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The big bang: Stock market capitalization in the long run☆

Dmitry Kuvshinov[a,*], Kaspar Zimmermann[b]

[a] Department of Economics and Business, Universitat Pompeu Fabra, Barcelona School of Economics, and CEPR, Spain
[b] Leibniz Institute for Financial Research SAFE, Germany

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ABSTRACT

We study trends and drivers of long-run stock market growth in 17 advanced economies. Between 1870 and the 1980s, stock market capitalization grew in line with GDP. But over subsequent decades, an unprecedented expansion saw market cap to GDP ratios triple and remain persistently high. While most historical stock market growth was driven by issuances, this recent expansion was fueled by rising equity prices. We show that the key driver of this structural break was a profit shift towards listed firms, with listed firm profit shares in both GDP and capital income doubling to reach their highest levels in 146 years.

1. Introduction

The past three decades have seen several pronounced changes in the US corporate sector and the broader macroeconomy. While stock prices, market capitalization, and corporate profits have all increased markedly, the labor share of income and the rate of economic growth have declined (Barkai, 2020; Greenwald et al., 2021; Karabarbounis and Neiman, 2013). Without long-run cross-country data, however, one cannot tell whether these developments are a recent country-specific phenomenon, or are part of a broader secular trend. After all, Rajan and Zingales (2003) have shown that stock market cycles can be very long, with the 1990s increases in market capitalization being a reversal to the previously high levels of the early 1900s. Similarly, the recent labor share declines may be specific to the US (Gutiérrez and Piton, 2020), and increases in corporate profitability may represent mean reversals following profit declines of the 1960s and 1970s (Barkai and Benzell, 2018; Feldstein and Summers, 1977; Nordhaus, 1974).

This paper studies long-run trends in listed firms' market capitalization and their drivers. The unique advantage of focusing on listed companies is that we can obtain the

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* Corresponding author.
E-mail addresses: dmitry.kuvshinov@upf.edu (D. Kuvshinov), zimmermann@safe-frankfurt.de (K. Zimmermann).

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high-quality data necessary for analyzing corporate sector developments over very long time periods in many countries. For this purpose, we introduce a new integrated database covering stock market capitalization, equity issuance, stock prices, and listed firms' dividends and earnings in 17 advanced economies from 1870 to 2016.[1] These series were constructed from a wide range of primary and secondary historical sources, with many of these previously unused or newly assembled using hand-collected archival data. Together with the extensive documentation in the online Data Appendix, they provide a new resource for researchers to study the development of the stock market, corporate profitability, and equity finance throughout the last century and a half. The detail of our data also allows us to not only document the trends, but also to perform a detailed accounting decomposition of the drivers of long-run stock market growth.

We find that between 1870 and the 1980s, advanced economy stock market capitalization grew in line with GDP, averaging to around one-third of output. Throughout this period, long-run stock market growth was driven by equity issuances while real capital gains were on average zero. After the 1980s, a sharp structural break took place with market cap to GDP ratios across advanced economies tripling and remaining persistently high. In contrast to the historical period, this recent growth acceleration was driven by rising stock prices while issuances actually slowed. The key driver behind these stock price increases was a profit shift away from other parts of the economy towards listed corporations, with listed firm profit growth far outstripping that in GDP and capital income. Our findings show that the post-1980s increases in US corporate profits and market capitalization are part of an unprecedented global expansion, which goes above and beyond the well-documented increases in advanced economy capital shares.

Our findings speak to three pertinent issues in financial economics. The first of these concerns the long-run evolution of stock market size. Efforts to document the size of the listed equity market date back to at least to the 19th century, first conducted through surveys commissioned by wealthy financiers (Burdett, 1882; Green, 1887) and later through increasingly systematic efforts to map out the trends in different components of household wealth (Hoffmann, 1965; Roe, 1971; Goldsmith, 1985). The received wisdom is that both the stock market (Rajan and Zingales, 2003) and total wealth (Piketty and Zucman, 2014) were large in the early and late 20th century, and depressed in-between. We show that this is indeed the case, but the historical and the current stock market expansion are more different than they are alike, with the recent expansion being larger, more persistent, and driven by different forces.

The second issue concerns the drivers of long-run stock market growth. Two literatures have addressed this question from different angles with the first focusing on the role of institutions and norms in facilitating household savings and market entry (La Porta et al., 1997; Piketty and Zucman, 2014; Rajan and Zingales, 2003), and the second focusing on growth in profits and stock prices through increases in mark-ups (Corhay et al., 2020; De Loecker et al., 2020), declines in taxes (McGrattan and Prescott, 2005), and falls in the labor share (Greenwald et al., 2021). We show that the degree to which each of these views is applicable depends very much on context and the historical period studied. While norms, institutions, and issuances are likely to have been key throughout history, the recent period is very unusual in that most of the stock market growth was driven by rising equity prices, fueled by high listed firm profits which reflected a redistribution of income within capital.

The third issue relates to the scope and scale of the observed trends. Prior studies document a number of secular trends for US corporations with some debate on their pervasiveness across countries and economic sectors: increases in corporate profits and concentration (Barkai, 2020; Philippon, 2019; De Loecker et al., 2020), falls in corporate issuance (or rising corporate savings; Gao et al., 2013; Doidge et al., 2013; Armenter and Hnatkovska, 2017; Chen et al., 2017), and a rise and fall of the value added share of corporations (Jensen, 1989; Saez and Zucman, 2020; Smith et al., 2019). We show that the scope of the trends in both capitalization and listed profits is very broad, spanning the major advanced economies and economic sectors, and that their scale is historically unprecedented. The slowdown in corporate net equity issuance also extends beyond the US economy. That being said, the post-1980s trends do show some differences between countries with, for example, high equity issuances in Portugal, modest capitalization growth in the UK and Italy, and relatively strong stock market growth in Sweden and Switzerland. But the US is by no means an outlier, ranking around the middle of advanced economies in terms of the magnitudes of the decline in issuances and increases in profits and capitalization.

Our detailed analysis starts by documenting long-run cross-country trends in stock market wealth. The first century of our data saw several pronounced cycles, with the median market cap to GDP ratio doubling between the early 1890s and 1910, falling back to its 1880s levels after World War I, increasing again in the 1950s and falling to near-historical lows after the 1970s stagflation. But all these cycles were largely mean-reverting: median stock market capitalization always eventually returned to its long-run level of around one-third of GDP, and the cross-country interquartile range stayed between 0.1 and 0.6 of GDP.

Over the last several decades, an unprecedented expansion saw the cross-country median market cap to GDP ratio increase from 0.2 in 1980 to 1 in 2000. Moreover, this surge in stock market wealth seems to have been persistent. Despite sharp equity price corrections in the early 2000s and 2008–2009, market cap to GDP ratios today remain around three times larger than the historical norm. These "big bang" increases in market capitalization took place in all 17 countries, and in each country bar one (Belgium), they represented the largest structural break in the

[1] The market capitalization and issuance data are newly assembled, and the stock price and dividend data are updated versions of those in Jordà et al. (2019). Earnings data only cover the recent decades, whereas all other series cover a long-run cross-section of countries.

market cap to GDP ratio during the entire 146-year historical time period examined here. The observed long-run trends also underscore a rise in the global importance of the US equity market at the expense of the UK and France: while all three countries enjoyed roughly equal global market shares in the early 1900s, by the 1960s the US stock market accounted for close to 70% of the total 17-country capitalization.

Market capitalization growth can be driven by either quantities (i.e., equity issuances) or prices. We find that throughout the majority of the historical period, long-run capitalization growth was primarily quantity driven. Before 1985, real market capitalization grew by about 4% per year with the lion share of this growth accounted for by net equity issuance. Examining its drivers, we find that net issuance was higher when new markets were being established, and when the cost of equity was low relative to the cost of debt. While stock prices were volatile both over the short and medium run, before 1985 these cyclical fluctuations averaged out to around zero.

In contrast to these historical episodes, the post-1980s acceleration in stock market growth was accompanied by a slowdown in net equity issuance, which was more than compensated for by sharp increases in real capital gains. We run two counterfactual exercises, which confirm the importance of stock prices in driving the post-1985 increases in market capitalization. If we ignore the post-1985 changes in issuances by setting issuance levels to their pre-1985 average, the counterfactual evolution of stock market cap closely follows actual data up to 2000 and results in even larger capitalization increases afterwards. If we ignore the changes in prices by setting post-1985 capital gains to their historical average of around zero, the market cap to GDP ratio actually declines due to slowing issuance. In the cross-section, countries with the highest post-1985 capital gains also recorded the largest market capitalization increases during this time period.

But the fact that net issuance slowed and capital gains increased does not mean that all these capital gains accrued to firms already listed in the 1980s. On the contrary, we show that the slowdown in net issuance hides large gross movements between old and new listings, with the newly listed firm share generally increasing after 1980. Over the very long run, new listings follow a U-shaped pattern with large new listing waves in the early 1900s, very few new listings in the mid 20th century, and a revival of new listings, especially in previously tightly regulated economies, during the 1980s and 1990s. This lends support to the Rajan and Zingales' (2003) "great reversals" theory that links the mid-20th century stagnation in financial development to an increasing dominance of market incumbents at the expense of new firms.

