the personal taxation level of their investors (Graham (1999), Lin and Flannery (2013)).

My fourth and final finding is that AIM companies responded to the tax cut with large increases in their capital stock and labour expenditure, in-line with the "traditional view" of corporate investment and with the findings of Moon (2022) who finds large effects from a capital gains tax cut in South Korea. After the tax cut, AIM companies increased their tangible capital stock (specifically property, plant, and equipment) relative to pre-reform total assets by 24 percentage points, total pay relative to pre-reform revenue by 8 percentage points, and total employees relative to pre-reform revenue by 0.5 percentage points. My finding of an increase in investment following a cut in personal investment taxes differs from Yagan (2015) and Bach et al. (2021) given that they find no effect on aggregate investment following US and French dividend tax reforms, but also from Matray (2023) and Bilicka et al. (2023) who find that an increase in French and Greek dividend taxes respectively led to an increase in company investment, which implies a positive dividend tax elasticity. I investigate which factors are important in explaining the heterogeneity in tax effects, and show that dividend paying firms increased their capital stock significantly less than non-dividend paying companies after the tax cut, and that companies which issued the most new equity and debt invested the most in capital and labour, in-line with the life-cycle model of Korinek and Stiglitz (2009) who emphasize the importance of maturity in company investment decisions. I also find a positive relationship between pay increases and the concentration of shareholder ownership, which when taken together with the observed negative relationship between investment in capital and company payout policies, lends support to the agency model of Chetty and Saez (2010) which highlights the tensions between managers and shareholders when making payout and investment decisions.

The remainder of this paper is organized as follows. Section 2 outlines the setting of this study, Section 3 presents the results, and Section 4 concludes.

2. INSTITUTIONAL DETAILS

This section outlines the institutional details of the legislation change which allowed AIM stocks to be held in ISAs for the first time in 2013. I discuss the AIM stock exchange, the main LSE, ISAs, and the motivation for the legislation change.

2.1. THE AIM AND THE MAIN LSE

The AIM was launched in 1995 and was designed for smaller growing companies who wanted to raise equity more quickly and at a lower price than on the main LSE. The AIM markets itself as the world's most successful growth market, and since opening, as of December 2022 3,988 companies have raised over £130 billion ($195 billion) on the AIM. Doukas and Hoque (2016) find that half of firms who initially list on the AIM could list on the main market, but choose not to because of the lower initial listing fee and lower subsequent cost of raising capital. The financial reporting and accounting requirements are also less stringent on the AIM. While most AIM stocks are small growth companies, there are also many large well established UK businesses listed on the AIM.[4]

The FTSE All-Share comprises around 600 companies and is the aggregation of the FTSE 100 Index, the FTSE 250 Index, and the FTSE Small Cap Index, which are stock indices formed from stocks listed on the main LSE. In terms of market capitalization and age, there is a wide overlap of companies listed on the AIM and the FTSE All-Share Index, with the FTSE All-Share also listing many small and growing companies. I exploit this overlap along with other commonalities when forming my control group. To limit data issues such as stale prices and missing observations, I will focus on the 100 largest companies listed on the AIM which are the more established and the more frequently traded.

[4] Under certain conditions, AIM stocks can also be exempt from a 40% inheritance tax. Section A.5 in the Appendix provides more details.

2.2. Personal Investment Taxes in the United Kingdom

Between 2010 and 2016, a 28% capital gains tax for stocks was due on any profits made during the financial year above the capital gains tax allowance which was £10,900 ($16,350). In the years leading up the legislation change, the capital gains tax rate varied between 40% (2004 to 2008) and 18% (2008 and 2010). Between 2013 and 2016, dividends were taxed up to 37.5% if the investor earned over £150,000 ($225,000). Between 2010 and 2013 the dividend tax rate was 42.5%, and between 2004 and 2009 it was 32.5%.[5]

2.3. AIM Stocks Become Eligible for ISAs

Individual Savings Accounts (ISAs) allow UK residents to save and also invest money in qualifying investments up to a certain limit each financial year without being subject to capital gains or dividend tax. The Stocks and Shares ISA limit was £11,520 ($17,280) in the 2013-2014 financial year, £15,000 ($22,500) from July 2014 till April 2017 and £20,000 ($30,000) since then. Similar tax efficient investment accounts exist in other countries, for example France, Canada, Italy, Russia, South Africa, and the Scandinavian countries. Traditional and Roth Individual Retirement Accounts (IRAs) in the US also exempt investors from capital gains and dividend taxes within the IRA, but unlike ISAs, IRAs can face a penalty for withdrawing funds before retirement.[6] In 2013, over three million people held a Stocks and Shares ISA account, which was approximately 6% of the UK adult population. The total value of these investments was over £200 billion ($300 billion) which dwarfs the total 2013 AIM market capitalization in 2013, £76 billion ($114 billion).[7]

On the 3rd of July 2013, the UK treasury announced that as of the 5th of August 2013, stocks listed on the AIM could be held in Stocks and Shares ISAs for the first time.

[5] For more information on UK taxes see Section A.5 in the Appendix, https://www.gov.uk/capital-gains-tax, and https://www.gov.uk/tax-on-dividends.

[6] Unlike traditional IRAs, ISA contributions are not income tax deductible, and withdrawals in retirement are not income tax liable. Unlike Roth IRAs, pre-retirement investment earnings withdrawals are not penalised.

[7] As a comparison, the total market cap of the FTSE All-Share at that time was over £1 trillion ($1.5 trillion).

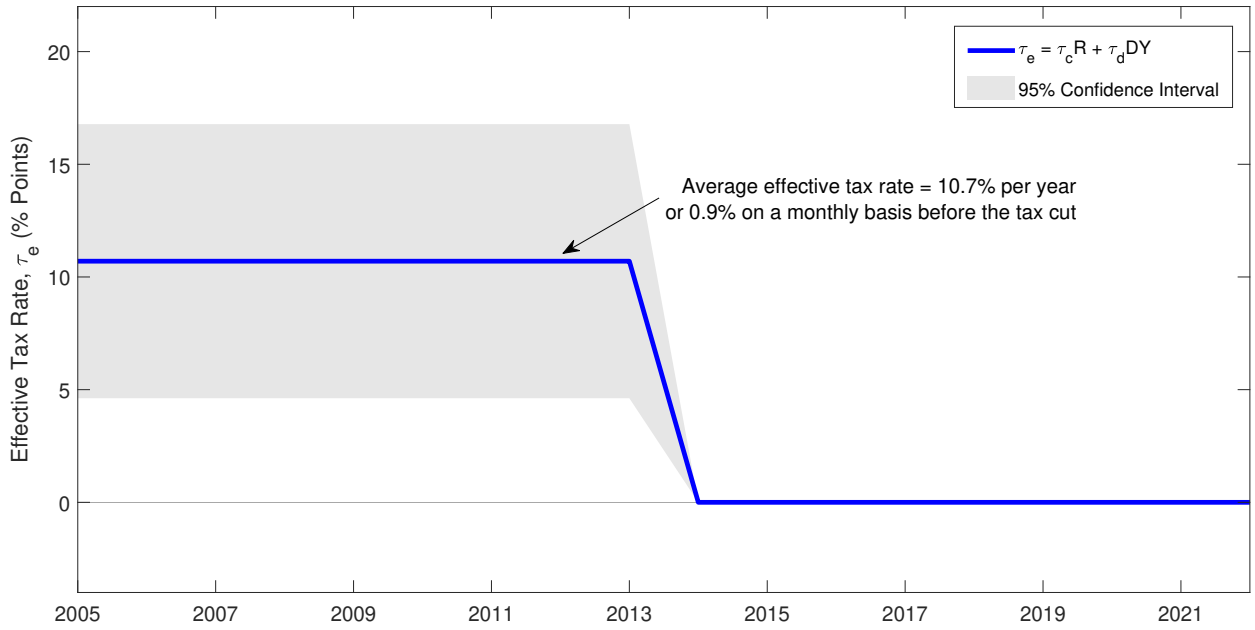

Figure 1: This figure plots the average effective tax rate (τ_e) of the AIM 100 sample before and after the tax cut in 2013 alongside 95% confidence intervals, where τ_e equals the average sum of the effective capital gains tax rate (capital gains tax rate multiplied by net returns) and the effective dividend tax yield (dividend tax rate multiplied by the dividend yield).

The main reason behind the legislation change was an impetus within the UK government to provide more help to smaller growing domestic companies by giving them access to the large pool of ISA capital (also referred to as "patient capital") and therefore reduce their equity cost of capital. The initiative remains to this day a high priority for the UK governments as they seek to nurture a favourable environment to develop home-grown innovative companies.[8] Furthermore, AIM companies and business lobby groups had been calling for the ISA legislation change for many years. They had argued it would level the playing field for companies looking to raise capital on both exchanges and would therefore provide AIM companies with a potential multi-billion pound pool of capital. Figure 1 shows that in the years before the tax cut came into effect, the average effective personal tax rate of the AIM 100 was equal to 10.7% per year, or 0.9% on a monthly basis, compared to 0% for the main

[8]For further details on the government's motivations and justifications, see the following https://www.gov.uk/government/publications/patient-capital-review.

market FTSE stocks. During this period, the average top rate capital gains and dividend tax rate was 29.8% and 36.4% respectively, and the average yearly return and dividend yield for the AIM 100 sample was 32% and 1.1% respectively.[9]

Regarding anticipation of the announcement, news reports show there was some general discussion in the years leading up to the official government announcement, but no reports preceded or predicted the exact date. However, due to the nature of the legislation change, the main effect on asset demand and asset returns is not likely to have been realised before AIM stocks were actually allowed to be held in ISAs as the treatment only affected retail investors and not other financial institutions. Also, the short time between the announcement and the legislation change meant that investors did not have a long time to change their behaviour before the change came into effect. Another restriction to the speed and magnitude of the legislation is that there is an ISA limit each financial year, so if investors have reached their limit for that financial year and do not wish to liquidate their current holdings, they have to wait for the next financial year to add AIM stocks to their ISA. Empirical studies have shown that retail investors exhibit inattention to their portfolios and are slow, or even reluctant to rebalance (Madrian and Shea (2001), Agnew et al. (2003), and Sialm et al. (2015))[10]. These factors suggest against any large anticipatory effects.

Regarding confounding events, no other events occurred during 2013 which affected only AIM stocks specifically or ISAs. In 2014, for the same reasons that permitted AIM stocks to be held in ISAs, i.e. to encourage capital flows into smaller growing businesses, stamp duty tax was abolished on AIM stock purchases on the 28th of April 2014. The tax was however small, only 0.5%, and was not therefore economically important to the majority of retail investors who buy and hold for more than a few months (Benartzi and Thaler 1995) .[11]

[9] See Equation 2 for estimation details. Negative returns and non-dividend paying companies were included in the effective personal tax rate calculations. The sample period also includes the global financial crisis which negates the hypothesis that this was an uncharacteristically bullish period for equities.

[10] For a theoretical demonstration see Abel et al. (2007), Huang and Liu (2007), and Abel et al. (2013).

[11] A main market LSE stock investor would require a one-off premium of 0.503%, or 0.00836% per month compounded over five years, to negate the extra stamp duty tax compared to AIM stocks, a very small percentage

Three additional events happened in the years around the reform, but all of them affected either all UK investors, or all UK companies, and are therefore not an issue for identification when using a difference-in-differences methodology. Firstly, the yearly ISA limit for all investments increased from £11,520 ($17,280) to £15,000 ($22,500) in July 2014. Secondly, from 2012 to 2018 the main rate of corporation tax in the UK was gradually reduced from 24% to 19%. Finally, in the years around the tax cut, there were changes to the Annual Investment Allowance, which is a form of tax relief that allows businesses to deduct the full value of eligible expenditure up to a limit from their profits before tax. The 2013 AIM legislation change set the effective personal tax rate of AIM stocks from 10.7% per year to 0% when held in tax efficient investment accounts, and therefore the magnitude of the tax cut provides an ideal setting to study whether personal taxes affect company investment decisions and stock returns.

3. Empirical Analysis

In this section I first describe my data sources and then I discuss my main empirical strategy where I match AIM stocks to FTSE stocks based on a propensity score matching methodology in order to accurately estimate the effects of the tax cut using a difference-in-differences analysis.

3.1. Data

The main data sources for this study are Refinitiv Datastream and Bloomberg, from which I obtain information on company characteristics, prices, trading metrics, balance sheet, and income statement data for all companies listed on the the AIM 100 and the FTSE All-Share. Five monthly European factor portfolios (Fama and French 2015) covering the whole sam-

relative to average annual stock returns.

ple period and a European momentum factor (Carhart 1997) are obtained from Kenneth French's website, and a global liquidity factor (Pástor and Stambaugh 2003) is obtained from the website of Robert Stambaugh which ends in December 2021. For AIM shareholder data, I use the FactSet database which collects data mainly from the UK Share Register (UKSR), as well as the Regulatory News Service (RNS) which contains all the disclosures of institutions who own over 3% of a publicly listed UK company. ETF fund flow and high frequency tick data is obtained from Refinitiv Eikon and Refinitiv Datascope respectively. Following Yagan (2015), Moon (2022), and Matray (2023), I scale real investment outcome variables by revenue, assets, or total capital. To limit the effect of outliers, I winsorize excess returns at the second and ninety-eighth percent level by time period and group, and real economic outcome variables across the whole sample at the second and ninety-eighth percent level.

3.2. The FTSE All-Share as a Control Group

The ideal control group in this setting would be a similar group of AIM companies which did not receive the tax cut. However, as the legislation change affected all AIM stocks this is not possible. The next best option is to create a control group from the main LSE which is as similar as possible to the AIM sample so that the parallel trends conditions holds. Creating a control group which is as similar as possible to the treatment group reduces the likelihood that changes in outcome variables are being driven by confounding factors.

Many AIM companies could list on the main market if they wanted to. Both FTSE and AIM stocks are LSE constituents, they operate mainly in the UK, and they compete within the same economic sectors. As a consequence, they will have similar customers and risk exposures. Furthermore, FTSE stocks have always been allowed to be held in ISAs and did not experience a change in their tax treatment during the time period studied. A big difference between AIM and FTSE stocks however is their average size and age, as seen in Table 1. The AIM mostly consists of young, small to medium sized companies, whereas the FTSE

contains older, small to very large sized companies. Therefore, the average FTSE company is much older and larger than the average AIM company.

The observation that smaller capitalization stocks systematically earn different returns to larger capitalization stocks was one of the first and most important documented in the asset pricing literature (Banz 1981). Company payout and investment decisions are also strongly associated with company size. To address the potential effect that company size, age, and other important characteristics might have on the pre-trends between AIM and FTSE companies, I create a control group from the FTSE All-Share index by using a propensity score matching methodology with the following covariates: company size, age, sector, market-to-book ratio (value), and market beta. These characteristics were chosen as they are well established drivers of company valuations and behaviour.[12]

Table 1 displays the following observable characteristics of the AIM sample, the FTSE matched sample, and the full FTSE All-Share sample: market capitalization (size), age, market-to-book ratio (value), market beta[13], Dimson Beta, price to earnings ratio, return on equity (ROE), and trading volume. Firstly, the last column of Table 1 shows that the AIM and full FTSE All-Share sample are indeed very different across all characteristics, with the difference in sample averages for six out of eight characteristics highly statistically different from zero. This is in stark contrast to the propensity score matched control group in the second to last column, with the differences in sample averages across all characteristics statistically insignificant, and therefore on average, the AIM and the matched FTSE sample are statistically indistinguishable at the 99% confidence level. As a further check, I estimate Dimson (1979) Betas[14] which correct for infrequent trading. While the average beta sizes increased for both the AIM stocks and the matched FTSE sample (0.72 and 0.77 respectively), the two samples are still statistically indistinguishable on average.

[12]The data used for matching are from before the legislation announcement.

[13]The FTSE 100 is used to calculate the CAPM beta for UK stocks, and since both the stock samples include many small-cap stocks, the average betas are low on average.

[14]The estimation used an additional four lagged market excess returns with two years of daily data.

Table 1

This table displays the sample averages of relevant observable characteristics before the legislation change for the AIM 100 sample, the matched FTSE sample, and the full FTSE All-Share sample. The absolute difference in sample averages between the AIM sample and the FTSE samples are also displayed, along with their statistical significance. The observable characteristics are log market capitalization (size), age, market value of equity to book value of equity (P/B), CAPM beta relative to the FTSE 100, Dimson Beta with 4 lags, price to earnings ratio, return on equity (ROE), and log volume. Where an exchange listing date is missing, the incorporation date of the company is used to estimate company age. Sector codes were used in the matching procedure but sector averages are not displayed due to a lack of economic meaning. Data is winsorized to limit the effect of outliers on sample averages. Standard errors are in parentheses below sample averages. Stars denote whether sample averages are statistically different at the following confidence intervals: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

	Sample Averages			Sample Differences	
Characteristic	AIM	Matched FTSE	Full FTSE	AIM/Matched	AIM/Full
Log Size	18.86	19.02	20.22	0.17	1.36***
	(0.08)	(0.08)	(0.06)		
Age	11.90	14.29	27.10	2.38	15.20***
	(1.19)	(1.21)	(1.20)		
Value (P/B)	1.37	1.65	1.07	0.28	0.30
	(0.17)	(0.23)	(0.07)		
Beta	0.38	0.42	0.68	0.04	0.30***
	(0.04)	(0.04)	(0.02)		
Dimson Beta	0.72	0.77	0.87	0.05	0.15***
	(0.05)	(0.04)	(0.02)		
Price/Earnings	32.02	25.55	25.19	6.47	6.84
	(5.02)	(4.10)	(1.56)		
ROE	6.76	7.60	14.32	0.85	7.57**
	(2.44)	(2.10)	(1.04)		
Log Volume	12.20	12.44	12.81	0.23	0.61***
	(0.19)	(0.13)	(0.07)		

In summary, the AIM and the propensity score matched FTSE All-Share samples are very similar across multiple characteristics which have been highlighted in the financial economics literature as factors which are important determinants of both stock price valuations and company financial decisions. Furthermore, as a precaution and to account for any possible fundamental differences in the AIM and the matched FTSE sample which may affect the trends in outcomes, I include the main risk factors and control variables documented in the asset pricing literature, and present results for the unmatched control group when analysing stock returns. As in Yagan (2015), Moon (2022), and Matray (2023), the main identifying assumption underlying the difference-in-differences methodology design is not the random assignment of companies to list on the AIM and the main market LSE, it is that the AIM and the matched main market LSE company outcomes would have trended similarly in the absence of the tax cut. I therefore include the dynamic difference-in-differences coefficient plots for all the main outcome variables in the results section.

3.3. Hypothesis Design

Before presenting the empirical results of this study, I briefly discuss the potential effects of the tax cut under certain hypotheses.

Hypothesis 1: a cut in personal taxes will reduce the equity cost of capital and therefore the expected excess return of a stock.

If investor tax clienteles exist (Miller and Modigliani 1961), and stock returns compensate investors for their tax liability (Brennan 1970), we should observe a permanent decrease in AIM excess stock returns after the legislation change as investors no longer need to be compensated for their tax liability if they hold stocks in their ISAs. Alternatively, if investors are always able to offset their tax liabilities (Miller and Scholes 1978), we should not observe any

change in AIM stock returns.

Hypothesis 2: a cut in personal taxes will increase equity and debt issuance, and increase the dividend payments and investments of a company.

If company management take the personal taxes of their investors into account when deciding on payout policy, and if personal taxes affect the cost of capital and therefore the marginal returns on investments (in-line with the "traditional view" of corporate investment Harberger (1962), Feldstein (1970), Poterba and Summers (1983)) then we should observe an increase in dividend payments, equity and debt issuance, capital, and labour expenditure after the tax cut. Alternatively, if dividend and investment decisions are based only on the retained earnings of companies and taxes have no impact on dividend payments, capital structure, and investments (in-line with the "new view" King (1977), Bradford (1981), Auerbach (1979)), then we shouldn't observe an increase in equity or debt issuance, dividend payments, capital stock, or the labour expenditure of AIM companies.

3.4. The Effect of the Legislation Change on Stock Returns

In this section, I examine whether AIM stock returns were affected by the large cut in capital gains and dividend taxes. As in Sialm (2009), the analysis in this section is based on Brennan (1970). Assume that the equilibrium rate of return for stocks follows the below more generalized version of Brennan (1970)'s Equation 2.18,

$$\mathbb{E}(R_i - R_f) = \tau_i + \beta_i' \mathbb{X}, \tag{1}$$

where $\mathbb{E}(R_i - R_f)$ is the expected equilibrium pre-tax excess rate of return for stock i, τ_i = is the tax premium which provides compensation for capital gains and dividend tax, $\mathbb{X}$ con-

tains a matrix of priced risk factors for which investors require compensation, and β measures the sign and magnitude of the required compensation for each factor for stock i. In Brennan (1970), $\mathbb{X}$ contains only the expected excess market return, but Sialm (2009) extends this to include the Fama-French-Carhart factors.[15] In a world where asset returns are perfectly explained by Equation 1, the estimated tax premium should equal the effective tax rate of the marginal investor. If we assume that retail investors are the marginal investor for AIM stocks, and that they rebalance once a year and anticipate realising their capital gains without postponing (as in Brennan (1970)), we can estimate the effective tax yield that they faced before the tax cut and hence the AIM tax premium.[16] Even if investors do not rebalance every year, the capital gains component of the effective tax yield is still priced-in since returns, and hence the capital gains liability, compound over time which means the intuition can be applied to any time-horizon.[17] Figure 1 displays an estimate of τ_i for my sample of AIM stocks in the pre-legislation change period, with the average annual effective tax rate equal to 10.7%, or 0.9% on a monthly basis. I estimate the effective tax rate $\hat{\tau}_{\mathrm{i}}$ with the following equation,

$$\hat{\tau}_{\mathrm{i}} = \frac{1}{T}\sum_{t=1}^{T}\left(\frac{1}{I}\sum_{i=1}^{I}\left(\tau_{\mathrm{c,t}}R_{i,t} + \tau_{\mathrm{d,t}}DY_{i,t}|t\right)\right) = 10.7\%, \tag{2}$$

[15] The expected excess market return in Equation 2.18 Brennan (1970) is multiplied by a constant term which includes capital gains and dividend taxes, and will therefore be absorbed into the estimated risk loading for the market return. Following the empirical methodology of Sialm (2009), and due to the preferential tax treatment of UK government bond proceeds, I do not subtract a risk-free rate from the tax premium.

[16] Benartzi and Thaler (1995) estimate the average retail investor's investment horizon to be one year, and Barrot et al. (2016) estimate an average portfolio holding period of 310 days, which provides empirical support for the yearly rebalancing assumption. If the marginal AIM investor rebalanced more (less) frequently than once a year, the present value of their capital gains tax liability would be relatively higher (lower), and therefore the effect on AIM stock prices and returns after the tax cut would be larger (smaller).

[17] Consider a fixed-period setting with two assets which apart from their capital gains tax treatment are identical. Assume also that all investors face the same taxes. If the capital gains tax rate on asset 1 is less than the capital gains tax rate on asset 2, ceteris paribus, investors will value asset 1 more than asset 2, and the price of asset 1 will be higher. Without any other frictions, the price (and therefore return) disparity between the two assets must be explained by the capital gains tax differential, otherwise an arbitrage opportunity will exist, i.e. even if investors do not intend to sell the asset every period, if the price of the asset does not reflect the expected capital gains tax rate differential, investors will long and short the two assets until their prices reflect this tax differential.

where $\tau_{\text{c,t}}$ is the capital gains tax rate in year t, $R_{i,t}$ is the annual net stock return of company i in year t, $\tau_{\text{d,t}}$ the dividend tax rate in year t, and $DY_{i,t}$ the dividend yield of company i in year t. Negative stock returns and non-dividend paying companies are included in the sample. The time period used in the estimation is July 2004 to end of June 2013.

Equation 1 therefore provides a simple framework to test the effect of the tax cut, or equivalently the effect of setting $\tau_i = 0$, on AIM stock returns. Consider the following econometric version of Equation 1 which we can estimate using OLS,

$$\bar{R}_{i,t} - R_{f,t} = \alpha_i + \beta'_{1,i}\mathbb{X}_t + \mathbb{1}_{(t\geq 7/13)}\left(\gamma_i + \beta'_{2,i}\mathbb{X}_t\right) + \epsilon_{i,t}, \tag{3}$$

where $\bar{R}_{i,t} - R_{f,t}$ is the average realized excess return of asset group i at time t, α_i is a constant for asset group i, $\mathbb{X}_t$ is a matrix of tradeable risk factors, $\beta_{1,i}$ is a vector of coefficient estimates for the risk factors for asset group i, $\mathbb{1}_{(t\geq 7/13)}$ is an indicator function which equals 1 if the observation is during or after July 2013 (the month of the announcement), γ_i is the coefficient estimate of the indicator function for asset group i, $\beta_{2,i}$ is a vector of coefficient estimates of the risk factors interacted with the indicator function for asset group i, and $\epsilon_{i,t}$ is an error term. α_i will capture any tax premium before the tax cut, and γ_i will capture the effect on stock returns after the tax cut and after controlling for systematic risk. I calculate average returns using three groups of stocks: the AIM 100 sample, the propensity score matched FTSE sample, and the full FTSE All-Share sample. For priced risk factors, I test multiple different specifications using factors from the following set: the market return, size, value, profitability, investment, momentum, and liquidity.[18] If taxes are capitalized into asset prices and Equation 1 is an accurate representation of asset returns, we can make the following predictions for each of the above equally weighted portfolios: after controlling for systematic risk, monthly excess AIM stock returns should have a positive and statistically

[18] See Section 3.1 for more information on the factor portfolios. All missing observations are dropped from the sample in every analysis.

significant constant equal to 0.9% before the tax cut (Figure 1 and Equation 2). After the tax cut and after controlling for systematic risk, the tax premium AIM stocks previously commanded to compensate investors for their tax liability should be eliminated, and therefore we should estimate a negative and statistically significant γ equal to -0.9%. The same logic applies to the spread between AIM and matched FTSE stock returns, as well as the spread between the AIM and the full FTSE since no tax premium is commanded by FTSE stocks before or after legislation change.