To map out the deeper underlying drivers of the post-1980s increases in stock prices and capitalization, we use the dynamic Gordon growth model to decompose the market cap to GDP ratio into three components: the current ratio of listed firms' dividends to GDP (the *profit share* channel), *future growth* of dividends or earnings, and the rate at which these future cashflows to shareholders are discounted (the *discount rate* channel). Starting with the growth channel, we find that high market capitalization does not predict high future dividend growth at cyclical frequency. Combined with recent evidence of slowing long-run GDP growth and productivity in the US and globally (Fernald, 2015; Goldin et al., 2021), this suggests that high growth expectations are unlikely to be driving the increases in market cap.

We also show that movements in discount rates can only explain a small share of the observed capitalization increases. Even though safe interest rates declined markedly during this period, an increase in the equity risk premium meant that the rate at which future equity cashflows are discounted fell by less than one percentage point after the 1980s, accounting for about 10% of the increase in market cap to GDP ratios. This finding is in line with several recent papers that document a stable rate of return on capital and increases in the equity premium, and connect these trends to increases in macroeconomic risk and shortages of safe assets (Caballero et al., 2017; Farhi and Gourio, 2018; Gomme et al., 2015).

This leaves one other potential explanation of the post-1980s increases in market capitalization: an increase in the listed firms' profit share. We find that this channel is key. Between 1870 and the 1980s, dividends paid by listed firms fluctuated around the level of about 1.3% of GDP. The 1990s saw listed firm dividends and earnings double, with these increases continuing into the 2000s. Our counterfactual analysis shows that this channel alone can explain 70% of the post-1980s increases in the market cap to GDP ratio, and combined with the lower discount rate, it can explain almost all of the capitalization increase. Digging into the drivers of this profit shift, we show that it was driven by increases in profit per unit of sales, rather than increases in market shares (sales to gross output). This is in line with Gutiérrez and Philippon (2020), who show that there has not been a significant increase in the domestic and global market shares of dominant firms in recent decades.

We further show that these profit increases go above and beyond the recently documented declines in the labor share and increases in capital income relative to GDP (Karabarbounis and Neiman, 2013). The ratio of listed firms earnings to capital income has more than doubled since 1990, and those countries that experienced the largest capitalization increases during the big bang also recorded larger increases in the earnings-to-capital-income ratio. This means that the listed firm profit boom has, at least partially, come at the expense of other types of capital income.

We find that two key counterparts of the profit shift were declines in interest and tax expenses, which fell sharply after 1980 across advanced economies. The evidence on across-firm income redistribution is more mixed, with the US listed firm profitability increases happening alongside those of other businesses. The importance of lower interest and tax costs in fueling listed firm profit growth helps explain why the post-1980s increases in profits and mark-ups have been accompanied by low levels of consumer price growth and steady or increasing unit labor costs (Syverson, 2019). Overall, this evidence suggests that within-capital-income shifts play an important role in shaping the distribution of wealth, and that interest rates can affect wealth not only directly through the discount rate, but also indirectly by changing corporate cashflows.

The rest of this paper is organized as follows. Section 2 describes the data, Section 3 describes the trends in market capitalization, Section 4 breaks down these trends into changes in prices and quantities, and Section 5 studies the underlying drivers of the post-1980s global stock market expansion.

2. A new cross-country stock market database

This paper introduces a new long-run dataset on stock market size and its drivers. The central feature of these data is a new annual series of stock market capitalization covering 17 countries from 1870 to 2016. The countries included are Australia, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States. These are complemented by statistics on sources of market capitalization growth—issuances and capital gains—and the corresponding corporate fundamentals in the form of listed firm profits and dividends. Together, these data offer a new integrated assessment of stock market development and its underlying drivers over the long run.

Our market capitalization data measure the total market value of all ordinary shares of domestic companies listed on domestic exchanges at the end of each calendar year. We use a wide range of primary and secondary data sources to construct these series, many of these new and previously unused. The secondary sources consist of financial history books and research articles, as well as various publications by stock exchanges, statistical agencies, central banks, and trade bodies. Where reliable secondary sources are not available, we construct the capitalization measure by aggregating the total market values of individual stocks, using data on stock prices and number of shares or listed capital value from stock exchange bulletins and gazettes, stock exchange handbooks, and companies' published accounts. Most of these primary source data were newly compiled through a series of archival visits to the respective countries' stock exchanges, central banks, and national libraries, while some were also helpfully shared with us by other researchers. We generally produce annual estimates of capitalization, but for instances where these were not available, we obtained capitalization data for benchmark years and constructed the annual series using changes in the book capital of listed companies and share prices. In the Data Appendix, Tables E.1– E.17 and Figs. E.1– E.17 list the sources used for each country and show a comparison of our estimates to those in previous studies.

Existing literature identifies four main challenges for deriving stock market capitalization estimates that are consistent across countries and over time. The first challenge is that the capitalization series should only cover ordinary shares and exclude other securities listed on the stock exchange, such as preference shares and bonds (Hannah, 2018, discusses these issues for the early London Stock Exchange data). We therefore ensure that our estimates capture ordinary shares only, by constructing our own benchmark year estimates where necessary, and by using supplementary stock exchange data and research publications to make this distinction.

The second challenge is that the capitalization measure should sum the value of all shares listed on every stock exchange within a country, net of any cross listings. Wherever possible, we therefore rely on data that cover all the major stock exchanges in the country, constructing our own estimates from microdata when necessary, as in the case of the pre World War I German stock market cap (see Data Appendix Table E.7). It is, however, not always possible to obtain information on the capitalization of smaller stock exchanges, especially one that goes beyond benchmark years. For most countries in our sample, the bias from excluding smaller exchanges is small because by the late 19th century, stock markets in many countries were already quite centralised, and many securities that were chiefly traded on smaller markets were often also quoted on the main stock exchange. These issues are most important for the early US data, where several large regional exchanges and an active curb exchange were in operation (Sylla, 2006). For the US and several other countries we, therefore, rely on benchmark year estimates to proxy the size of regional and curb exchanges relative to the main market.

The third challenge relates to excluding foreign stocks. For most of our estimates, the foreign stock share is either well measured (e.g., in recent data) or small (as for most of the mid-20th century data), so the measurement issues mainly concern the large international stock exchanges in the early 20th century, in particular the London Stock Exchange. We use secondary sources to adjust the equity market capitalization for foreign stocks whenever necessary, so the remaining biases should be small, with the most likely direction leading us to slightly overstate the domestic stock market capitalization in the financial center countries during the early 20th century. In Appendix D.1, we discuss the data issues associated with foreign listings in more detail.

The final challenge relates to the definition of a listing. On the one hand, as highlighted by Rydqvist and Guo (2020) many shares that were listed on the smaller stock exchanges were traded rather infrequently in the late 19th and early 20th century. On the other hand, some shares that were actively traded were traded in semi-official markets, such as the New York Curb Exchange. To be consistent across countries and time, we generally stick to the standard definition of the listing as being quoted on one of the stock exchanges in the country (i.e., being part of the stock listing) regardless of whether the stock is traded often or not. The one exception we make is the New York Curb Exchange, where trading was conducted informally on the street before increasing formalization of trading activities beginning in the 1920s (Garvy, 1944). Here we follow the typical approach of US financial historians (Sylla, 2006; O'Sullivan, 2007) and include the Curb Exchange in our capitalization totals. Excluding the Curb Exchange would reduce our US market capitalization estimates by around one-fifth for the pre-1920 period, based on data shared with us by Prof. Leslie Hannah, and trading volume statistics in O'Sullivan (2007).

In addition to the market capitalization series, we construct estimates of, first, net equity issuance and capital gains, which allow us to decompose market cap movements into prices and quantities; second, the market value of new listings, which allows us to proxy the market share of newly listed firms; and third, listed firm profits and dividends, which allow us to assess whether changes in market capitalization are driven by corporate fundamentals or discount rates.

Net equity issuance measures the market value of all new listings and secondary issues net of delistings and redemptions. These series are constructed from similar sources to our market capitalization data, with most of the estimates coming from hand-collected microdata, complemented by estimates of financial historians, statistical agencies, and central banks, and international flow of funds data constructed by Richter and Diebold (2021). The main challenges when constructing the net issuance series lie in including all types of issuance, listings and delistings, and accounting for their market value. To this end, we seek to construct much of these series ourselves from microdata, but in some cases—as for example with some of the mid-20th century data for Germany—we combined data on the book value of issuance with estimates of the listed equity market-to-book ratio. Finally, we complement our net issuance data with an implied issuance estimate computed as the difference between market capitalization growth and the growth in the value-weighted equity price index (see Section 4 for more details). This proxy has the advantage that it should theoretically include all types of issuance, redemptions, and delistings valued at market prices, but the disadvantage is that it is constructed as a residual and hence subject to larger measurement error.

The capital gains series are an updated version of the dataset in Jordà et al. (2019) extended to cover Canada and with the sources for all countries chosen to maximize consistency in coverage and timing with the market cap data, thus reducing the aforementioned measurement error in the implied issuance series. The series on the market value of new listings aim to capture the total end-year market value of all IPOs and direct listings during the calendar year. To construct these, we primarily rely on microdata, complemented by statistics on IPOs (for example, those in Chambers and Dimson, 2009; Kunz and Aggarwal, 1994). When we cannot measure the market value of new listings directly, we rely on supplementing and scaling the IPO proceeds and raw issuance data. The new listings series are available for five countries, with sources and estimation methods described in Data Appendix C.

Our data on the profits and dividends of listed firms allow us to link movements in market capitalization to changes in the underlying firm fundamentals. We compute a long-run series of dividends paid by listed firms as the market capitalization times the dividend-price ratio from Jordà et al. (2019), with an additional new series for Canada. Since variation in payout ratios and means of compensating shareholders makes dividends an imperfect measure of total cashflows to shareholders (Grullon and Michaely, 2002), we complement these dividend data with estimates of listed company earnings obtained from Compustat Global and Compustat North America. The coverage of Compustat firms broadly matches that of our data, but for some of the early observations in the late 1980s and early 1990s, we drop country-years with insufficient data (less than 30% of total market cap) and scale the other observations by the ratio of Compustat capitalization to our aggregate capitalization estimates.

The Data Appendix contains a detailed description of the sources for each of the three main new series—market capitalization, net issuance, and market value of new listings—alongside a discussion of the various quality checks and comparison with existing estimates. In general, our market capitalization data are in line with previous country-specific estimates constructed by financial historians and statisticians. When it comes to the cross-country estimates of Goldsmith (1985), our estimates are typically below his national balance sheet data, because his estimates often include unlisted stocks, preference shares or bonds in the capitalization total, whereas ours focus on listed ordinary shares only. Our estimates are sometimes above and sometimes below those of Rajan and Zingales (2003), depending on the specific country and time period.

Taken together, we examine the largest and most detailed database of stock market capitalization and the sources of its growth to date. These data allow us to study the long-run evolution of stock market size and perform detailed accounting decompositions of its drivers across a broad representative sample covering 17 advanced economies.

3. Long-run trends in market capitalization

3.1. Aggregate and within-country trends

Fig. 1 shows the ratio of stock market capitalization to GDP across the 17 countries in our sample for years 1870 to 2016. The solid blue line is the median, and the shaded area is the interquartile range of country-level data. The first century of our data saw several pronounced cycles, with the median market cap to GDP ratio doubling between the early 1890s and 1910, falling back to its 1880s levels in the aftermath of World War I, increasing again in the 1950s, and falling to near-historical lows in the aftermath of the 1970s stagflation. But all these cycles were largely mean-reverting, with median stock market capitalization always eventually returning to its long-run average level of around one-third of GDP, and the cross-country interquartile range staying between 0.1 and 0.6 of GDP.

As a consequence, from the end of the 19th century and up until the late 1980s, the size of the stock market evolved broadly in line with GDP. Over the subsequent decades however, an unprecedented market expansion took place. The median market cap to GDP ratio increased from 0.2 in 1980 to 1 in 2000, with some countries' stock markets growing to three times the size of their domestic output. Moreover, this surge in stock market cap seems to have been persistent. Despite the sharp equity price corrections in the early 2000s and the Global Financial Crisis of 2008–2009, market cap to GDP ratios today remain around three times larger than the historical norm. We loosely term this post-1980s market expansion

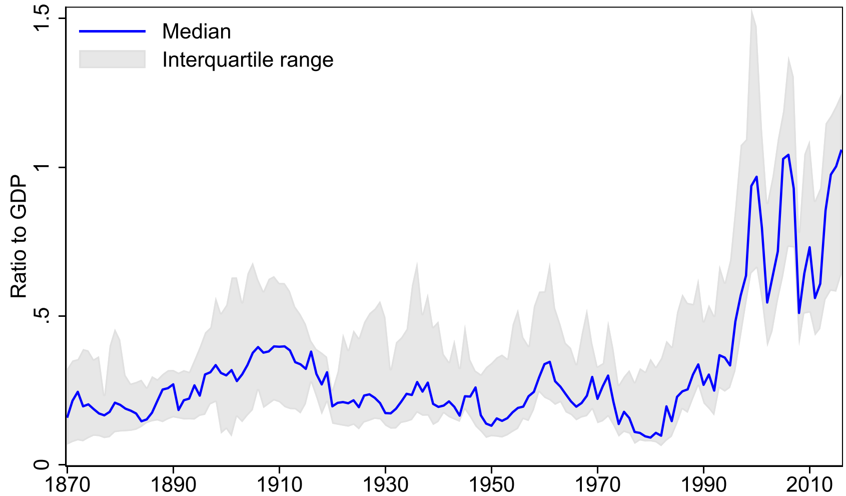

Fig. 1. Stock market capitalization in advanced economies.
Stock market capitalization to GDP ratio, 17 countries. The solid line and the shaded area are, respectively, the median and interquartile range of the individual country capitalization ratios in each year.

as the big bang.[2] The left-hand panel of Appendix Fig. A.1 shows that this time series pattern—a century of variations around a stable mean followed by a sharp and persistent increase—holds regardless of how we aggregate the individual country data, though value-weighted average capitalization levels are higher throughout the sample and display larger cyclical variation than both the median and the unweighted cross-country mean.

Fig. 2 shows that the same time series pattern is evident not only across, but also within individual countries. The solid black lines show the evolution of the market cap to GDP ratio in each country in our sample. In every single one of these countries, the stock market grew rapidly during the 1980s and 1990s and sustained this high level of capitalization thereafter. In almost every country, the capitalization ratios reached during the 1990s and sustained into the 2000s were much higher than any past historical peaks.

What exactly changed as a result of this post-1980s market expansion? How persistent was the observed increase in market capitalization, and how does the variation in market cap during the last three decades compare to the historical peaks and troughs? To help us answer these questions, we first test for structural breaks in each country's market capitalization time series using the Bai and Perron (2003) method. The vertical dashed lines in Fig. 2 show the identified breaks in the mean of the market cap to GDP ratio time series, and the solid horizontal lines show the corresponding period-specific means. The series shown in the thick red lines are restricted to at most one structural break per country, and the series in the thin blue lines do not impose a limit on the number of breaks. When we restrict the time series to having at most one structural break, the recent market capitalization increase is identified as the most important shift in the mean market cap to GDP ratio in all countries bar one (Belgium). When we allow for multiple structural breaks, the structural mean shifts identified for the pre-1980 time period are both much smaller and less persistent, with the historical structural increases typically followed by similarly sized declines.

Without looking ahead into the future, we cannot tell if the post-1980s mean shift is permanent, but it is already larger and more persistent than the other historical market capitalization increases both across and within countries. This does not, however, imply that any given post-1980s market peak is likely to be long-lasting: on the contrary, we have already observed much cyclical mean-reverting variation around this higher mean, with several pronounced cycles, including the dot-com boom and bust in the late 1990s/early 2000s. Similarly, the period before the 1980s saw several short-run cycles alongside a long-run cycle, consistent with the “great reversals” pattern identified by Rajan and Zingales (2003), with low mid-20th-century levels of capitalization surrounded by the 1900s and 1990s market peaks. We turn to analyze such cyclical variation next.

3.2. Market capitalization cycles

In Fig. 3, we examine the volatility and persistence of market capitalization growth across different historical periods. The left-hand panel confirms that market capitalization displays substantial cyclical variation throughout our sample period. The standard deviation of real market capitalization growth—the year-on-year change in market cap relative to previous year's market cap deflated by CPI—has been high both before and after 1985: around 20% for annual growth, and 7%–10% for average growth over horizons of 5 to 10 years.

The variation in market capitalization also tends to be highly persistent. Not only does the growth volatility re-

[2] Note that our terminology is simply a visual description of the time series pattern observed in the market capitalization data, and bears no connection to the big bang market reforms in the UK. Our use of this term does not imply that any of the observed rends were driven by market liberalization.