Table 2 displays the regression results of Equation 3. The top panel uses only the market return as a risk factor, the middle panel uses the three Fama-French factors, and the bottom panel uses all factors in the set. We see that the null hypotheses assuming tax capitalization are not rejected by the stock return data at the 95% confidence level for all return specifications (AIM stocks alone, the spread between AIM stocks and their matched FTSE counterparts, and the spread between AIM stocks and the unmatched FTSE sample). For the AIM-Matched FTSE return spread in the middle column, the null hypotheses are never rejected, and the absolute magnitude of the coefficient estimates are very close to 0.9%. The null hypothesis of $\gamma = -0.9\%$ is never rejected for all three samples, and for all three separate systematic risk specifications. By failing to reject the null hypotheses of tax capitalization in all specifications, Table 2 provides very strong and clear evidence that taxes are capitalized into asset prices and hence affect stock returns. Before the legislation change, excess AIM stock returns earned a positive and significant return premium of at least 0.9 percentage points per month, even after controlling for an extensive list of priced risk factors which have been shown in the empirical asset pricing literature to capture systematic risk and after comparing AIM stock returns to the already treated FTSE stocks. After the legislation change, excess AIM stock returns became at least 0.9 percentage points lower per month than they were, completely removing the tax premium they once commanded. The regressions have also permitted factor betas to change after the tax cut, which addresses the possibility that

Table 2

This table displays the coefficient estimates of α and γ in the return factor model (Equation 3) for average AIM excess stock returns alone, AIM excess returns minus the propensity score matched FTSE sample average returns, and the AIM excess returns minus the full FTSE sample average returns. The top panel uses only the excess market return as a risk factor, the middle panel uses the Fama & French 3 factors, and the bottom panel uses all risk factors: market, size, value, profitability, investment, momentum, and liquidity. Newey-West standard errors are displayed below coefficient estimates in parentheses. The sample period is between 2004 and 2022. The null hypothesis value of α and γ assuming tax capitalization is stated in each table segment. Stars denote whether coefficient estimates reject their H_0 values at the following confidence intervals: *** p < 0.01, ** p < 0.05 , * p < 0.1.

$$R_{i,t} - R_{f,t} = a_i + \beta'_{1,t} X_t + \mathbb{I}_{(t \geq 7.13)}(\gamma_i + \beta'_{2,t} X_t) + \varepsilon_{i,t}$$

Panel A: X = Market Factor		H_0: $\alpha_i = 0.9\%, \gamma_i = -0.9\%$	
i	AIM	AIM - Matched FTSE	AIM - Full FTSE
α_i	0.013	0.008	0.005
	(0.005)	(0.003)	(0.003)
γ_i	-0.014	-0.012	-0.009
	(0.005)	(0.003)	(0.004)
Adj R-squared	0.49	0.07	0.04
Panel B: X = Fama & French 3 Factors		H_0: $\alpha_i = 0.9\%, \gamma_i = -0.9\%$	
α_i	0.011	0.007	0.004*
	(0.004)	(0.003)	(0.003)
γ_i	-0.013	-0.011	-0.008
	(0.004)	(0.003)	(0.004)
Adj R-squared	0.66	0.11	0.19
Panel C: X = All Factors		H_0: $\alpha_i = 0.9\%, \gamma_i = -0.9\%$	
α_i	0.014*	0.007	0.005
	(0.003)	(0.003)	(0.003)
γ_i	-0.014	-0.010	-0.008
	(0.004)	(0.004)	(0.004)
Adj R-squared	0.69	0.13	0.22

changes in asset returns were due to changes in systematic risk exposure.

In order to fully exploit the benefits of this unique difference-in-differences set-up, I now proceed to investigate the effect on AIM stock returns using the much bigger sample of individual observations instead of portfolio averages. Doing so will allow to control for stock, sector, and time fixed effects which might be important in explaining the empirical results so far, as well additional controls, such as stock level proxies for liquidity and public information to account for additional mechanisms which might have arisen after the tax cut. The difference-in-differences specification is:

$$R_{i,t} - R_{f,t} = \alpha_i + \alpha_{s,t} + \beta \, \text{Treated}_i \times \text{Post}_t + \gamma' \, \text{Controls}_{i,t} + \epsilon_{i,t}, \tag{4}$$

where $R_{i,t} - R_{f,t}$ is the monthly excess return of stock i in month t, Post_t is equal to one from July 2013 on-wards, and controls refers to the inclusion of the factor portfolios (market, size, value, investment, profitability, momentum, and liquidity) which were used in the previous portfolio analysis. To capture liquidity and information effects which might result from AIM stocks being permitted into ISA's for the first time, I also include the following additional controls for each stock: trading volume, turnover, and the number of professional analysts making earnings forecasts. I include stock fixed effects to absorb any time invariant characteristics of individual stocks, a sector and month interaction, and the factor portfolios to ensure that the difference in returns is not being driven by systematic risk sources (a higher market beta for example). As before, I interact the factor portfolios with a treated, post, and treated times post dummy which permits time-varying loadings, and I state the null hypothesis value for the interaction term assuming tax capitalization in the table above the coefficient estimate.[19] Column's (1) and (2) of Table 3 test against a null hypothesis of $\beta = -0.9\%$ for the whole AIM sample against the matched FTSE sample in the first column, and the whole AIM sample against the unmatched FTSE sample in the second column. Col-

[19] Assignment to treatment is fixed and therefore results are for an intention to treat analysis.

umn's (3) and (4) dissect the AIM sample by looking at the highest and lowest effective tax rate quartile's in the pre-legislation change period separately, and hence test against the null hypotheses of $\beta = -1.9\%$ and $\beta = -0.03\%$, the respective average effective tax rates for the highest and lowest quartiles in the pre-legislation change period. Looking at these subsets of AIM stocks separately allows us to test whether those stocks with the highest (lowest) effective tax rate experienced the largest (smallest) reduction in their excess stock returns.[20]

In the first column, $\hat{\beta} = -0.011$ implies that after the legislation change and after controlling for systematic and stock level risk factors, AIM stock returns relative to the matched FTSE control group were around 1.1 percentage points less per month than they would have been had they not been allowed to be held in tax efficient ISA accounts, a magnitude which the data does not reject as equalling the effective tax rate in the pre-legislation change period.[21] In column (2) where the control group is the unmatched FTSE sample, $\hat{\beta} = -0.009$, an amount which exactly equals the effective tax rate in the pre-legislation change period.[22] In column's (3) and (4) the null hypothesis values for tax capitalization are also not rejected, and hence the magnitude of the tax cut effect is not statistically significant from each individual quartiles' effective tax rate in the pre-legislation period, a striking result. This within-AIM heterogeneity strongly reinforces the first main result by showing that even within the AIM stock sample, stock returns decreased commensurately with their effective tax rate in the pre-legislation change period. Table A.1 in the Appendix shows that the results in Table 3 are very similar in magnitude and robust to using different combinations of risk factors (e.g. using only the market factor, and dropping momentum from the

[20] To calculate the effective tax rate quartiles, I rank AIM stocks based on their average yearly effective tax rate in the decade before the tax cut.

[21] I cluster standard errors at the firm level because my sample was selected based on the 100 largest AIM stocks and therefore not all AIM stocks have been represented. However, the results remain qualitatively and quantitatively similar when clustering standard errors at the more conservative sector level, and when double clustering by sector and month. See Abadie et al. (2017) for a discussion of when and at what level clustering is appropriate.

[22] A range of other effective tax rate estimates around 0.9% per month would also not be rejected by the data, which is important if the marginal investor's holding period was more or less than one year as assumed.

Table 3

This table displays the treated×post coefficient estimates for the monthly difference-in-differences regressions, Equation 4, which compares monthly AIM stock returns against the propensity score matched and the unmatched monthly FTSE stock returns, before and after the legislation change. Fixed Effects refers to the inclusion of company and a month-sector interaction fixed effect. Controls refers to the inclusion of the five Fama-French factors, momentum, and liquidity, all interacted with a post and treated dummy variable. Stock level proxies for public information and liquidity are also included as controls. The sample period is between 2004 and 2022. Standard errors are in parentheses below coefficient estimates, and are clustered at the firm level. The null hypothesis value for β assuming tax capitalization is stated above the corresponding column. Column (1) uses the matched FTSE sample as a control group, and column (2) uses the unmatched FTSE control group. Compared to column (2), column (3) uses only AIM stocks in the highest effective tax rate quartile from the pre-legislation period, and column (4) uses the lowest quartile. Stars denote whether coefficient estimates reject their H_0 values at the following confidence intervals: *** p < 0.01, ** p < 0.05 , * p < 0.1.

	Dependent Variable: Monthly Return			
	$H_0: \beta = -0.9\%$		$H_0: \beta = -1.9\%$	$H_0: \beta = -0.03\%$
	(1)	(2)	(3)	(4)
Treated × Post	-0.011	-0.009	-0.021	-0.002
	(0.004)	(0.003)	(0.007)	(0.006)
Fixed Effects	Yes	Yes	Yes	Yes
Clustered SE's	Yes	Yes	Yes	Yes
All Controls	Yes	Yes	Yes	Yes
Months	210	210	210	210
Observations	23,364	85,975	77,872	77,120
Adj R-squared	0.19	0.28	0.30	0.30

set), and when standard errors are doubled clustered at the firm and month level.

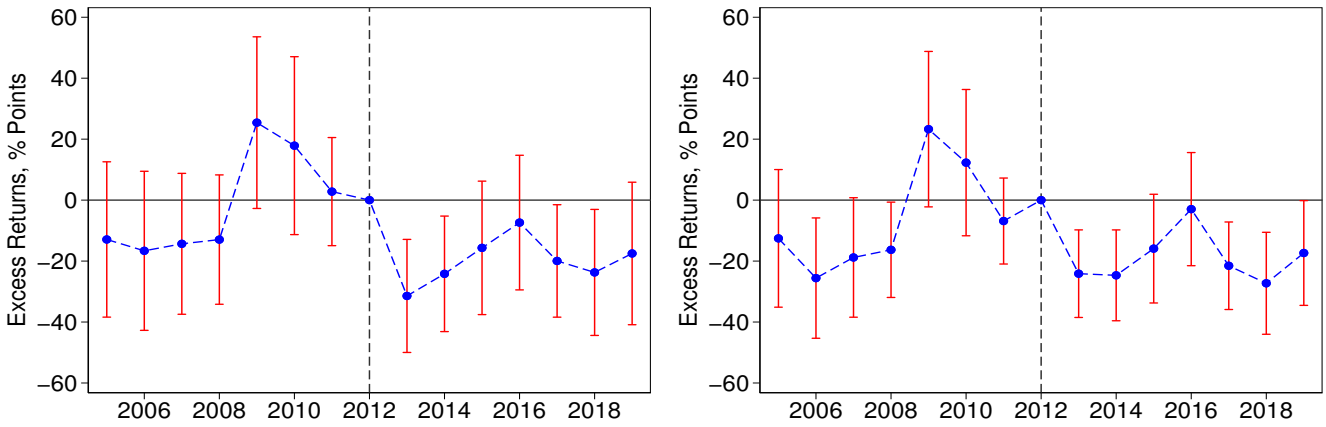

Figure 2: The left (right) figure plots the coefficient estimates of the annual excess returns dynamic difference-in-differences (DID) regression along with 95% confidence intervals displayed vertically using the matched (unmatched) sample as the control group. The baseline year is 2012, the year before the announcement. Standard errors are clustered at the firm level. Firm fixed effects and a sector × year interaction are included in the regression.

Figure 2 plots the coefficient estimates of the following dynamic difference-in-differences for yearly excess AIM stock returns relative to the matched and unmatched FTSE samples:

$$\mathrm{R}_{i,t} - \mathrm{R}_{f,t} = \alpha_i + \alpha_{s,t} + \sum_{k=t_0, k\neq j}^{T} \beta_k \, \mathrm{Treated}_i \times \mathbb{1}(k = t) + \epsilon_{i,t}, \tag{5}$$

where $\mathbb{1}$ is an indicator function for month t, j is the baseline month before the policy announcement, and $\mathrm{Treated}_i$ is a dummy variable which equals one if the stock is an AIM stock. β_k captures the period t specific effect for the treatment group relative to the control group, with respect to the baseline period before the legislation announcement j. We observe firstly that the parallel trends condition always holds for the matched control group in the left-hand side chart, and in the most recent years for the unmatched control group in the right-hand side chart. Secondly we observe the permanent reduction in excess AIM stock returns relative to both the matched and unmatched FTSE samples.

The results in Table 2 and Table 3 show that after AIM stocks were permitted to be

held in tax efficient ISA savings accounts, their average excess stock returns decreased by amounts equal to their effective tax rates in the pre-legislation period, as predicted by asset pricing models of tax capitalization. Figure 2 reinforces this by showing that the reduction in returns was permanent. This is important as it shows very clearly the effect that different levels of taxation have on the returns of assets. The economic intuition of these results is that after the tax cut, the equilibrium rate of return decreased for retail investors as their tax liability was reduced by the previously demanded tax premium. This meant the instantaneous stock price was cheaper than its new equilibrium price, and retail investors therefore bought the stock until the new more expensive price reflected the new permanently reduced rate of return. For institutional investors, the required rate of return for AIM stocks did not change after the legislation change, and it is possible that they sold their AIM holdings after the initial rally in order to profit from their positions. Table A.2 in the Appendix provides evidence that AIM stock prices relative to their pre-reform (2012) book value increased after the legislation change, especially for those AIM companies who had the highest effective tax rates before the legislation change.[23] Using shareholder data, Figure A.1 in the Appendix shows how retail investors and then retail investor focused institutions increased their relative ownership of AIM companies after the legislation change, mostly at the expense of stakeholders. Section's A.2 and A.3 in the Appendix provide further evidence of a positive price and demand impact from the tax cut by showing an increase in the flows into AIM-related ETFs, and high-frequency price reactions on the days of the announcement and legislation change.

These findings are in-line with Sialm (2009) who provides both time-series and cross-sectional evidence over a long time-horizon in the US that personal investment taxes are capitalized into stock returns by looking at the disparity in the pre-tax stock returns of

[23] The limitation of looking at prices in this natural experiment setting is that while AIM prices clearly became higher after the legislation change than they were before (see Table A.2), the difference in price (and valuation ratios) between AIM and main market stocks will not have parallel trends in the pre-legislation period, unlike returns which differed by a constant amount commensurate with the AIM tax premium.

portfolios sorted by their average dividend yield, and Litzenberger and Ramaswamy (1979) who find that asset returns compensate investors for their tax burden and also provides empirical evidence for the theoretical tax-CAPM model of Brennan (1970).[24] They are also inline with Schulz (2016) who highlights the importance of taking into consideration the effect of taxes and other frictions when addressing perceived asset pricing puzzles.[25] These results contribute to the small body of empirical research which establishes a link between personal taxes and stock returns, as noted by Graham (2003). The contribution to previous studies is that I have provided evidence for tax clienteles and stock return compensation in a causal regression framework which is more robust than a time-series analysis because it addresses potential endogeneity issues which may bias the effect of taxes on stock returns. [26] [27]

3.5. Dividend Payout Policy and Capital Structure

In this section I examine the dividend payout policy and the capital structure decisions of AIM companies after the legislation change. Once AIM stocks could be held in ISAs, retail investors no longer faced an up to 37.5% income tax upon receipt of dividend payments.