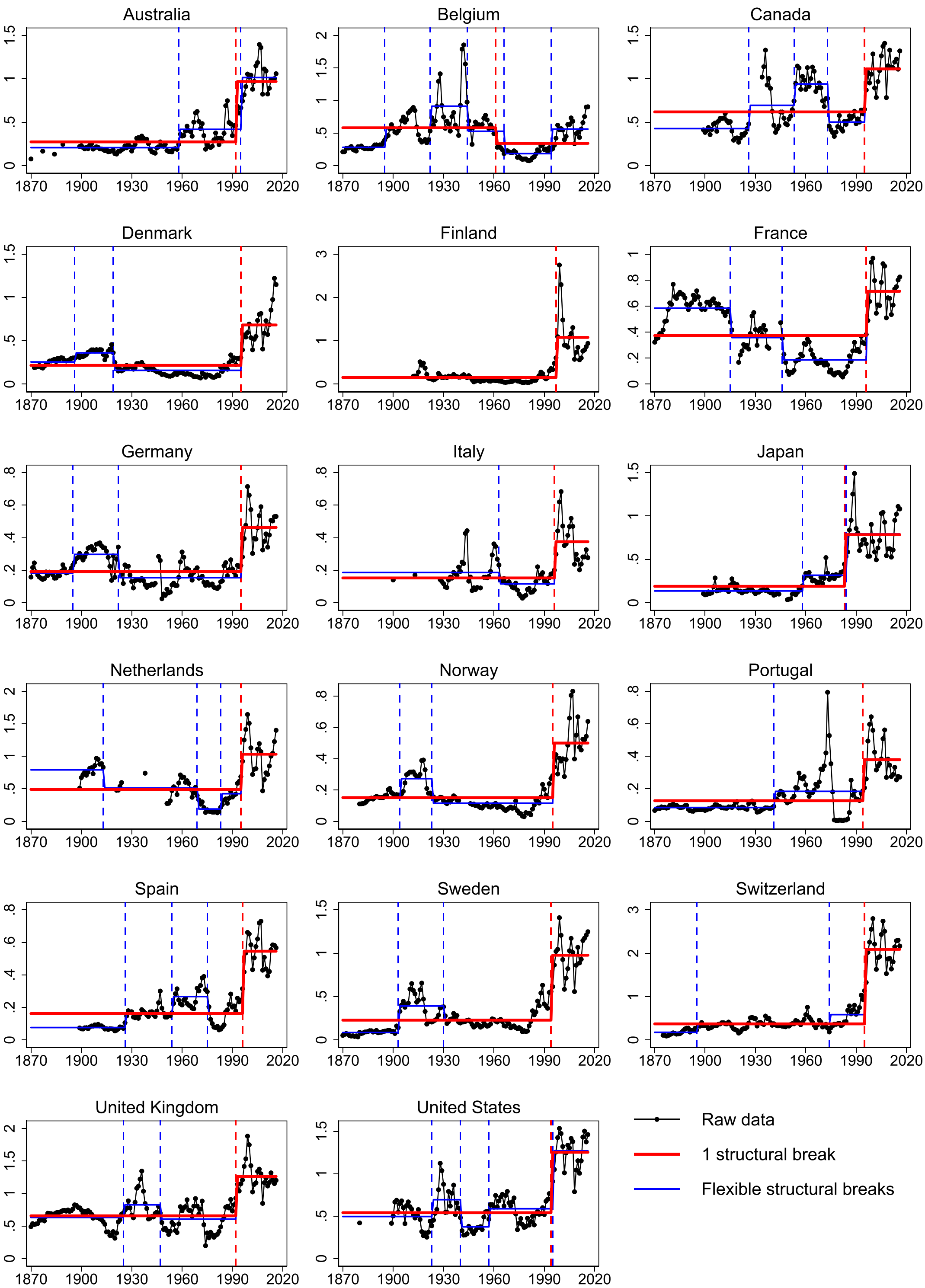

Fig. 2. Stock market capitalization to GDP ratios in individual countries.

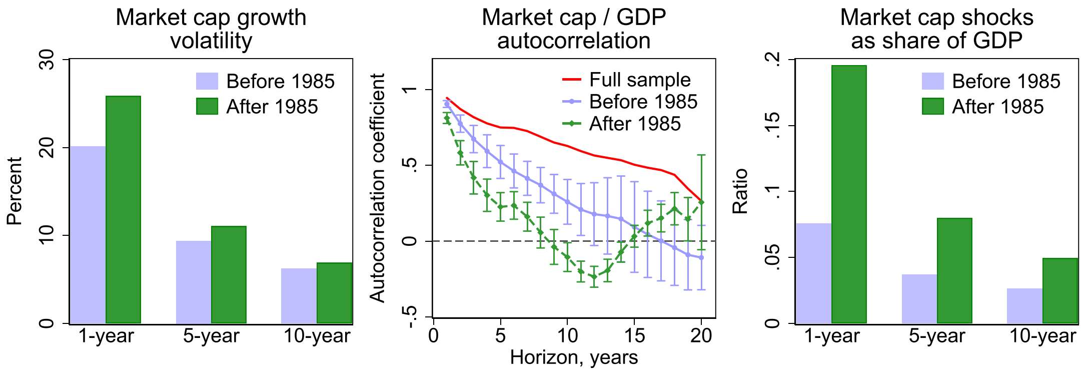

Fig. 3. Cyclical variation in market capitalization.
Left panel: Standard deviation of annual, 5-year average, and 10-year average log real market capitalization growth, calculated as $log(MCAP_t/CPI_t) - log(MCAP_{t-1}/CPI_{t-1})$. Middle panel: Autocorrelation coefficient obtained by regressing the market cap to GDP ratio in year $t+h$ on the ratio in year t, for different horizons $h = \{1, 20\}$ years and subsamples. Error bars show 90% confidence bands. Right panel: Standard deviation of year-on-year, average 5-year, and average 10-year changes in market capitalization as a share of GDP, calculated as $(MCAP_t - MCAP_{t-1})/GDP_{t-1}$.

main high at long horizons, but for the full sample (solid red line in the middle panel), the autocorrelation coefficient of the market cap to GDP ratio does not reach zero even at the 20-year horizon. This is largely due to the highly persistent shifts in the time series mean that occurred around the big bang. Within each of the pre- and post-1985 subsamples, market capitalization does tend to eventually revert to its sample-specific mean—with autocorrelation coefficients approaching zero over time—but it does so at a very slow pace, reaching zero at horizons of 7 to 15 years. The faster mean-reversion during the post-1985 period indicates that after the big bang, the cycles in market capitalization have become somewhat shorter, as for example evidenced by sharp capitalization increases during the 1990s dot-com boom followed by rapid declines during the subsequent market correction.

Even though the growth of market capitalization has not become substantially more volatile after the 1980s, market capitalization movements have become much bigger as a share of GDP as a consequence of the large level shift in stock market size. The right-hand panel of Fig. 3 shows that the variation in market capitalization, when expressed as a share of GDP, more than doubled between the pre-1985 and post-1985 time periods, both at short and long horizons. Whereas historically the standard deviation in stock market wealth was on the order of 2%–7% of national income, depending on the horizon, after 1985 these shocks have amounted to 20% of GDP at one-year frequency and 5%–8% of GDP at longer horizons. Consequently, similarly-sized percentage movements in stock prices are likely to have much larger wealth effects today, and are hence more likely to influence household spending and real activity (Chodorow-Reich et al., 2021; Coronado and Perozek, 2003; Poterba, 2000).

3.3. *International and institutional comparisons*

Previous studies have often focused on capitalization differences across countries, and the associated links with institutional norms and financial development (La Porta et al., 1997; Rajan and Zingales, 2003). The post-1980s increases in stock market wealth took place across the 17 countries in our sample, but they were not of equal size everywhere. Fig. 2 shows that while market cap in Switzerland and Finland increased almost sixfold, the increase in Belgium was relatively modest and increases in France and the UK took market capitalization back to previously seen historical peaks rather than all-time historical records. The case of Portugal is also rather unique since the 1980s market expansion mainly represented the re-emergence of the stock market after its near disappearance in the aftermath of the Carnation Revolution of 1974. This means that when we look at the distribution of global market capitalization across countries, we may see some changes—and this exactly what our data show.

Fig. 4 shows the share of each country's stock market in the total of the 17 economies. We report separate shares for the US, UK, France, Germany, and Japan and lump the other 12 countries together. In late 19th century, capital markets were roughly equally divided between three major players: the US, France, and UK. This distribution, however, changed markedly during the subsequent 50 years. While the US was able to quickly increase its market share between 1880 and 1930, the French stock market's global importance more or less vanished. The UK's market share also dwindled, albeit at a slower pace than France's. After World War II, global equity markets became almost entirely dominated by the US, with US equities accounting for roughly 70% of the advanced economy market cap in 1950.[3]

Even though the US stock market has lost some of its global importance over recent decades, its size is still comparable to that of the other 16 countries grouped together. New equity markets have gained importance, with other countries slowly catching up and Japan's market share expanding during the high growth era after World War II and even temporarily catching up to the US at the peak of the

[3] This dominance reflected the fact that the US stock market was relatively large in proportion to GDP (Fig. 2, as well as the fact that the US economy is large relative to the other countries in the sample, with the US GDP accounting for about 50% of the 17-country total.

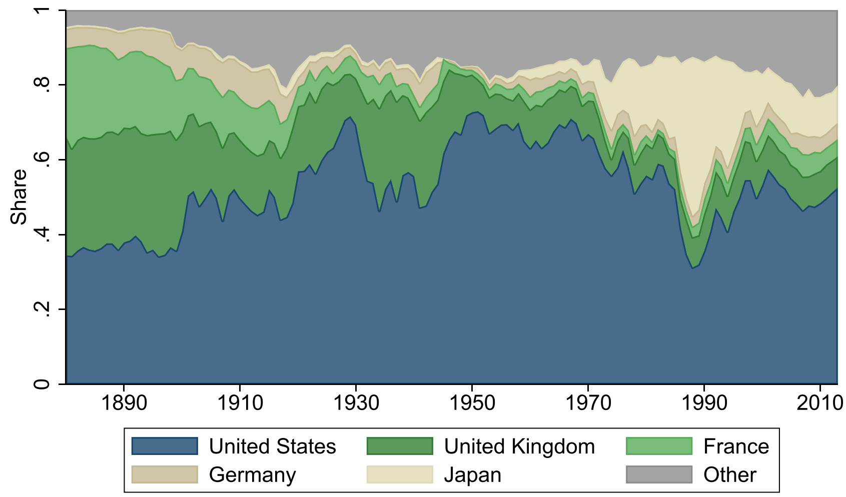

Fig. 4. Global market capitalization shares across advanced economies.
Shares of individual countries' capitalization in the advanced-economy total. Capitalization shares are computed by transforming the domestic stock market capitalization into US dollars using historical exchange rates and dividing it by the sum of capitalizations of all 17 countries. Shares of the US, the UK, France, Germany, and Japan are shown separately. All other countries are combined together into one joint item. Since data for Japan start in 1899, we assume a constant market share equal to its 1899 value for the early historical period.