In a related study, Chetty and Saez (2005) investigate the effects of the 2003 US dividend tax cut. Compared to their setting, I observe a complete elimination of dividend taxes when stocks are held in ISAs. Furthermore, unlike Chetty and Saez (2005) who assign their sample of companies to treatment and control groups under the assumption that their control group has no reason to change their dividend payments because of higher institutional ownership, I am able to compare AIM dividend payments to a group of companies which did

[24] Litzenberger and Ramaswamy (1979) tested a modified version of Brennan (1970)'s after-tax CAPM (assuming no capital gains tax) by examining the relationship between pre-tax returns and dividend payments. Dai et al. (2008) also find evidence in an event study that tax changes can affect stock demand and returns.

[25] See Binsbergen and Koijen (2016) for a challenge of the tax estimates used in Schulz (2016).

[26] On the potential effect that the timing of the sample selection might have had on the magnitude of the results, instead of selecting the AIM 100 stock sample before the legislation change announcement, I selected the AIM 100 sample one, two, and three years before and after the announcement date to see how this affected the main results of this section. The results remained quantitatively and qualitatively similar.

[27] Carletti et al. (2021) look at the behaviour of households and also identify large tax cut effects.

not experience a tax cut, main-market FTSE stocks, and therefore provide a causal estimate for the effect of a tax cut on company dividend payments without additional assumptions.

To study the effect of the tax cut on company decisions, I estimate Equation 6 below, where Financial Decision in this section refers to the following dependent variables: log of dividends paid (in millions of pounds), a dividend dummy which equals one if the company paid any dividends in the year and zero otherwise, log of shares issued, and debt relative to pre-reform (2012) assets. I include the pre-reform (2012) value of the following controls (as used in Fama and French (2001)), interacted with time dummy variables: company profits, company size, book-to-market ratio, the company's total value of assets, and the company's total cash holdings.

$$\text{Financial Decision}_{i,t} = \alpha_i + \alpha_{s,t} + \beta\,\text{Treated}_i \times \text{Post}_t + \gamma'\,\text{Controls}_{i,t} + \epsilon_{i,t}. \tag{6}$$

Did the legislation change encourage AIM companies who already made dividend payments to pay out more of their earnings to their investors? Column's (1) and (2) of Table 4 show that there was a positive and statistically significant increase in the amount of dividends paid, both with and without the controls. The coefficient estimate in column (2) corresponds to an average 40% increase in the amount of dividends paid after the legislation change, which implies an elasticity with respect to one minus the dividend tax rate of 0.55, very similar to the dividend tax elasticity estimated by Chetty and Saez (2005), Yagan (2015), and Matray (2023).[28] Investors who held their shares in an ISA no longer faced a dividend income tax of up to 37.5%, and therefore were able to receive dividend payments without this sizeable tax burden. This sharp increase in dividend payments is consistent with the results of Chetty and Saez (2005) who found that US companies paid out 20% more dividends after dividend

[28] I estimate elasticity with respect to one minus the tax rate as $\epsilon_{y,1-\tau} = \frac{\%\Delta y}{\%\Delta(\text{net of tax rate})} = \frac{\Delta y}{y_0} \times \frac{(1-\tau_0)}{\Delta\tau}$ for each tax rate separately. $\%\Delta y$ uses the treated×post coefficient estimate when the dependent variable is logged.

taxes were reduced from 35% to 15% in the US. The results are also in-line with Desai and Jin (2011) and Golubov et al. (2020) who showed that companies alter their payout policies in response to shareholder tax-based preferences, and provides empirical support for the theoretical model of Allen et al. (2000).

Did the elimination of dividend taxes for ISA investors encourage more AIM companies to start paying out dividends? Column's (3) and (4) in Table 4 present the coefficient estimates of the linear probability model and show that there was between a 5.6% to 8.6% increase respectively in the number of AIM companies paying dividends after the tax cut, but this increase is only statistically significant in the specification without controls.[29] This result provides evidence that after the tax cut, a higher number of AIM companies started paying out dividends to their investors, in-line with Chetty and Saez (2005) who found that the fraction of publicly listed companies paying out dividends increased from 20% to 25% six quarters after the tax cut.

Share repurchases are an alternative way for companies to pay out cash to their investors. After AIM stocks became eligible to be held in ISAs, any share repurchases would no longer be liable for capital gains tax if investors held the stock in an ISA. Six quarters before the tax cut, there were no share repurchases recorded, but there were six share repurchases recorded six quarters after. Were the companies who initiated share repurchases the same as the dividend paying stocks? Out of the six companies who initiated share repurchases after the legislation change, five of them were already issuing dividend payments. Perez-Gonzalez (2003) finds evidence that individual shareholders can influence dividend policy, which suggests that after the tax cut, company management were influenced to increase their dividend payments to shareholders. In Appendix A.7, I discuss how the tax cut might affect the efficiency of capital markets and I also provide a back-of-the-envelope evaluation of the tax cut.

[29] Adding controls reduces the sample size and increase the standard error of the estimate.

Table 4

This table displays the treated×post coefficient estimates for the financial decision's regression, Equation 6, which compares yearly log dividend payments, a dividend dummy, the log of shares issued, and the debt to pre-reform (2012) assets ratio for AIM companies relative to their matched FTSE sample, before and after the legislation change. Fixed Effects refers to the inclusion of a company and a month-sector interaction fixed effect. Controls refers to the inclusion of the pre-reform value (2012) of the following variables interacted with year fixed effects: company profits, company size, book-to-market ratio, value of assets, and value of cash holdings. The sample period is between 2005 and 2022. The pre-treated mean is estimated for AIM stocks in the pre-legislation change period, and the elasticity is estimated for both taxes separately with the treated×post coefficient estimate used for $\%\Delta y$ when the dependent variable is logged. Standard errors are in parentheses below coefficient estimates, and are clustered at the firm level. Stars denote whether sample averages are statistically different from zero at the following confidence intervals: *** p < 0.01, ** p < 0.05 , * p < 0.1.

	Dependent Variable							
	Log Dividends		Dividend Dummy		Log Shares Issued		Debt	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treated × Post	0.633***	0.403**	0.086*	0.056	0.202**	0.133*	0.205***	0.137**
	(0.154)	(0.180)	(0.049)	(0.059)	(0.080)	(0.075)	(0.053)	(0.056)
Additional Controls	No	Yes	No	Yes	No	Yes	No	Yes
Pre-Treated Mean	7.90		0.37		11.42		0.09	
Impl. Elasticity $1-\tau_d$	0.86	0.55	0.32	0.21	0.27	0.18	3.24	2.17
Impl. Elasticity $1-\tau_g$	1.63	1.04	0.60	0.39	0.52	0.34	6.17	4.12
Observations	1,579	1,226	2,670	1,814	2,479	1,705	2,682	1,820
Adj R-squared	0.69	0.73	0.68	0.63	0.90	0.93	0.54	0.55

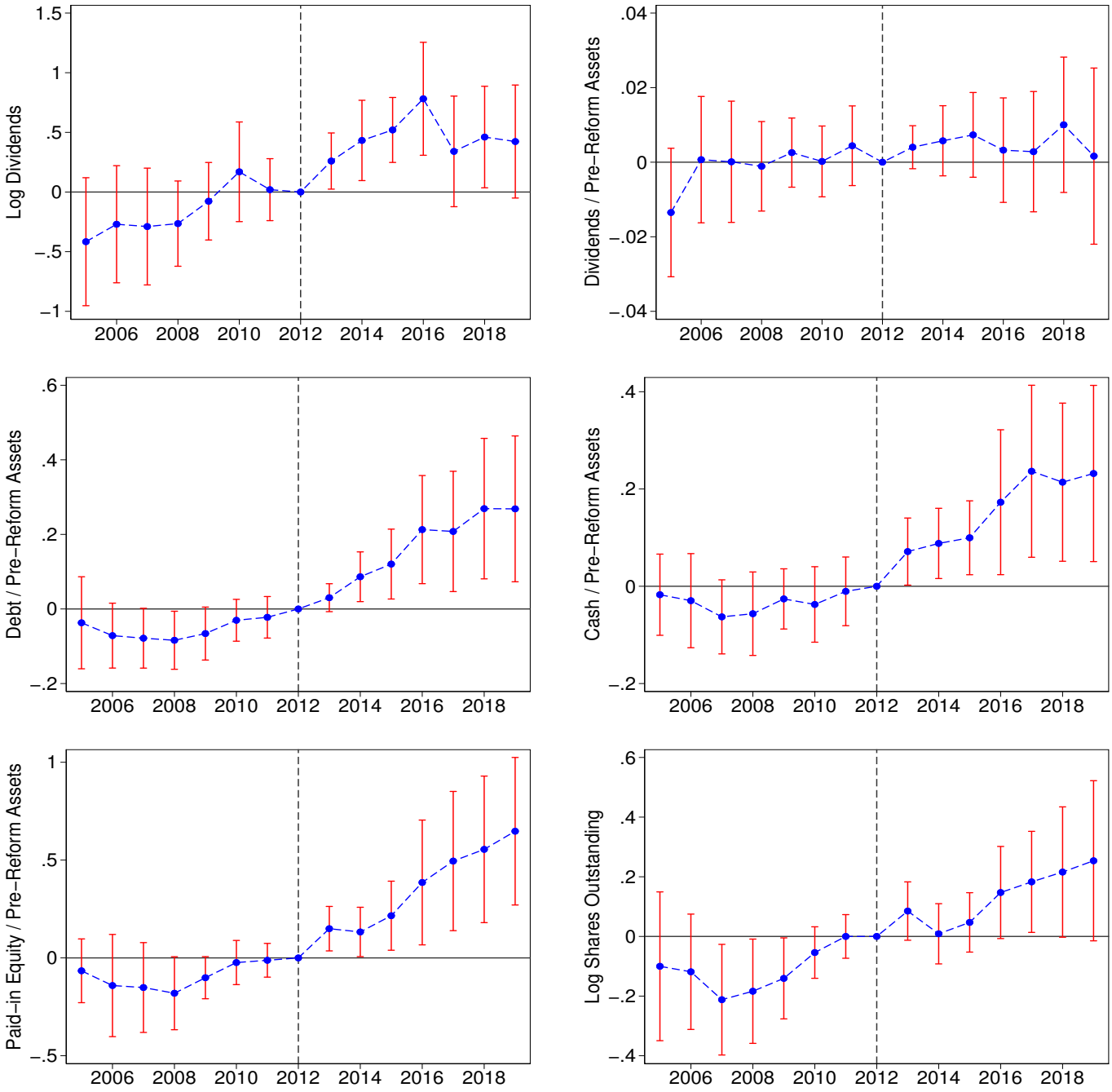

Figure 3: The top left figure plots the coefficient estimates of the log dividends dynamic difference-in-differences regression along with 95% confidence intervals displayed vertically, the top right figure for dividends weighted by pre-reform (2012) assets, the middle left figure for debt weighted by pre-reform assets, the middle right figure for cash weighted by pre-reform assets, the bottom left figure for paid-in equity weighted by pre-reform assets, and the bottom right figure for the log of shares outstanding. The baseline year is 2012, the year before the announcement. Standard errors are clustered at the firm level. Firm fixed effects and a sector × year interaction are included in the regression.

Did the capital structure decision of AIM companies change after the reduction in personal taxes, as hypothesized by Miller (1977)? Column's (5) and (6) in Table 4 present the difference-in-differences coefficient estimates when the dependent variable is the log of shares issued. Both coefficients are positive and statistically significant, and the coefficient estimate of the specification with controls implies that companies increased the amount of equity in issue by 13%, an elasticity with respect to one minus the dividend and capital gains tax of 0.18 and 0.34 respectively, in-line with the view that a reduction in their cost of capital meant that AIM companies could raise capital on more favourable terms. Regarding the external validity of this result, it is likely that the elasticity of equity issuance to taxes is higher for publicly listed companies rather than privately owned companies due to their better access to equity capital markets, and for growing rather than mature companies, as in the model of Korinek and Stiglitz (2009).

Another decision which might be influenced by higher stock prices is the leverage ratio of companies. With higher stock prices, companies may have more scope to issue debt and therefore benefit from the interest rate tax-shield without unsettling their shareholder base. Column's (7) and (8) in Table 4 display the difference-in-differences coefficient estimate with the debt to pre-reform assets as the dependent variable. The coefficients are both positive and statistically significant. In terms of magnitude, the coefficient estimates correspond to a between 21% and 14% average increase in the debt to pre-reform assets for AIM companies after the legislation change. In-line with Faccio and Xu (2015) who study pooled tax changes across many countries in a cross-sectional but not difference-in-differences setting, these two results provide evidence that the capital structure decision of companies is affected by the personal taxation level of their investors, since the reduction of taxes reduces a companies cost of capital, which makes marginal investments more worthwhile and hence companies raise additional capital to fund them.

Figure 3 plots the coefficient estimates for log dividends, dividends to pre-reform

assets, debt relative to pre-reform assets, cash relative to pre-reform assets, paid-in equity relative to pre-reform asssets, and the log of shares in issue, for the dynamic difference-in-differences (Equation 5). Paid-in equity (also known as paid-in capital) is calculated as the sum of shareholders equity and the contributed surplus, and therefore complements the number of shares outstanding as an equity issuance measure which does not reflect monetary amounts. For all variables, we see that the parallel trends condition holds in the most recent years before the tax cut. After the reform, we see a clear and sustained increase in log dividends, log shares outstanding, paid-in equity, cash, and debt post-reform.[30] However, for dividends relative to pre-reform assets, while the coefficient estimates are on average higher than the reference period, we do not observe a statistically significant increase post-reform. This suggests that the increase in dividend payments was driven primarily by companies already paying dividends, and not by an extensive margin effect. While Chetty and Saez (2005) observed both a large intensive and extensive margin effect, my sample of AIM companies is generally younger and faster growing, which could explain why more AIM companies didn't initiate dividend payments, and instead opted to invest, as explored in the next section.

The elasticity of debt to pre-reform assets in column (8) of Table 4 is also very large (2.2 and 4.1 for dividend and capital gains taxes respectively), and this large increase can partly be explained by the relatively low initial debt level of AIM companies in the pre-legislation change period, which at 0.09 is much lower than 0.21 for the control group (see Table's A.3 and A.4 in the Appendix for further summary statistics both pre and post-reform).[31] An interesting question is whether the increase in debt was due to a scale effect, or due to a relaxation of collateral constraints. In standard collateral constraint models (e.g. Banerjee and Newman (1993), Fonseca and Van Doornik (2022), and Bau and Matray (2023)), a firm's

[30] I discuss the increase in cash in Section 3.8.

[31] Additionally, Table's A.5 and A.6 in the Appendix provide results for unweighted dependent variables. At 0.93 and 1.77, we see the elasticity of logged debt to dividend and capital gains tax respectively is large but noticeably smaller than the elasticity for the ratio of debt to pre-reform assets.

debt level is determined by the firm's equity value and a collateral constraint parameter. Figure A.4 in the Appendix plots the dynamic difference-in-differences of the contemporaneous debt to market equity ratio for the AIM sample relative to the control group, relative to the index period in 2012. We observe no statistically significant increase in the contemporaneous debt to equity ratio, which suggests that the increase in leverage for AIM companies was due to a scale effect, i.e. the increase in the equity value (due to the reduction in the cost of capital) allowed AIM companies to increase their debt levels by a proportional amount, and not due to a relaxation of their collateral constraint parameter.

3.6. Real Economic Effects: Capital and Labour Investment

In this section, I examine the capital and labour expenditure of AIM companies after the legislation change. Section 3.4 showed that the equity cost of capital for AIM companies decreased after the tax cut, and Section 3.5 showed that AIM companies responded to the reduction in dividend taxes and their cost of capital by paying out more in dividends and issuing more equity and debt. The natural question is whether AIM companies also increased expenditure on assets and labour after raising additional capital?

To investigate this, I estimate Equation 6 with the following dependent variables: tangible capital (property, plant, and equipment (PPE)) relative to pre-reform (2012) assets, capital expenditure relative to pre-reform PPE, total pay relative to pre-reform revenue, and the total number of employees relative to pre-reform revenue. Table 5 displays the coefficient estimates and shows a statistically significant increase for all real economic dependent variables. PPE relative to pre-reform assets increased by 24 percentage points, an elasticity with respect to one minus the dividend (capital gains) tax rate of 1.81 (3.44), capex relative to pre-reform PPE increased by 43 percentage points, an elasticity with respect to one minus the dividend (capital gains) tax rate of 1.12 (2.14), total pay relative to pre-reform revenue by 8 percentage points, an elasticity with respect to one minus the dividend (capital gains)

tax rate of 0.51 (0.98), and the total number of employees relative to pre-reform total revenue by 0.5 percentage points, an elasticity with respect to one minus the dividend (capital gains) tax rate of 1.35 (2.57).[32] These elasticities are comparable to those estimated by Moon (2022) who estimates a capex elasticity with respect to the capital gains tax of 1.99, compared to 2.14 in column (4) of Table 5.

Figure 4 plots the coefficient estimates for the dynamic difference-in-differences for the same outcome variables above. We see that the parallel trends condition holds for most outcome variables, at least in the periods closest to reform date, and that after the reform, there is a clear and persistent increase in all real economic variables, in-line with the "traditional view" of corporate decision making which assumes that the investment decisions of companies is affected by the personal investment tax rate of their investors. After the tax cut, AIM companies issued both equity and debt due to their lower cost of capital, and using this capital, they increased their stock of property, plant, and equipment, as well as their capital expenditure persistently after the reform. They also increased their total pay sizeably, as well as the total number of employees hired. When looking at average pay per employee instead of total pay, the effect is positive but only statistically significant at the 90% level, which suggests that firms mostly expanded the size of their workforce, rather than just paying their existing employees more.[33]

Did the AIM companies who issued the most equity and debt also invest the most? When looking at those AIM companies whose equity and debt issuance was above the AIM median, the treated×post coefficient estimate for both PPE and total pay is substantially larger than the sample average. AIM companies who issued the most equity (debt) had a PPE elasticity with respect to one minus the dividend tax rate of 2.06 (2.99) against the sample average of 1.88 (column (1) in Table 5). This implies that those companies who invested the most were the most financially constrained before-hand and the tax cut afforded those

[32] Table's A.5 and A.6 in the Appendix show that results are robust to using an unweighted specification.
[33] Section 3.8 looks at the allocated spending split in further detail.

Table 5

This table displays the treated×post coefficient estimates for the financial decision's regression, Equation 6, which compares capital, or property, plant, and equipment (PPE), capital expenditure (capex), total pay to all employees and officers, and the total number of employees. PPE is scaled by total assets in the year prior to the tax cut (2012), capex is scaled by PPE in the year prior to the tax cut, pay and employees are scaled by total revenue in the year prior to the tax cut. All specifications include a company and a month-sector interaction fixed effect. Controls refers to the inclusion of the pre-reform (2012) value of the following variables interacted with year fixed effects: company profits, company size, book-to-market ratio, value of assets, and value of cash holdings. The sample period is between 2005 and 2022. The pre-treated mean is estimated for AIM stocks in the pre-legislation change period, and the elasticity is estimated for both taxes separately with the treated×post coefficient estimate used for $\%\Delta y$ when the dependent variable is logged. Standard errors are in parentheses below coefficient estimates, and are clustered at the firm level. Stars denote whether sample averages are statistically different from zero at the following confidence intervals: *** p < 0.01, ** p < 0.05 , * p < 0.1.

	Dependent Variable							
	PPE		Capex		Pay		Employees	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treated × Post	0.251***	0.242***	1.025***	0.433**	0.295***	0.078	0.007***	0.005***
	(0.068)	(0.072)	(0.361)	(0.218)	(0.070)	(0.057)	(0.001)	(0.001)
Additional Controls	No	Yes	No	Yes	No	Yes	No	Yes
Pre-Treated Mean	0.18		0.52		0.21		0.01	
Impl. Elasticity $1-\tau_d$	1.88	1.81	2.66	1.12	1.95	0.51	1.89	1.35
Impl. Elasticity $1-\tau_g$	3.57	3.44	5.06	2.14	3.70	0.98	3.60	2.57
Observations	2,645	1,796	2,593	1,756	2,361	1,676	2,349	1,666
Adj R-squared	0.67	0.73	0.48	0.53	0.77	0.80	0.69	0.74

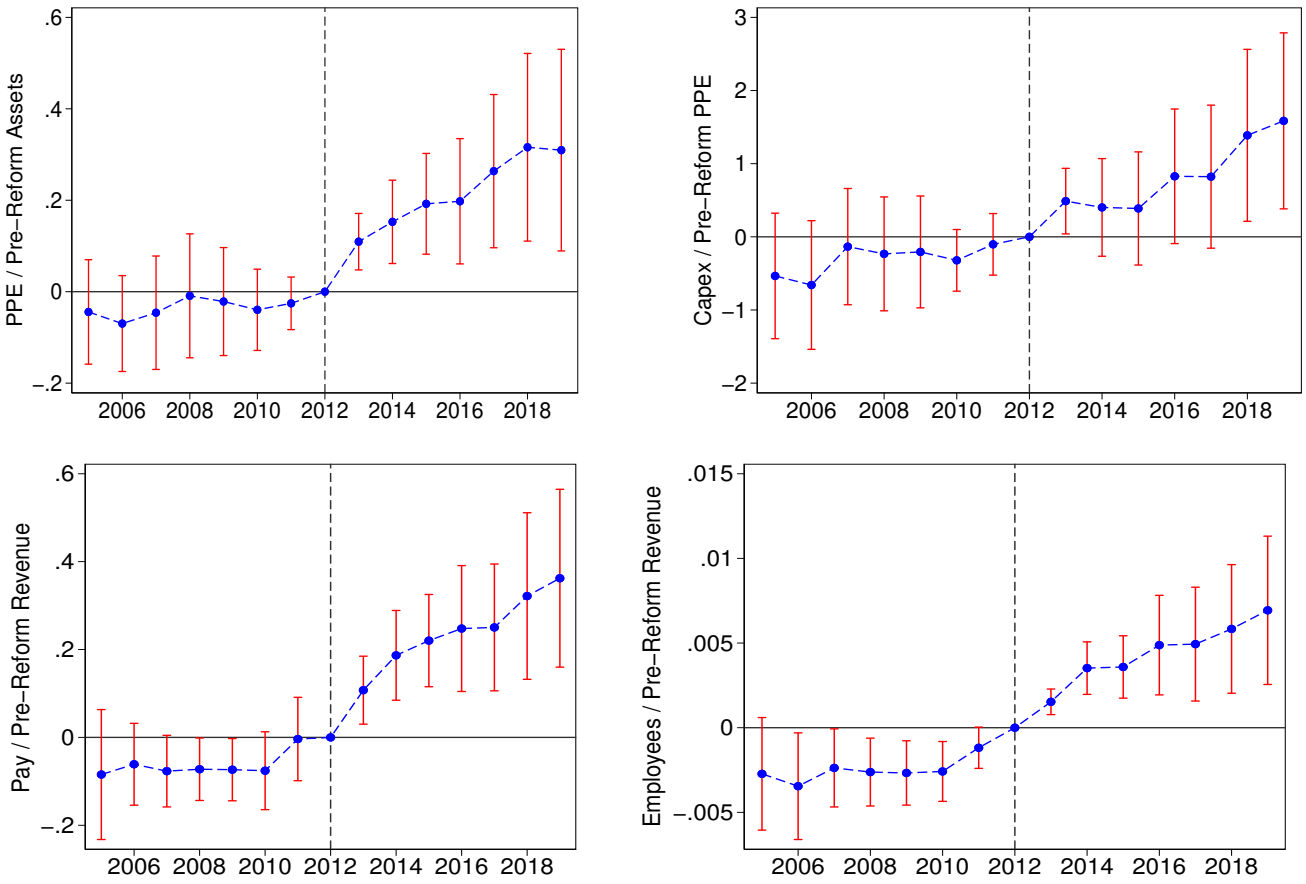

Figure 4: The top left figure plots the coefficient estimates of the dynamic difference-in-differences regression with Property, Plant, and Equipment (PPE) weighted by pre-reform (2012) assets as the dependent variable, along with 95% confidence intervals displayed vertically, the top right figure for capital expenditure (capex) weighted by pre-reform PPE, the bottom left figure for total pay weighted by pre-reform revenue, and the bottom right figure for the number of employees weighted by pre-reform revenue. The baseline year is 2012, the year before the announcement. Standard errors are clustered at the firm level. Firm fixed effects and a sector × year interaction are included in the regression.

companies with the opportunity to raise capital at a lower cost, hence making the new investments more worthwhile.

3.7. Across-Firm Analysis and Relation to Other Studies

In this section, I look into the heterogeneity across the AIM sample depending on their cash constraints, ownership concentration, and dividend policy. I then discuss my findings in relation to other studies in the literature, and the external validity of my results.

The top panel of Table 6 displays the coefficient estimates of a three-way difference-in-differences regression with a cash rich dummy variable, interacted with the treated×post dummy variables. Cash rich takes the value of one if the company's pre-legislation change profit margin is above the sample median, since the more profits the company generates, the more capital available for the company to reinvest or pay dividends to investors (all else being equal). The middle panel of Table 6 displays the coefficient estimates of a three-way difference-in-differences regression with a concentrated ownership dummy variable, interacted with the treated×post dummy variables. Concentrated ownership takes a value of one if the stakeholder ownership of the company is above the sample median, the idea being that the more of the equity the stakeholders own, the more influence they will have over the company's decision making process. The bottom panel of Table 6 displays the coefficient estimates of a three-way difference-in-differences regression with a dividend paying dummy variable, interacted with the treated×post dummy variables. The dividend paying dummy takes a value of one if the company paid out dividends anytime after the reform.

Three interesting results arise from this exercise. Firstly, in the top panel, we see that the most cash rich AIM companies were not the companies issuing the most equity after the tax cut, which is intuitive since these companies already have relatively more capital available to invest in new projects or to pay dividends. On the other hand, it reinforces the evidence for the "traditional view" of corporate decision making because the result im-

Table 6

This table displays the treated×post, and the treated×post×firm characteristic coefficient estimates, from a three-way difference-in-differences regression where firm characteristic equals either a cash rich dummy, a concentrated ownership dummy, or a dividend paying dummy. The yearly dependent variable in column (1) is the log of dividends paid, column (2) the log of shares in issuance, column (3) debt relative to pre-reform assets, column (4) PPE relative to pre-reform assets, column (5) pay relative to pre-reform revenue, and column (6) employees relative to pre-reform revenue. All specifications include a company and a month-sector interaction fixed effect. The sample period is between 2005 and 2022. Standard errors are in parentheses below coefficient estimates, and are clustered at the firm level. Stars denote whether coefficient estimates are statistically different from zero at the following confidence intervals: *** p < 0.01, ** p < 0.05 , * p < 0.1.