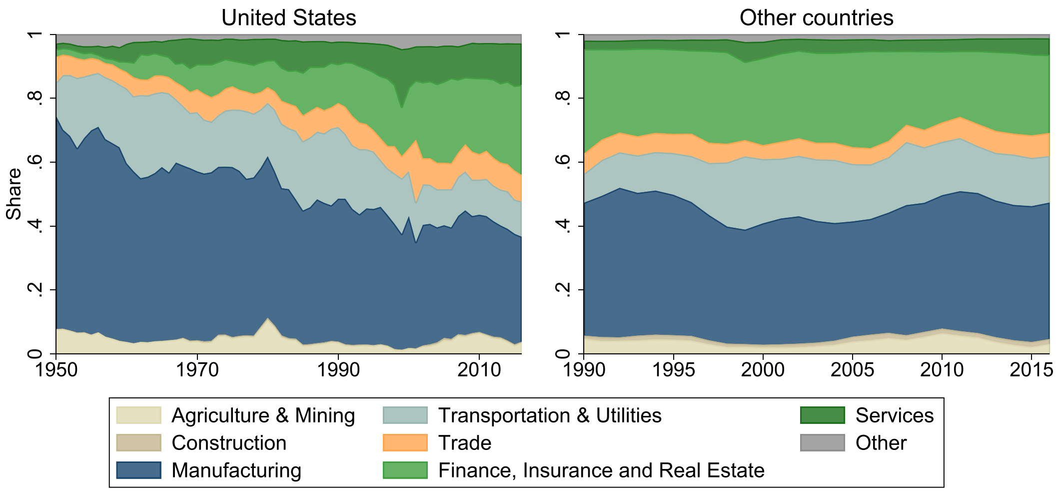

Fig. 5. Sectoral market capitalization shares.
Market capitalization of firms in the specific sector divided by total market capitalization. Data from Compustat Global and Compustat North America. Right-hand panel shows the unweighted cross-country averages of the respective sectoral shares.

Japanese stock market bubble before a dramatic collapse. Capitalization of Japanese listed companies grew from 5% of the global market in 1970 to 40% in 1989, but fell back to around 10% thereafter. These market capitalization share comparisons could be skewed by our exclusion of foreign companies listed on the country's exchange—an issue that we investigate in detail in Appendix D.1. We find that foreign listings are small from the UK, where total market capitalization of foreign equity is comparable in size to that of domestic equity. This means that the global market capitalization shares in Fig. 4 understate the importance of London as a global financial center, particularly in the early 20th century.

The increase in stock market cap was common not only across countries, but also across different economic sectors. Fig 5 shows the shares of different industrial sectors in total market capitalization, computed using Compustat data going back to 1950 for the US (left-hand panel) and back to 1990 for the other countries in our sample (right-hand panel). US sectoral trends are characterized by a falling market share of manufacturing firms (dark blue area) and an increase in the market cap of financial and service companies (light and dark green areas). These trends, however, started before the 1980s and simply continued during the period of the big bang. For other countries in the sample (Fig. 5 right-hand panel), sectoral shares have remained remarkably stable since 1990, with market capitalization of different industries increasing in tandem with one another.

To explore the connection between broader institutional characteristics and market size, the left-hand panel of

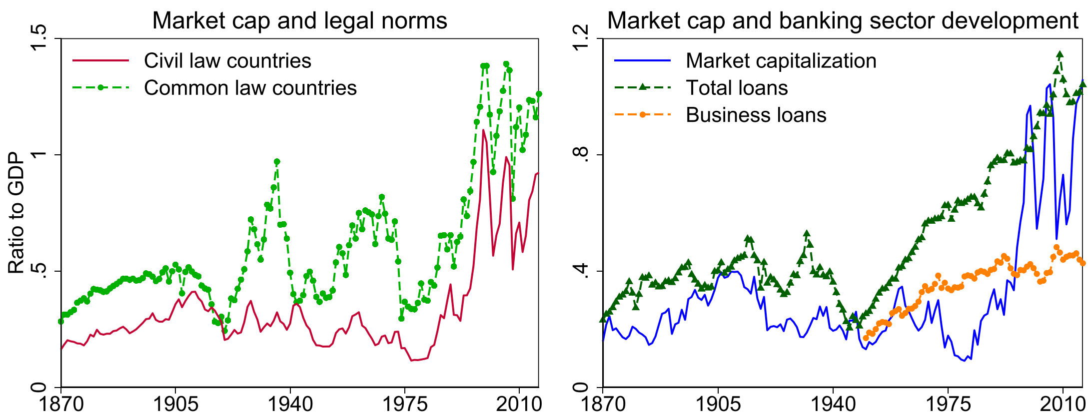

Fig. 6. Market capitalization and measures of financial and institutional development.
Left-hand panel: Median market cap to GDP ratios for two groups of countries. Common law countries are Australia, Canada, the UK, and the US. Civil law countries are all other countries in our dataset. Right-hand panel: Median market cap to GDP ratio and the ratios of total loans and total business loans to GDP.

Fig. 6 displays the evolution of stock market capitalization separately for countries with common law legal systems (UK, Canada, US, and Australia) and those operating under civil law (the rest of our sample). La Porta et al. (1997) hypothesised that stock markets in common law countries tend to be more developed because of the more market-friendly legal norms. Consistent with the legal origins hypothesis, common law countries had a persistently higher market cap to GDP ratio. Nevertheless, the post-1980 increase in stock market cap "takes off" at a similar time and is similar in magnitude across both country groups.

The right-hand side of Fig. 6 compares the evolution of market capitalization to that of two proxies for banking sector development: total credit to the non-financial sector (green triangles) and total non-financial business credit (orange circles). Over the very long run, both market capitalization and credit activity have grown faster than GDP. However both the timing and the duration of the late 20th century credit expansion are different to those in the stock market cap. Total credit starts increasing much earlier, and does so at a much slower pace than market capitalization. Moreover, the increase in business credit is much more modest than that in total credit, largely because much of the secular increase in credit during the second half of the 20th century is driven by higher household mortgage debt (Jordà et al., 2016). The sharp increases in market capitalization in the post-1980s period happened at a time of relative stability in the total volume of business loans.

How do our estimates compare to previous studies? Our Data Appendix includes detailed country level Figs. E.1–E.17 that show our final estimates alongside those of previous researchers. Appendix Fig. A.1 shows that our broad trends mirror those of Rajan and Zingales (2003) using all countries in their sample (dark triangles) or only those countries present in both ours and their datasets (light diamonds). Our estimates are somewhat lower than those of Rajan and Zingales (2003), most likely because we are able to take advantage of recent work by financial historians (e.g., Annaert et al., 2012; López et al., 2005; Waldenström, 2014) and the raw stock listings data to obtain an improved measure of the capitalization of ordinary domestic shares that excludes preference shares and nets out cross listings between exchanges when necessary. Nevertheless, the general patterns of high capitalization in the 1910s and 1990s, and low capitalization in mid 20th century and especially around 1980, are clearly visible across alternative estimates.

Previous studies have often used market capitalization as a proxy for financial development, but the patterns in our data indicate a substantial divergence between stock market cap and other financial and institutional development proxies. One reason for this is that financial development and institutions are more likely to affect quantities of listed equity through factors such as entry costs and market access, whereas our market capitalization measure captures short and long run movements in equity prices as well as quantities. In order to gain a more discerned picture of the underlying drivers of stock market growth, we need to decompose it into changes in prices and quantities, and separately assess the drivers of this price and quantity variation as well as their relative importance through history. The integrated nature of our database, and the inclusion of consistent series of stock prices and quantities alongside those of capitalization, allow us to do exactly that.

4. Trends in prices and quantities of listed equity

4.1. Market capitalization growth decomposition

Market capitalization can grow through either quantities or prices of listed equity. Quantity variation typically corresponds to firms' financing decisions, market entry and exit, whereas changes in stock prices should be linked to changes in company profits and the discount rates used to capitalize the profit stream into valuations. Decomposing market capitalization growth into changes in prices and quantities, therefore, gives us a first pass at disentangling the drivers of the long-run trends in Section 3.

Our price-quantity decomposition follows the standard procedure in the studies of the US stock market and, more broadly, household wealth (e.g., Bansal et al., 2007; Blanco et al., 2020; Goyal and Welch, 2008; Piketty and Zucman, 2014). To fix ideas, note that total market capitalization, $MCAP$, at time t is the sum of the market capitalizations of each individual share i, in turn calculated as the share price P_i times the quantity of listed shares Q_i:

$$MCAP_t = \sum_{i=1}^{N_t} P_{i,t} Q_{i,t}. \tag{1}$$

An increase in market capitalization can come about from share issuance by listed companies (higher Q), new companies entering the listing (higher N), or higher prices of existing listings P. Put differently, aggregate market capitalization is the sum of last year's capitalization, $MCAP_{t-1}$, times the capital gain during the year, and the net equity issuance consisting of new listings and secondary issues net of delistings and redemptions:

$$MCAP_t = (1 + Capital\ gain_t) * MCAP_{t-1} + Net\ issuance_t. \tag{2}$$

Dividing both sides by $MCAP_{t-1}$ and deflating by CPI, real market capitalization growth, g^{MCAP}, is the sum of the real capital gain cg_t and net issuance relative to the previous year's market cap iss_t:[4]

$$g_t^{MCAP} = cg_t + iss_t,$$
$$\text{where } g_t^{MCAP} = \frac{MCAP_t * CPI_{t-1}}{MCAP_{t-1} * CPI_t} - 1 \text{ and } iss_t = \frac{Net\ issuance_t}{MCAP_{t-1}}. \tag{3}$$

The decomposition in Eq. (3) is a pure accounting exercise and does not rely on any assumptions about the underlying sources of stock market wealth. Its different components can be estimated directly from the data. We observe market cap growth g and capital gains cg for all country-year observations in our sample, and for more than half of the observations we also observe actual net equity issuance. For countries and years where we do not have actual issuance data, we calculate it as the difference between market capitalization growth and equity capital gains.[5]

Fig. 7 shows the decomposition of average cross-country market capitalization growth (solid black line) into real capital gains (dark blue bars) and issuances relative to market cap (light green bars) following Eq. (3). The components also include a small residual, which comes about from either the log approximation or the differences between implied issuance (market capitalization minus capital gain) and actual issuance. All variables are smoothed using five-year moving averages of annual data. Stock prices are the main driver of cyclical variation in stock market cap: the stock market boom of the 1880s, the crashes during the world wars and the 1970s, and the 1990s dot-com boom all had large impacts on real capitalization growth rates. Appendix Fig. B.1 provides additional evidence on the volatility of the price and quantity component of market cap growth. It shows that capital gains are volatile, displaying a standard deviation of about 20% annually, 9% over five years, and still 6% after 10 years. Net issuance to market cap is on average about half as volatile as equity capital gains, but more persistent when looking at 5-year and 10-year intervals.