	Dependent Variable					
	Log Dividends	Log Shares	Debt	PPE	Pay	Employees
Panel A	(1)	(2)	(3)	(4)	(5)	(6)
Treated × Post	0.478*	0.385***	0.151*	0.208*	0.307***	0.006***
	(0.260)	(0.117)	(0.079)	(0.117)	(0.079)	(0.002)
Treated × Post × Cash Rich	0.106	-0.361**	0.104	0.052	-0.041	0.000
	(0.319)	(0.175)	(0.110)	(0.130)	(0.139)	(0.002)
Observations	1,579	2,425	2,627	2,590	2,361	2,349
Adj R-squared	0.70	0.91	0.54	0.68	0.77	0.69
Panel B	(1)	(2)	(3)	(4)	(5)	(6)
Treated × Post	0.518**	0.174*	0.167**	0.238**	0.166**	0.004**
	(0.230)	(0.105)	(0.077)	(0.119)	(0.072)	(0.001)
Treated × Post × Concetrated Ownership	0.986*	-0.438	-0.187	-0.389	0.335***	0.005*
	(0.511)	(0.467)	(0.189)	(0.282)	(0.095)	(0.002)
Observations	1,234	1,983	2,149	2,118	1,884	1,863
Adj R-squared	0.70	0.91	0.54	0.69	0.80	0.73
Panel C	(1)	(2)	(3)	(4)	(5)	(6)
Treated × Post	-	0.356**	0.272***	0.461***	0.401***	0.010***
		(0.159)	(0.081)	(0.110)	(0.087)	(0.002)
Treated × Post × Dividend Paying	-	-0.225	-0.095	-0.263**	-0.136	-0.004
		(0.189)	(0.096)	(0.120)	(0.107)	(0.003)
Observations	-	2,479	2,682	2,645	2,361	2,349
Adj R-squared	-	0.90	0.54	0.67	0.77	0.69

plies it was cash constrained AIM companies who were issuing equity given the reduction in their cost of capital. Secondly, in the middle panel, we see that the AIM companies with the highest stakeholder ownership percentage were those that increased their total pay the most. Given the increase in total pay mostly came from the number of employees hired, it suggests that company directors and founders hired more staff to potentially reduce their workload, expand into new areas, or to bring in-house some previously out-sourced jobs. Finally, in the bottom panel we see that the majority of the increase in PPE came from those AIM companies who were not paying out dividends, which suggests that the magnitude of the effect for a cut in personal investment taxes on company investment decisions will vary depending on whether the company is a dividend paying firm or not. From an accounting perspective, this is intuitive as it implies dividend paying AIM companies have relatively less money left over to invest in their capital expenditure after they have exhausted some of their available capital on payouts, especially since it was the AIM companies who were already paying out dividends who further increased their payouts after the tax cut (Figure 3). This result is in-line with company life-cycle models such as Korinek and Stiglitz (2009) which argue that younger, faster growing companies, who typically do not pay dividends, are more likely to respond to personal tax cuts than more mature firms who base their investment decisions more off retained earnings rather than the cost of issuing new capital. Moreover, while not explicitly modelled within the agency framework of Chetty and Saez (2010), the results in the second and third panels lend support to the frictions in Chetty and Saez (2010) which derive from a difference in incentives due to the non-perfectly aligned payoff's between managers and shareholders.

Why have some studies found no evidence, or even a positive elasticity, for the effect of personal investment taxes on company investment decisions? Firstly, an important difference between my setting and other similar studies is that investors and companies were more likely to view the AIM tax cut as permanent since it equalised a large initial dif-

ference in the tax treat of UK listed companies, whereas the dividend tax cuts in the US, France, and Greece were more prone to future reversals due to political and business cycles. If investors do not view a tax cut as permanent, then the change in the tax rate will not be fully capitalized into asset prices, and therefore the cost of capital faced by companies will not change as much. Furthermore, companies will not pursue investments which take long periods to pay off given the uncertainty around the future tax levels. Secondly, my sample consists of younger, publicly listed companies, who will be less financially constrained than privately held firms due to their better access to capital markets, and have less concentrated ownership structures which could create frictions as in Chetty and Saez (2010). Publicly listed companies might also be more financially sophisticated and therefore able to take advantage of the opportunities afforded to them by tax cuts (Bach et al. 2021). Furthermore, my sample consists of growing companies who could be more likely to begin new investments following a change in tax rates than more mature companies as in Korinek and Stiglitz (2009). Finally, in my setting I observe a reduction in both dividend and capital gains taxes, and it possible that investors respond more to capital gains taxes than dividend taxes if the share of capital gains tax exempt investors is less than the share of dividend tax exempt investors, or if capital gains make up a much higher component of total returns than dividend payments. This is supported by the evidence provided by Moon (2022) who observes an increase in investments following a cut in capital gains tax in South Korea. Relatedly, Goodman et al. (2023) find that limiting interest rate deductions from taxable profit calculations has no economically significant impact on company investments, which when taken together with the other evidence in this section, reinforces the message that various tax changes which all directly affect the cost of capital, can have differential effects on company financial and investment decisions depending on the specific setting and the frictions at play.

3.8. FOLLOWING THE MONEY

In this section I compare the amount of newly issued capital to the expenditure of AIM companies after the tax cut. Specifically, I compare the post-reform amount of paid-in equity and debt of AIM companies to their post-reform spending on dividends, buybacks, PPE, employee pay, and cash holdings. I scale all variables by their pre-reform (2012) value of total assets so that all variables have the same unit of measurement.

Table 7 displays the coefficient estimates of the difference-in-differences regression for the "Money In" group of variables, and the "Money Out/Held" group separately, and the bottom row of the table aggregates the coefficient estimates within each group. On average, AIM companies raised 0.653 pence per pound of pre-reform total assets after the tax cut, and spent/held 0.604 pence per pound of pre-reform total assets after the tax cut. These amounts are close in magnitude, and from these numbers we can infer that on average AIM companies raised 69% of their new capital through additional equity, and 31% through new debt. We can also infer that on average, AIM companies spent 1.3% of their new capital on dividends, close to 0% on share buybacks, 37% on PPE, 20% on pay, and held 30% as cash.

The pass-through of newly issued equity and debt (money in) to PPE and pay is 57%, which is substantially higher than the equivalent pass-through of the "retained earning shock" estimated by Matray (2023) of 38%, but much closer to the 60-70% pass-through estimate of Rauh (2006) who studies the change in capital expenditure in response to changes mandatory pension contributions. Furthermore, Bilicka et al. (2023) find that on average 46% of reallocated dividend funds went on capital investment, which is broadly in-line with the 37% pass-through I estimate for PPE expenditure, but their pass-through to cash estimate of 6% is much lower than the 30% I estimate for AIM companies.

A potential explanation for the large increase in cash for AIM companies is that the lower cost of capital substantially increased the number of positive net present value investment opportunities available to them, which increased the value of having cash available

Table 7

This table displays the treated×post coefficient estimates for two groups of variables denoted as "Money In" and "Money Out/Held". The "Money In" category includes paid-in equity and debt, and the "Money Out/Held" category includes dividends, buybacks, PPE, pay, and cash. All variables are scaled by total assets in the pre-reform period (2012), and all specifications include a company and month-sector interaction fixed effect. Standard errors are in parentheses below coefficient estimates, and are clustered at the firm level. Stars denote whether coefficient estimates are statistically different from zero at the following confidence intervals: *** p < 0.01, ** p < 0.05 , * p < 0.1.

	Dependent Variable						
	Money In		Money Out / Held				
	Paid-In Equity	Debt	Dividends	Buybacks	PPE	Pay	Cash
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treated × Post	0.448***	0.205***	0.009	0.000	0.251***	0.135***	0.209***
	(0.117)	(0.053)	(0.008)	(0.001)	(0.068)	(0.041)	(0.052)
Pre-Treated Mean	0.36	0.09	0.01	0.00	0.18	0.09	0.11
Impl. Elasticity $1-\tau_d$	1.69	3.24	1.07	0.00	1.88	2.01	2.62
Impl. Elasticity $1-\tau_g$	3.22	6.17	2.03	0.00	3.56	3.82	4.98
Observations	2,553	2,682	2,670	2,623	2,645	2,437	2,421
Adj R-squared	0.72	0.54	0.67	0.33	0.67	0.78	0.69
$\sum$ Treated × Post	0.653				0.604		

within the company so that they could more readily take advantage of any new profitable investment opportunities. An additional explanation is that the increased cash amount could serve as a buffer to help manage their larger debts in times of financial distress or interest rate shocks.

4. Conclusion

Prior to a legislation change in August 2013, AIM stocks were not permitted to be held in tax efficient Individual Savings Accounts (ISAs) which exempt retail investors from dividend and capital gains tax. I exploited variation across both time and assets in order to study the effect that this large tax cut had on the returns of AIM stocks, their capital structure, and their payout and investment decisions. I found evidence that asset prices compensate investors for their tax burden, consistent with the theory of Brennan (1970), and therefore with the empirical evidence of Poterba and Summers (1984) and Sialm (2009). My analysis also uncovered the existence of tax clienteles who respond to different tax rates, consistent with the ideas of Miller and Modigliani (1961).

After the legislation change, I showed that monthly AIM excess stock returns decreased in-line with their effective tax rate in the pre-legislation change period. Furthermore, AIM stocks with the highest and lowest effective tax rates in the pre-legislation period experienced commensurate decreases in their excess stock returns after the tax cut. This result was robust to using a factor model approach and a difference-in-differences specification, which ensures that the results do not hinge on the choice of control group.

I also showed that AIM companies responded to the tax rate faced by their retail investors by issuing more equity and debt, increasing their dividend payments, and increasing their capital stock and labour expenditure, in-line with the "traditional view" of corporate investment (Harberger (1962), Feldstein (1970), Poterba and Summers (1983)). My results

highlighted the importance of the specific type of tax cut under consideration, as well company characteristics such as maturity, financial constraints, and ownership concentration.

A. Appendix

A.1. How Did the Ownership Structure of AIM Stocks Change?

Recent literature such as Koijen and Yogo (2019), and Koijen et al. (2021) explores the heterogeneity in investor types across different stocks, and the resulting implications on the stock price dynamics. By using the same shareholdings data as these studies, I can investigate how the shareholder composition of AIM stocks changed after the legislation change. This is a particularly useful exercise in this study as the tax cut only directly affected retail and not institutional investors.

FactSet records shareholder ownership and designates each shareholder into an investor group. For UK listed stocks, the main source of this data is the UK shareholder register (UKSR). FactSet only records information on the UKSR if the investor has assets under management (AUM) over £20 million and if the investor is not registered offshore. Additionally, FactSet also collects data from the Regulatory News Service (RNS), and it calculates the sum of funds held across its database to fill in any gaps if they exist. Figure A.1 displays the ownership share of AIM stocks before and after the legislation change at a quarterly horizon. I group investors into short horizon investors, long horizon investors, stakeholders, retail focused institutions, and residual ownership investors.[34] The residual ownership therefore includes retail investors, institutions with less than £20 million under management, and institutions registered offshore. Koijen and Yogo (2019), who use US data which has a lower

[34] Short horizon investors includes hedge funds, bank investment divisions, brokers, fund of hedge funds, market makers, real estate hedge funds, stock borrowers, and venture capitalists. Long horizon investors includes pension funds, insurance companies, endowments, sovereign wealth funds, and research firms. Stakeholders includes mostly the founders and early investors of a company. Retail focused institutions includes mutual funds, family offices, investment advisors, private banking, and fund of funds.

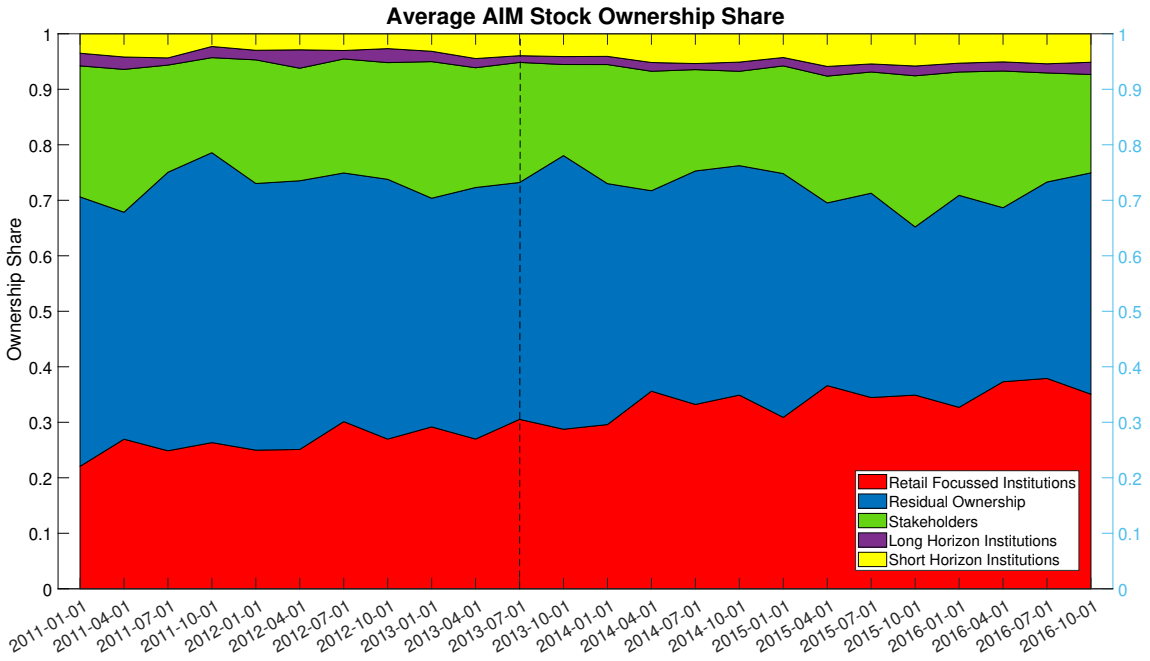

Figure A.1: This figure displays the ownership share of the AIM stock sample broken down into short horizon institutions, long horizon institutions, stakeholders, retail focused institutions, and the residual ownership share which includes retail investors.

recording threshold of $10 million AUM, refer to the residual group as the household sector.

Two main observations can be made from Figure A.1. Firstly, in the quarter immediately after the tax cut, the residual ownership of AIM stocks, which is likely to comprise mostly of retail investors, increased by 6.62 percentage points. The equivalent reduction in ownership came mostly from stakeholders (includes founders and early investors) who reduced their ownership by 5.21 percentage points. This suggests that in the first quarter after the tax cut, retail investors bought up AIM stocks, and stakeholders (founders and early investors) sold them. This is consistent with the idea of tax clienteles and investors responding to tax incentives.

The second observation is that after the initial quarter, retail focused institutions substantially increased their ownership of AIM stocks. Comparing the ownership before and after the legislation change, retail focused institutions increased their ownership by 7.23

percentage points.[35] Interestingly, this increase in ownership came at the expense of the residual ownership which decreased by 7.75 percentage points over the sample. One possible explanation for this is that retail investors moved their stock ownership into the control of investment managers, or institutions which specialise in ISA account management.[36]

A.2. ETF Fund Flows

While there is no ETF which exclusively invests in AIM stocks, the iShares MSCI UK Small Cap UCITS ETF is one of, if not the most popular ETF in which investors are able to get exposure to small-cap UK equities.[37] The ETF invests primarily in UK stocks across both the main market LSE and the AIM. Using data from the Global Funds Database at Refinitiv Eikon, Figure A.2 plots the following statistics: fund flows into the iShares MSCI UK Small Cap UCITS, the total value of the ETF, the number of AIM companies included in the ETF (out of approximately 200 companies in total), and finally the relative value of all AIM holdings in the ETF. The figures show that compared to before the legislation change, there was an increase in fund flows into the ETF, a permanent increase in the ETF value, an increase in the number of AIM companies included in the ETF, and an initial increase in the value of AIM holdings in the ETF, followed by an eventual decrease.

A.3. High Frequency Price Reactions on Announcement and Legislation Change Day

This section plots the five minute interval high frequency price data for the FTSE AIM All-Share Index on both the announcement day, and the legislation change day. In Figure A.3 we see that the AIM index jumped up both on the announcement and on the legislation change

[35] The FactSet data sample begins in the first quarter of 2011 and ends in the last quarter of 2016.

[36] It is noteworthy that the ownership of short and long term investors did not substantially change after the tax cut.

[37] On the performance of pooled investments, Sialm and Zhang (2020) find that the performance of US mutual funds is related to their tax burdens.

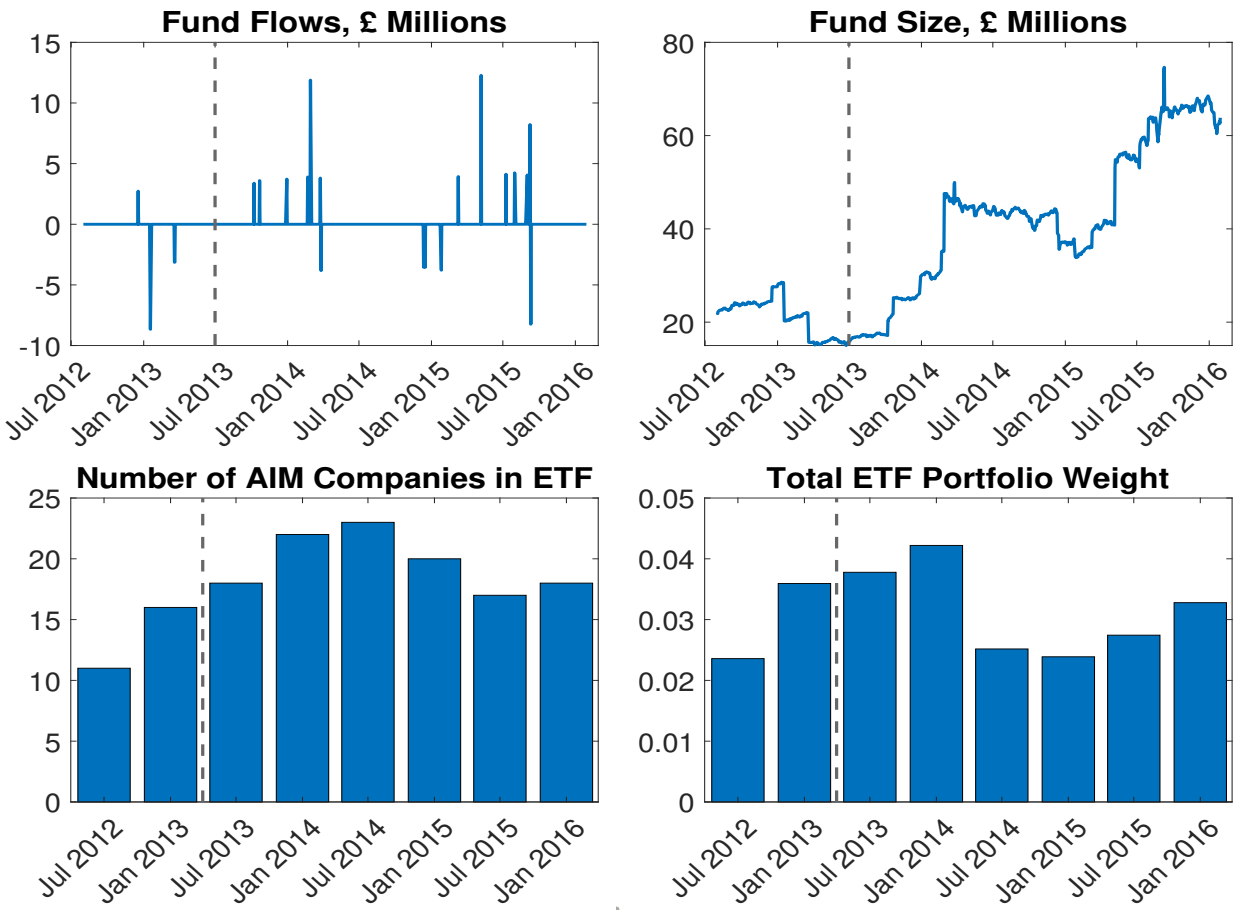

Figure A.2: The top left figure plots fund flows in millions of pounds sterling, the top right figure plots the total value of the ETF, the bottom left figure plots the number of AIM companies included in the ETF, and the bottom right figure plots the total value of AIM stock holding included in the ETF.

day, which supports the hypothesis that the instantaneous stock price was cheaper after the tax cut, and therefore investors bought AIM stock until their price reflected their new lower required rate of return.

Table A.1

This table displays the treated×post coefficient estimates for the monthly difference-in-differences regressions, Equation 4, using various specifications which all include a company and a month-sector interaction fixed effect. In Panel A, all controls refers to the inclusion of the five Fama-French factors, momentum, and liquidity, all interacted with a post and treated dummy variable. Stock level proxies for public information and liquidity are also included as controls. In Panel B, all controls except the momentum factor are included, and in Panel C only the market factor is included. Standard errors are in parentheses below coefficient estimates, and are double-clustered at the firm and month level in comparison to the main text table which was clustered at the firm level. The null hypothesis value for β assuming tax capitalization is stated above the corresponding column. Column (1) uses the matched FTSE sample as a control group, and column (2) uses the unmatched FTSE control group. Compared to column (2), column (3) uses only AIM stocks in the highest effective tax rate quartile from the pre-legislation period and column (4) uses the lowest quartile. Stars denote whether coefficient estimates reject their H_0 values at the following confidence intervals: *** p < 0.01, ** p < 0.05 , * p < 0.1.

	Dependent Variable: Monthly Return			
	$H_0: \beta = -0.9\%$		$H_0: \beta = -1.9\%$	$H_0: \beta = -0.03\%$
Panel A: All Controls	(1)	(2)	(3)	(4)
Treated × Post	-0.011	-0.009	-0.021	-0.002
	(0.004)	(0.004)	(0.008)	(0.007)
Observations	23,364	85,975	77,872	77,120
Adj R-squared	0.19	0.28	0.30	0.30
Panel B: All ex. Momentum	(1)	(2)	(3)	(4)
Treated × Post	-0.014	-0.010	-0.020	-0.005
	(0.004)	(0.004)	(0.008)	(0.008)
Observations	23,364	85,975	77,872	77,120
Adj R-squared	0.19	0.28	0.30	0.30
Panel C: Market Factor Only	(1)	(2)	(3)	(4)
Treated × Post	-0.015*	-0.009	-0.018	-0.001
	(0.003)	(0.004)	(0.006)	(0.007)
Observations	32,649	131,309	119,988	118,919
Adj R-squared	0.18	0.28	0.30	0.31

Table A.2

This table displays the treated×post coefficient estimates for the difference-in-differences regression for treated AIM companies against the matched FTSE control group, before and after the legislation change, using the following dependent variables: yearly total market capitalization price to pre-reform (2012) book values, monthly log turnover, log volume, and log number of analysts following a company. Fixed Effects refers to the inclusion of company, year (or month), sector, and a year (or month) ×sector interaction fixed effect. The sample begins in 2007 and ends in 2018. Standard errors are in parentheses below coefficient estimates, and are clustered at the firm level. Column (1) is the market to pre-reform book value for the full AIM sample, column (2) is for the AIM companies with the highest pre-reform effective tax rates, column (3) for AIM companies with the lowest pre-reform effective tax rate. Column (4) looks at log turnover, column (5) log volume, and column (6) the log of the number of analysts following a company. Stars denote whether sample averages are statistically different at the following confidence intervals: *** p < 0.01, ** p < 0.05 , * p < 0.1.

	Dependent Variable					
	Market to Book Price			Log Turnover	Log Volume	Log Analysts
	(1)	(2)	(3)	(4)	(5)	(6)
Treated × Post	2.405***	4.065***	-0.275	0.637***	0.594***	0.433***
	(0.715)	(1.399)	(0.563)	(0.230)	(0.138)	(0.098)
Observations	2,774	1,803	1,732	29,328	32,746	28,821
Adj R-squared	0.65	0.64	0.59	0.52	0.67	0.61

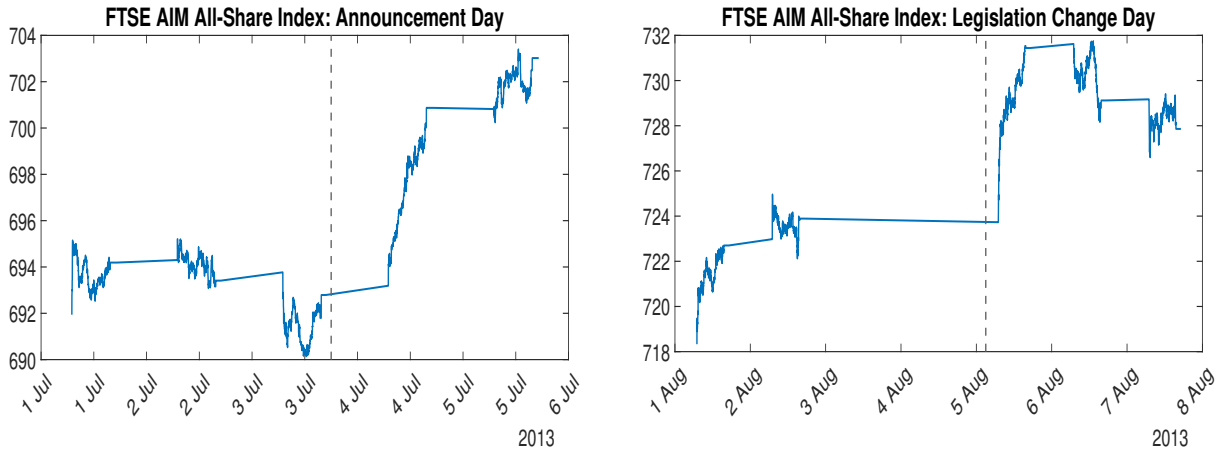

Figure A.3: The left panel plots the intra-day price of the FTSE AIM All-Share Index after the announcement, and the right panel plots the intra-day price on the day of the legislation change.

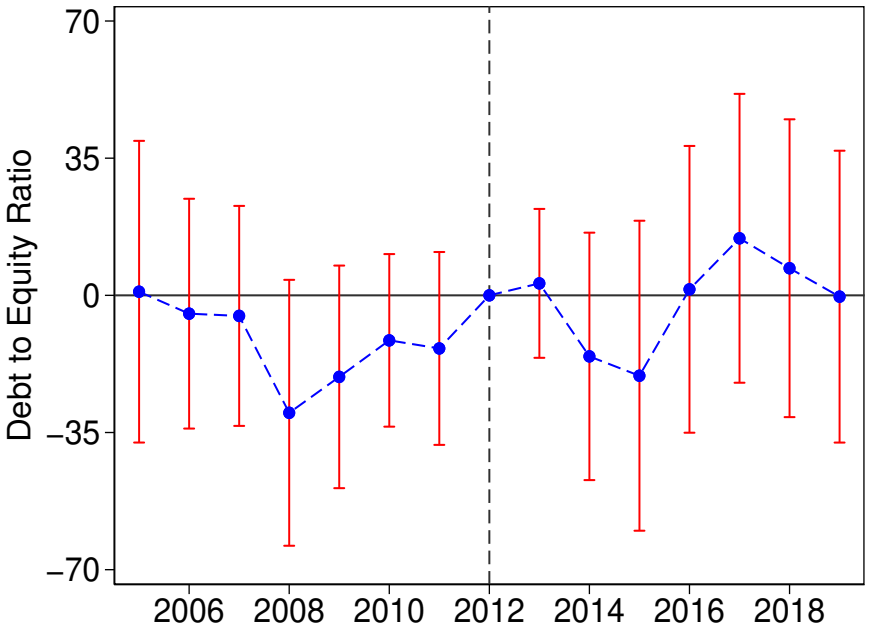

Figure A.4: This figure plots the coefficient estimates of the debt relative to contemporaneous equity dynamic difference-in-differences regression. The baseline year is 2012, the year before the announcement. Standard errors are clustered at the firm level. Firm fixed effects and a sector × year interaction are included in the regression.

Table A.3

This table displays summary statistics for the variables used as dependent variables in the analysis from Section 3.5 onwards. The summary statistics are estimated using pre-legislation change data. The top panel contains statistics for the treated AIM companies, and the bottom panel for the matched FTSE control group. The statistics displayed are the 10th percentile, median, 90th percentile, mean, and standard deviation. Pre-reform refers to the year before the tax cut, 2012.