When it comes to long-run stock market growth, however, equity issuance is key. Table 1 shows the mean changes in the market cap to GDP ratio and its components in the form of real capitalization growth, decomposed into issuances and capital gains, and the growth in real GDP over long periods of time. Column 1 covers the full sample, and columns 2–4 cover the three main distinct periods in the market capitalization trend: the pre WW I market expansion, the mid 20th century stagnation, and the post-1980s increase. The full sample averages confirm that issuance played a key role in fueling market cap growth throughout history, amounting to about 3.6% of market cap per year, while real capital gains on average contributed less than 1 percentage point per year to market cap growth. Stock market cap to GDP ratios would actually have fallen over time without the continuous inflow of new capital.

Yet the era of predominantly issuance-driven stock market growth seems to have come to an end. Column 4 of Table 1 and Fig. 7 both show that the issuance component of market cap is gradually losing importance, only growing market cap by about 2.2% on average after 1985, and falling close to zero after 2000. Market cap growth over recent decades has been predominately price driven, with real capital gains amounting to about 3.7 ppts on average, compared to the historical average of around zero. This new era is markedly different from the mid-20th century period during which the market cap to GDP ratio stagnated but net issuance remained above historical averages and the average real capital gain was negative.

The observed trends in equity issuance are not an artefact of our way of measuring these data. For around half the observations in our sample, we have data on actual net equity issuance, and for the other half we impute it as the difference between market cap growth and capital gains. For those countries where we have issuance data, both actual and implied issuance follow similar trends, with a somewhat larger issuance boom in implied issuance in the 1980s and 1990s, but a similarly sized fall in recent years (Appendix Fig. B.2a). The larger implied issuance boom in the 1980s and 1990s is most likely because actual issuance does not fully account for revaluations of newly issued equity at market prices, while these are fully incorporated into implied issuance values. If we look at trends in equity issuance relative to GDP as opposed to market cap, the slowdown in issuance starts somewhat later as the rapid market expansion of the 1990s ensured that even though issuance accounted for a declining share of stock market growth, the increases in the market cap to GDP ratio meant that it kept growing relative to GDP (Appendix Fig. B.2b).

[4] Note that in Eq. (3), the market cap growth rate g and capital gain cg can be either nominal or real, but for ease of interpretation across time periods, we perform the decomposition with real growth rates.

[5] This approach is very similar to Bansal et al. (2007) and Goyal and Welch (2008), who calculate net issuance as the difference between CRSP market cap growth and value-weighted capital gains.

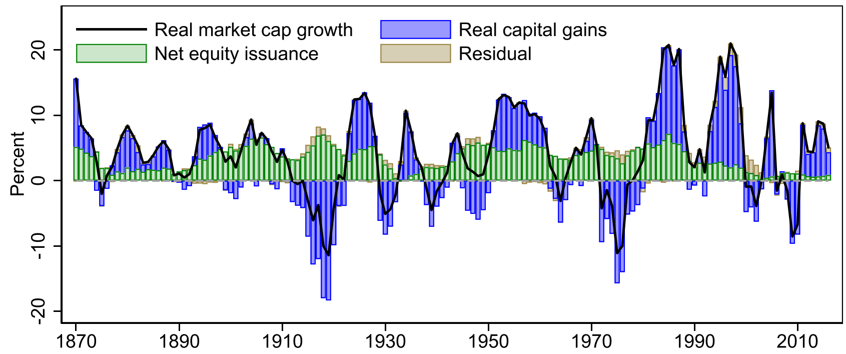

Fig. 7. Market capitalization growth decomposition.
Decomposition of real market cap growth into real capital gains and net issuance relative to previous year's market cap. Centered five-year moving averages of yearly log growth rates. Unweighted averages of 17 countries. Country-level data winsorized at 1%. Real variables are deflated by CPI.

Table 1
Market capitalization growth over long time periods.
This table shows the average annual growth rate of market capitalization and its components in the pooled sample of 17 countries between specified dates (full sample covers the 1870–2016 period). The top row shows the average change in the market cap to GDP ratio as a percentage of GDP. The middle rows show the log growth rate of real market cap and its decomposition into real equity capital gains and net equity issuance relative to previous year's market cap, in percentage points. The bottom row shows the average growth rate of real GDP.

	(1) Full sample	(2) Pre-1914	(3) 1914–1985	(4) Post-1985
Average change in MCAP/GDP	0.66	0.60	−0.07	2.25
Market cap growth decomposition				
Real market cap growth ≈	4.61	4.49	3.70	6.64
Real capital gain	0.74	0.79	−0.67	3.66
+ Issuance to market cap	3.58	3.82	4.15	2.16
Real GDP growth	2.77	2.40	3.26	2.06

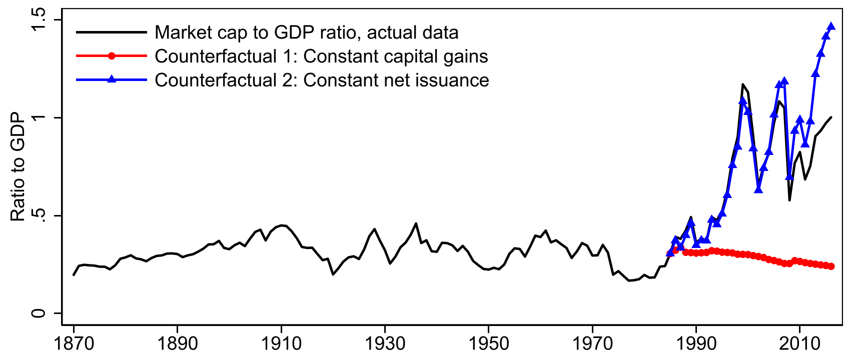

Fig. 8. Counterfactual evolution of market capitalization during the big bang.
Constant capital gains counterfactual forces the real capital gains during 1985–2016 to equal the pre-1985 average. Constant net issuance counterfactual forces net issuance relative to market cap during 1985–2016 to equal the pre-1985 average. Data are benchmarked so that the combined growth of the two counterfactuals between 1985 and 2016 equals the actual growth in observed market cap data. All data are unweighted averages of 17 countries.

4.2. Decomposing the recent stock market expansion

In this section, we examine the relative contribution of price and quantity changes to the post-1980s acceleration in stock market growth. To assess this, the top panel of Fig. 8 displays two counterfactual evolutions of the market cap to GDP ratio during this time period, together with the actual data (solid black line). The first counterfactual, marked by red diamonds, shows what the market cap evolution after 1985 would have been if we fixed capital gains to their pre-1985 average. Under this scenario, all changes in the market cap to GDP ratio from 1985 onwards are attributable to changes in net issuance and real GDP growth. The second counterfactual (blue triangles) instead fixes issuances to their pre-1985 mean and attributes all the post-1985 variation in the market cap to GDP ratio to changes in real capital gains and real GDP growth. We benchmark the estimates so that the combined growth under the two

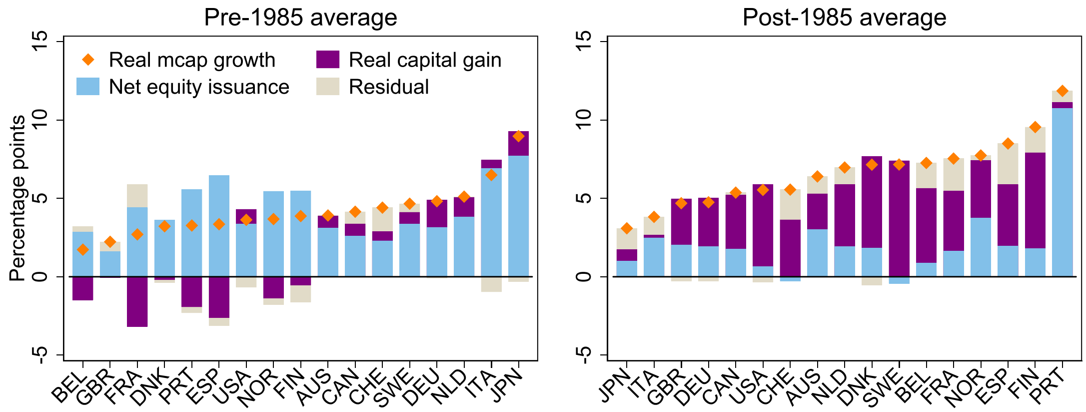

Fig. 9. Issuance and capital gains by country, before and after the big bang.
Averages of log growth rates for each country before and after 1985. The sum of the bars can deviate from the diamond because of the correlation between issuance and capital gains, and because of differences between implied and actual issuance. Net equity issuance is expressed as a share of previous year's market cap.

counterfactual scenarios equals the actual growth in market cap over 1985–2016.[6]

Counterfactual 1 in Fig. 8 shows that taking the post-1985 increases in capital gains out of the data eliminates the big bang entirely. If real capital gains had remained at their historical average of around zero, the market cap to GDP ratio would have declined slightly due to the post-2000 slowdown in net equity issuance. Counterfactual 2 shows that fixing issuance to its historical levels results in a market cap trend that closely follows actual data until the early 2000s, and then results in an even stronger market expansion because this counterfactual eliminates the recent issuance slowdown from the trends.

Fig. 9 shows that these aggregate trends are also reflected in country-level data. The left panel shows the average growth rate of market cap before 1985 decomposed into capital gains and issuance, and the right panel shows the average growth rate during the post-1985 market expansion. Almost all of the long-run growth in capitalization before 1985 was driven by issuances. But after 1985, the picture reverses with only the growth in the Portuguese stock market being issuance driven and the other countries being dominated by capital gains. The Portuguese case is, however, explained by country-specific events where the stock market more or less disappeared after the 1970s Carnation Revolution and reemerged throughout the 1980s (see also the case study in Appendix Fig. B.5). Appendix Fig. B.4 confirms that the largest post-1985 increases in the market cap to GDP ratio were observed in countries with the highest capital gains, rather than those with the highest issuances. In addition, we estimate counterfactual market cap evolutions identical to Fig. 8 for the individual countries in Appendix Fig. B.3. The individual country counterfactuals are similar to the aggregate in Fig. 8, with only Portugal and Australia experiencing substantial market growth under the fixed capital gain Counterfactual 1, and all countries bar Portugal experiencing much larger growth under the fixed issuance Counterfactual 2.

Fig. 9 also shows that the post-1985 stock price increases in the US are representative of broader cross-country patterns, with a number of Nordic countries in particular experiencing even larger real capital gains. The positive contribution of the residual during the big bang period also, again, shows that revaluations of newly issued equity may have further accelerated this recent market cap growth. The slowdown in issuance is relatively more pronounced in the US, but it is by no means an outlier with all countries bar Portugal reporting low issuance levels, and both Switzerland and Sweden reporting issuance growth contributions smaller than that in the US.

One reason why issuances have slowed so much could be the increasing use of buybacks as means of compensating shareholders starting in the 1980s (Grullon and Michaely, 2002). Unlike dividends, buybacks reduce net equity issuance by lowering the number of shares outstanding on the market. This means that the switch from dividends to buybacks could account for some of the issuance slowdown. Because the use of buybacks started earlier and was more common in the US (Megginson and Von Eije, 2008), it could also account for some of the differences between the US and other countries. We quantify and discuss the contribution of buybacks to the growth decomposition trends in Section D.2 of the Appendix. We find that without the switch to buybacks, post-1980s issuances would have been somewhat higher and capital gains somewhat lower, especially in the US. But the general patterns of falling issuances, less money flowing into the stock market, and uncharacteristically high capital gains would have remained in place.

[6] The benchmarking ensures that the different timing of the shocks to issuance and capital gains, and the correlation between the two, do not bias our findings. For example, after the burst of the 1980s Japanese bubble, both issuance and capital gains were sharply negative, meaning that any subsequent growth took place from a very low base. Ignoring the correlation between these two shocks would overstate the counterfactual market cap growth under both scenarios. That being said, data for non-benchmarked counterfactuals show even higher market cap growth under counterfactual 2 of fixed issuance which further supports our findings. The results are available from authors upon request.

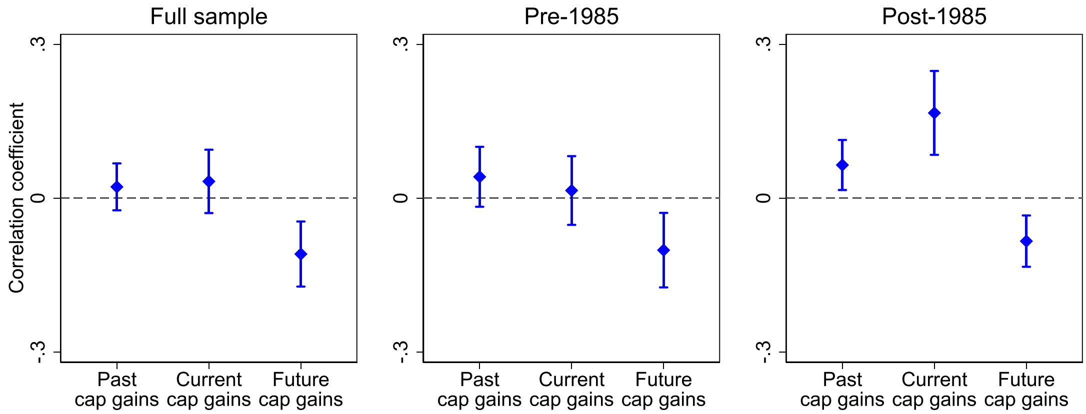

Fig. 10. Correlations between issuance and capital gains.
Correlation between equity issuance relative to market cap in year t, and real capital gain between years $t-4$ and t (past cap gains), year t (current cap gains), and years $t+1$ to $t+5$ (future cap gains), using pooled data for the selected time periods. Error bars show the 90% confidence bands.

The analysis in this section further confirms that the last several decades have been highly unusual, with large capital gains accelerating stock market growth beyond that of the real economy despite a slowdown in issuances. That being said, issuances were a key driver of stock market growth historically and continued to positively contribute to market capitalization growth even after 1985.

4.3. Equity issuance cycles and determinants

We have shown that net issuance and capital gains follow different long-run trends, with issuances being high historically and relatively modest in recent years and real capital gains being low historically and high after 1980. It turns out that this disconnect between issuance and capital gains is true for both the long and the short run. Fig. 10 shows the correlation between issuance (in year t) and past (years $t-4$ to t), present (year t), and future (years $t+1$ to $t+5$) real capital gains. Issuance and capital gain cycles do not move together: the correlation between past and current capital gains and issuance in the full sample is close to zero, and the correlation between current issuance and future capital gains is negative. This negative correlation confirms the Baker and Wurgler (2000, 2002) findings that companies tend to time the market and issue equity at market peaks. We also find that the procyclicality of equity issuance has become stronger in recent decades. Whereas before 1985 (Fig. 10 middle panel) equity and past capital gains were uncorrelated, they became positively correlated after 1985 (Fig. 10 right panel).

The evidence in Figs. 10 and 7 shows that both long and short-run variation in issuance is distinct from that in capital gains. Given the large cyclical volatility in stock prices, this makes it difficult to infer the time variation in quantities, as well as the associated changes in market access and financial development, from movements in market capitalization alone. Moreover, even the net issuance figures may mask large compositional changes between gross and net issues, and between new and old firms. To provide insight into the underlying trends in issuance and their drivers, we focus the rest of our analysis in this section on the variation in net issuance and gross new listings. We investigate the drivers of issuance by regressing different issuance measures on selected country and time characteristics, economic growth, and the cost of issuance, with results shown in Table 2. In the regressions for columns 1–3 we stick to our baseline net issuance measure, while columns 4–6 consider net issuance as a share of GDP instead of market cap, and columns 7–9 focus on gross new listings (IPOs plus direct listings) rather than net issues. A number of robust explanatory variables for net issuance stand out.

First, as suggested by the procyclicality of net issuance in Fig. 10, all three of our proxies for issuance are strongly correlated with the relative costs of issuing debt and equity. We proxy the cost of issuing equity by the dividend-price ratio—with higher dividend yields indicating lower valuations and a higher cost of equity—and the cost of issuing debt by the corporate bond yield, with bond yield data taken from Kuvshinov (2021). A one percentage point increase in the dividend-price ratio predicts half a percentage point lower issuance relative to market cap (about 0.1 ppts lower relative to GDP) and 0.3–0.7 percentage points lower new listings relative to market cap. Higher corporate bond yields show similarly-sized effects in the opposite direction, with a higher cost of debt leading firms to obtain finance through equity markets. We also find some role for the business cycle. Issuance is positively correlated with GDP growth, but the effect seems stronger for firms already listed on the market than new listings, as evidenced by larger and more significant coefficients on GDP growth in columns 1–3 compared to in columns 7–9.

Second, we investigate the role of institutional characteristics. We find that issuance bears little correspondence to legal norms: common law countries tend to have higher market capitalization (right panel of Fig. 6) but lower net issuance and new listings (columns 1 and 7), perhaps because the markets are already well established and a large share of the country's firms are already listed on the exchange. However, because capitalization in these countries tends to be large, their net issuance is larger as a share of GDP (column 4).