Pre Tax Cut

	Variable	10th Per.	Median	90th Per.	Mean	Sta. Dev.
Treated	Log Dividends	6.21	7.97	9.43	7.90	1.29
	Dividend Dummy	0	0	1	0.37	0.48
	Dividends / Pre-Reform Assets	0	0	0.03	0.01	0.03
	Buybacks / Pre-Reform Assets	0	0	0	0	0.01
	Log Shares Outstanding	9.62	11.49	12.94	11.42	1.18
	Paid-in Equity / Pre-Reform Assets	0.02	0.16	0.79	0.36	0.65
	Debt / Pre-Reform Assets	0	0.01	0.27	0.09	0.16
	PPE / Pre-Reform Assets	0	0.05	0.51	0.18	0.31
	CAPEX / Pre-Reform PPE	0	0.13	0.74	0.52	1.86
	Pay / Pre-Reform Revenue	0.02	0.11	0.36	0.21	0.37
	Pay / Pre-Reform Assets	0	0.05	0.24	0.09	0.10
	Employees / Pre-Reform Revenue	0	0	0.01	0.01	0.01
	Cash / Pre-Reform Assets	0	0.07	0.26	0.11	0.12
Control	Log Dividends	7.50	8.93	10.15	8.86	1.09
	Dividend Dummy	0	1	1	0.68	0.47
	Dividends / Pre-Reform Assets	0	0.01	0.06	0.02	0.04
	Buybacks / Pre-Reform Assets	0	0	0.01	0	0.01
	Log Shares Outstanding	10.41	11.78	13.16	11.82	1.09
	Paid-in Equity / Pre-Reform Assets	0.02	0.14	0.58	0.30	0.52
	Debt / Pre-Reform Assets	0	0.13	0.51	0.21	0.27
	PPE / Pre-Reform Assets	0.01	0.10	0.62	0.25	0.33
	CAPEX / Pre-Reform PPE	0.05	0.19	0.64	0.49	1.73
	Pay / Pre-Reform Revenue	0.05	0.21	0.50	0.28	0.32
	Pay / Pre-Reform Assets	0.01	0.19	0.51	0.24	0.23
	Employees / Pre-Reform Revenue	0	0.01	0.01	0.01	0.01
	Cash / Pre-Reform Assets	0	0.06	0.51	0.23	0.49

Table A.4

This table displays summary statistics for the variables used as dependent variables in the analysis from Section 3.5 onwards. The summary statistics are estimated using post-legislation change data. The top panel contains statistics for the treated AIM companies, and the bottom panel for the matched FTSE control group. The statistics displayed are the 10th percentile, median, 90th percentile, mean, and standard deviation. Pre-reform refers to the year before the tax cut, 2012.

Post Tax Cut

	Variable	10th Per.	Median	90th Per.	Mean	Sta. Dev.
Treated	Log Dividends	7.54	9.02	10.28	8.94	1.08
	Dividend Dummy	0	0	1	0.46	0.50
	Dividends / Pre-Reform Assets	0	0	0.14	0.04	0.07
	Buybacks / Pre-Reform Assets	0	0	0.01	0	0.01
	Log Shares Outstanding	10.38	12.04	13.73	11.99	1.22
	Paid-in Equity / Pre-Reform Assets	0.05	0.50	3.35	1.10	1.50
	Debt / Pre-Reform Assets	0	0.15	1.26	0.38	0.54
	PPE / Pre-Reform Assets	0.01	0.25	1.61	0.54	0.66
	CAPEX / Pre-Reform PPE	0.03	0.29	3.39	1.72	4.18
	Pay / Pre-Reform Revenue	0.09	0.44	1.77	0.69	0.75
	Pay / Pre-Reform Assets	0.02	0.21	0.85	0.32	0.35
	Employees / Pre-Reform Revenue	0	0.01	0.04	0.01	0.01
	Cash / Pre-Reform Assets	0.02	0.16	0.81	0.34	0.51
Control	Log Dividends	8.06	9.46	10.63	9.37	1.09
	Dividends Dummy	0	1	1	0.74	0.44
	Dividend / Pre-Reform Assets	0	0.02	0.12	0.05	0.07
	Buybacks / Pre-Reform Assets	0	0	0.02	0.01	0.01
	Log Shares Outstanding	10.73	11.93	13.35	12.04	1.05
	Paid-in Equity / Pre-Reform Assets	0.03	0.22	0.93	0.38	0.54
	Debt / Pre-Reform Assets	0	0.19	0.71	0.30	0.37
	PPE / Pre-Reform Assets	0.01	0.18	0.81	0.35	0.47
	CAPEX / Pre-Reform PPE	0.04	0.21	0.84	0.50	1.31
	Pay / Pre-Reform Revenue	0.07	0.29	0.64	0.35	0.34
	Pay / Pre-Reform Assets	0.01	0.28	0.82	0.34	0.32
	Employees / Pre-Reform Revenue	0	0.01	0.01	0.01	0.01
	Cash / Pre-Reform Assets	0.01	0.07	0.54	0.22	0.42

Table A.5

This table displays the treated×post coefficient estimates for the financial decision's regression, Equation 6, which compares paid-in equity, debt, capital, or property, plant, and equipment (PPE), capital expenditure, total pay to all employees and officers, the total number of employees, and cash. All dependent variables are logged and all specifications include a company and a month-sector interaction fixed effect. The sample period is between 2005 and 2022. The pre-treated mean is estimated for AIM stocks in the pre-legislation change period, and the elasticity is estimated for both taxes separately with the treated×post coefficient estimate used for $\%\Delta y$ given that the dependent variable is logged. Standard errors are in parentheses below coefficient estimates, and are clustered at the firm level. Stars denote whether sample averages are statistically different from zero at the following confidence intervals: *** p < 0.01, ** p < 0.05 , * p < 0.1.

	Dependent Variable						
	Log Paid-In Equity	Log Debt	Log PPE	Log Capex	Log Pay	Log Employees	Log Cash
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treated × Post	0.475**	0.688***	1.131***	1.082***	0.952***	0.799***	0.668***
	(0.185)	(0.243)	(0.241)	(0.221)	(0.158)	(0.154)	(0.207)
Additional Controls	No	No	No	No	No	No	No
Pre-Treated Mean	10.25	9.31	8.96	7.66	8.89	5.23	9.12
Impl. Elasticity $1-\tau_d$	0.64	0.93	1.53	1.46	1.29	1.08	0.90
Impl. Elasticity $1-\tau_g$	1.22	1.77	2.91	2.78	2.45	2.05	1.72
Observations	2,553	2,128	2,618	2,588	2,437	2,394	2,407
Adj R-squared	0.78	0.68	0.79	0.70	0.87	0.89	0.61

Table A.6

This table displays the treated×post coefficient estimates for the financial decision's regression, Equation 6, which compares paid-in equity, debt, capital, or property, plant, and equipment (PPE), capital expenditure, total pay to all employees and officers, the total number of employees, and cash. All dependent variables are logged and all specifications include a company and a month-sector interaction fixed effect. Additional controls refers to the inclusion of the pre-reform (2012) value of the following variables interacted with year fixed effects: company profits, company size, book-to-market ratio, value of assets, and value of cash holdings. The sample period is between 2005 and 2022. The pre-treated mean is estimated for AIM stocks in the pre-legislation change period, and the elasticity is estimated for both taxes separately with the treated×post coefficient estimate used for $\%\Delta y$ given that the dependent variable is logged. Standard errors are in parentheses below coefficient estimates, and are clustered at the firm level. Stars denote whether sample averages are statistically different from zero at the following confidence intervals: *** p < 0.01, ** p < 0.05 , * p < 0.1.

	Dependent Variable						
	Log Paid-In Equity	Log Debt	Log PPE	Log Capex	Log Pay	Log Employees	Log Cash
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treated × Post	0.291**	0.475	0.988***	0.918***	0.652***	0.733***	0.557***
	(0147)	(0.304)	(0.241)	(0.249)	(0.136)	(0.162)	(0.192)
Additional Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pre-Treated Mean	10.25	9.31	8.96	7.66	8.89	5.23	9.12
Impl. Elasticity $1-\tau_d$	0.39	0.64	1.34	1.24	0.88	0.99	0.75
Impl. Elasticity $1-\tau_g$	0.75	1.22	2.54	2.36	1.68	1.88	1.43
Observations	1,763	1,473	1,779	1,761	1,690	1,664	1,692
Adj R-squared	0.78	0.66	0.83	0.76	0.89	0.89	0.63

A.5. Capital Gains, Dividend, and Inheritance Taxes in the United Kingdom: More Information

As of 2021 in the UK, Capital gains tax is due on any profits made during the financial year above the capital gains tax allowance which is £12,600 ($18,900). Investors can also report losses to reduce their total taxable gains. If an investor's total taxable gain is still above the tax-free allowance, they can deduct unused losses from previous tax years. Capital gains tax for stocks (chargeable assets) is 20% (it was 28% from 2010 to 2016) and for residential property it is 28% if taxable income is over £50,000 ($75,000). Tax is paid on anything above the personal allowance.[38] For dividends, no tax is paid on the first £2,000 ($3,000) of dividends and also if total income (including all sources of income that financial year) falls below £12,500 ($18,750). After these allowances, dividends are taxed at 32.5% if earning are above £50,000 ($75,000) and 37.5% if earnings are above £150,000 ($225,000).[39]

Inheritance tax (IHT) of 40% in the UK is applied to the value of all bequeathed assets over the current £325,000 ($487,500) threshold (since 2009). If an agent's main residence is being bequeathed, the nil-rate band increases by £125,000 ($187,500), increasing to £175,000 ($262,500) by 2021.[40] IHT is not liable in the following circumstances: If assets are bequeathed to a spouse or civil partner, if any wealth was gifted seven years before the agents death, if bequeathed wealth includes a life insurance policy or lump-sum pension payout which is under a trust, if all wealth is bequeathed to a charitable organisation. Gifts below £3,000 ($4,500) are allowed each year, IHT free. The estates of military personnel who die in active service do not face IHT. Most AIM shares qualify for "Business Property Relief" (BPR) which makes them exempt from IHT if the investor holds the AIM share for two continuous years. The tax office rule is that AIM shares qualify for BPR if they do not make most of their profits investing in financial assets.

[38] See https://www.gov.uk/tax-sell-shares for further information.
[39] See https://www.gov.uk/tax-on-dividends .
[40] The nil-rate band in the US is up to $5,000,000.

A.6. Did Stocks Switch Exchange During My Period of Study?

Switching between the AIM exchange and the main market LSE is not uncommon. In fact, as shown in Table A.7, it happens nearly every year in both directions. In total, from the entire AIM exchange, 65 companies switched to the main market LSE between 2008 and 2018. Throughout the same period, 56 companies went in the opposite direction. From my AIM 100 sample and the matched FTSE sample, 7 went from the AIM to the main, and 4 went from the main to the AIM.

All switches from my AIM 100 sample to the main LSE occurred after the legislation change. It is therefore possible that the switch was a consequence of the treatment. Hence, in my main analysis in Section 3, I keep the treatment status of companies fixed, which yields an "intention-to-treat" estimate of the treatment effect. As a robustness check, I allow treatment status to change, and I also drop all switching stocks from the analysis. Results remain substantially unchanged.

A.7. Efficiency Implications and Policy Evaluation of the Tax Cut

Permitting AIM stocks to be held in tax-efficient ISAs restored the previous imbalance in tax burdens on retail investors when investing in AIM and FTSE stocks. The imbalance of taxes could have led to an inefficient allocation of capital between AIM and FTSE stocks as investors might have been reluctant to invest in AIM stocks given their potential tax liability. This means that on the margin, capital which should have gone to AIM companies to invest in and help grow the company was not ending up there. Therefore, the legislation might have acted to improve the capital allocation efficiency in UK stock markets. In a more practical sense, the marginal positive net present value investment by a company might now go ahead if for example, future capital issues are able to reach capital targets more easily.

With regards to the efficiency improvement after the dividend tax reduction, if AIM companies were hoarding earnings and not paying them out as dividends because of the

dividend tax, it is possible that the retained earnings were not being used efficiently. Therefore, given that we observed an increase in dividend payments, this might suggest that the dividend tax cut increased the efficiency of capital allocation between companies and investors. As share repurchases also increased, it is not the case that dividend payments simply replaced share repurchases, which provides further evidence that there was an increase in the capital allocation efficiency after the tax cut.

Evaluating the policy would require a comparison between the direct loss in tax revenue after allowing AIM stocks to be held in ISAs, and the potential benefits a tax cut might have on the UK economy. The benefits of the tax cut may be an increase in investment and growth by AIM companies if they have more access to capital, which may result in higher UK economic growth, which in turn leads to higher tax receipts. Capital gains tax revenue in the UK in 2013 was around £4 billion, out of a total of £567.15 billion (OECD). Capital gains tax revenue came 77% from financial assets, of which 66% is categorized as "listed UK and foreign shares" which includes London Stock Exchange stocks (UK Government). From AIM and FTSE market capitalization's in 2013, if AIM represents around 5% of the total, I estimate that £101.64 million was collected in capital gains tax on AIM stocks, which is 0.01792% of total UK tax revenue. UK GDP in 2013 was £1.782 trillion, and therefore, in order for the tax cut policy to pay for itself, UK GDP would need to increase by 0.0057% as a consequence of the tax cut, or in monetary terms, provide at least £101.64 million in growth.

Table A.7

This table displays the number of companies which switched between the AIM stock exchange and the main market London Stock Exchange. Numbers are provided for all companies on each exchange, and also for my AIM sample and the matched FTSE sample. In total, 65 (56) companies switched from the AIM (Main) to the Main (AIM). In my sample, 7 (4) companies switched from the AIM (Main) to the Main (AIM).

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Full Exchange	AIM to Main	11	9	9	9	3	0	4	6	6	4	4
	Main to AIM	10	3	7	6	4	8	8	5	1	3	1
My Sample	AIM to Main	0	0	0	0	0	0	1	3	2	1	0
	Main to AIM	0	0	0	2	0	0	0	1	0	0	1

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