Table 2
Determinants of equity issuance.
This table reports the results of regressing various measures of equity issuance on its potential determinants. Dependent (issuance) variables are in logs. Specifications in columns (1), (4) and (7) are a pooled OLS with country-clustered standard errors. The other columns show panel specifications with country fixed effects [columns (2), (5) and (8)] and both country and year effects [columns (3), (6) and (9)]. Standard errors for these specifications are clustered by country and year and adjusted for autocorrelation. We set market establishment to equal 1 in the first decade of the country-specific market cap sample, and in the decade after a stock market was closed for a considerable time period (typically during a war or revolution). Common law countries are Australia, UK, Canada and US. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dependent variables								
	Net issuance / market cap			Net issuance / GDP			New listings / market cap		
Market establishment	3.86*	4.14*	4.42	0.40	0.34	0.61	5.90**	6.19**	4.38
	(1.94)	(2.15)	(3.09)	(0.27)	(0.47)	(0.59)	(1.85)	(2.97)	(3.60)
Pre-1914 dummy	0.78	1.16		0.66**	0.61		0.22	−0.66	
	(1.08)	(1.09)		(0.29)	(0.41)		(0.37)	(0.66)	
1985–2000 dummy	−1.71***	−1.46*		0.09	0.01		0.52	0.81	
	(0.53)	(0.85)		(0.25)	(0.22)		(0.24)	(0.59)	
Post-2000 dummy	−1.79***	−1.89***		−0.43	−0.56**		0.50	0.42*	
	(0.58)	(0.70)		(0.26)	(0.23)		(0.28)	(0.23)	
Common law country	−1.16**			0.46***			−0.57		
	(0.49)			(0.12)			(0.37)		
Dividend-price ratio	−0.47	−0.49***	−0.52***	−0.09**	−0.13***	−0.15***	−0.29**	−0.31**	−0.68***
	(0.32)	(0.15)	(0.19)	(0.04)	(0.04)	(0.05)	(0.07)	(0.15)	(0.18)
Corporate bond yield	0.57**	0.46***	0.63***	0.02	0.01	0.02	0.29	0.18***	0.34***
	(0.24)	(0.13)	(0.23)	(0.03)	(0.03)	(0.05)	(0.13)	(0.06)	(0.11)
Real GDP growth	0.20***	0.18***	0.18**	0.05***	0.04**	0.05**	0.07	0.04	0.03
	(0.06)	(0.06)	(0.07)	(0.01)	(0.02)	(0.02)	(0.05)	(0.04)	(0.04)
Country fixed effects		✓	✓		✓	✓		✓	✓
Year fixed effects			✓			✓			✓
R^2	0.07	0.06	0.16	0.03	0.02	0.13	0.25	0.20	0.42
Observations	1769	1769	1769	1769	1769	1769	394	394	394

Third, we find some evidence that issuance is particularly high after the establishment of new equity markets and the reopening of a stock market. The positive coefficients on the market establishment dummy—set equal to 1 in the first decade of the market data, or after a prolonged market closure—suggest that when stock markets begin or resume operation, firms look to take advantage of these new funding opportunities to obtain equity finance. This effect is stronger for new listings (columns 7–9), but much larger as a share of market cap than GDP pertaining to the fact that during these times, the country's stock market tends to be small. The significance of the market establishment dummy is lower with year fixed effects (columns 3, 6, and 9) because many markets in our sample were being established at similar time periods, reducing the cross-sectional variation in this measure. The prevalence of new markets being established helps explain the high issuance levels observed early in the sample: conditional on the market establishment dummy, the pre WW I time period (Pre-1914 dummy) does not have significantly higher issuance. Appendix Fig. B.5 shows shows several specific country case studies of market cap growth decomposition, which highlight that issuance was the driving force of a number of historical market expansions, including market growth after the foundation of the Helsinki and Oslo stock exchanges, and the re-establishment of the Lisbon Stock Exchange after the Carnation Revolution.

Finally, the time dummy coefficients in Table 2 confirm the broad secular trends evident in Fig. 7. While the pre-1914 issuance was relatively strong or at least not unusually low, the post big bang decades saw low levels of issuance, especially conditional on the low cost of issuing equity during this period. But interestingly, the trend issuance slowdown is much less evident when it comes to new listings (columns 7 and 8), suggesting that net and gross equity issuance may follow different time trends. After all, a post-1980s slowdown in net issuance does not necessarily imply that all the growth and capital gains accrued to firms already listed on the market in the early 1980s.

To further look into this, we construct a measure of churn—the market cap share of firms that were listed in the last 10 years—for five stock markets in our sample. There are two ways of measuring churn in our data. The most accurate method splits the current market capitalization into firms listed in the last 10 years and those listed beforehand, but the detail of the data only allow us to construct this measure for the US. For the other countries, we cannot track the capitalization of individual firms for long periods of time but we know the market cap of new listings taking place within each year. To calculate the second proxy for churn, we take the ratio of the market cap of new firms listed in one year to that of old firms, and sum these ratios over a 10-year period. The second measure ignores post-listing growth differentials between new and old listings, but in practice these are small (see Appendix Table B.1 and Fig. B.6) and in the US, the two churn measures are very close to each other (Fig. 11 top-left panel).

Fig. 11 shows the long-run evolution of the new listings market share in five different countries. We see substantial churn close to the stock market's establishment and in the part of the sample period more generally. The

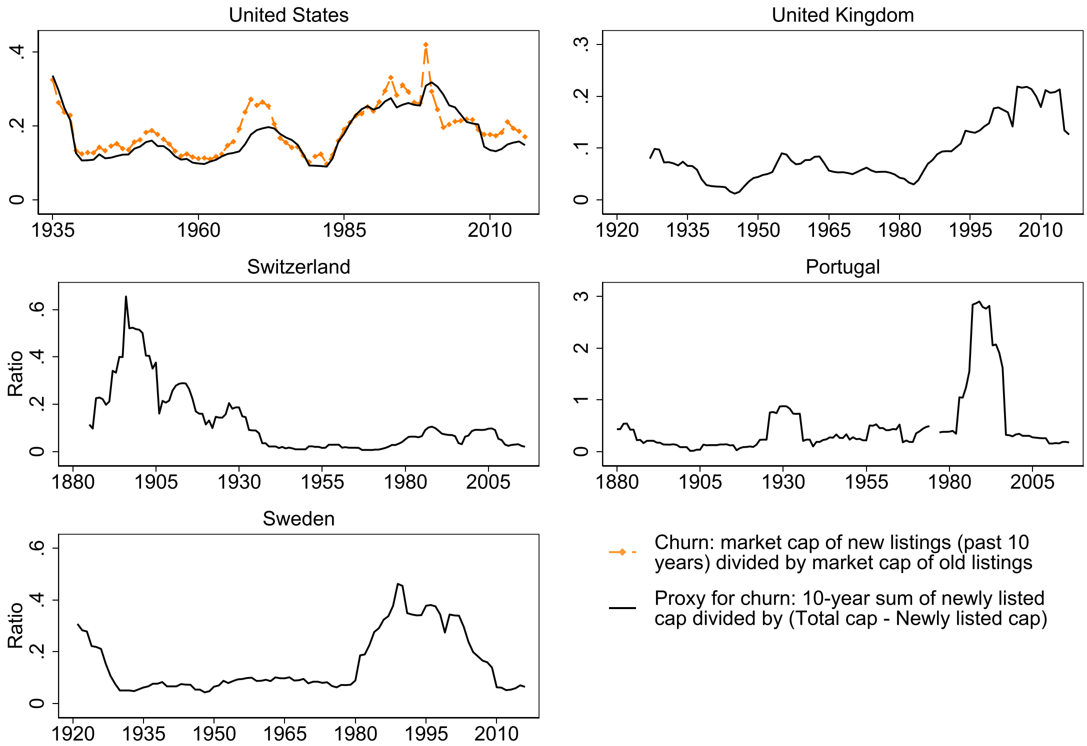

Fig. 11. Churn in selected stock markets.
We define churn as the market capitalization of firms listed within the last 10 years divided by the capitalization of other listings. For the US, we compute the churn in year t by summing the year t market cap of all stocks listed between years $t-9$ and t and dividing it by the sum of market caps of stocks listed before year $t-9$, using the listing dates for each stock in the CRSP database (dashed line). An alternative simpler proxy (solid line) first calculates the ratio of the cap of new listings in year z to that of old listings (listed before year z) for each of the preceding 10 years $z=t-9$ to $z=t$, and then sums these ratios.

market share of newly firms listed was high—close to one-third of old listings—in the 1930s US, 1880s Switzerland, and 1920s Sweden. The mid 20th century saw very little entry from new firms despite relatively high net issuance, suggesting that most of the issuance throughout this period was from companies that were already listed. This supports Rajan and Zingales (2003)' "great reversals" theory that during this period of stagnation in market growth, stock markets were dominated by incumbents and there was little entry from new firms. Throughout this time period, the market share of new listings generally remained at or below 10% of the value of old listings.

The 1980s saw a pickup in the amount of new equity entering the markets, but the size of this pickup differed materially across countries. The more established markets of the US, UK, and Switzerland recorded comparatively smaller increases in churn. Sweden and Portugal, however, saw large market entry and churn, much of it for institutional reasons. In Sweden, IPOs were not permitted until 1979, although firms could still list directly, which is why the new listings for the pre-1979 period are above zero. Following market liberalization of the 1980s, there was a large surge in market entry and IPOs, as discussed by Rydqvist and Högholm (1995). In Portugal, after the stock market more or less disappeared in the immediate aftermath of the Carnation Revolution, the eventual market reestablishment saw the market share of new firms become much larger than that of old firms, by a factor of about 3. Even for the US, where the pick-up in churn was not as strong as in Sweden and Portugal, by 2015 around half of the total market capitalization was accounted for by firms listed after 1985 (Appendix Fig. B.7).

5. Drivers of the post-1980s stock market growth

This section explores the drivers of the persistent equity price increases that underpin the post-1980s expansion in stock market wealth. These drivers can be outlined within the framework of the dynamic Gordon growth model. We first note that the ratio of market capitalization to GDP is approximately equal to the ratio of aggregate dividends paid by listed firms to GDP, D^{agg}/GDP, times the average value-weighted price-dividend ratio of the stock market $\overline{P_t/D_t}$:

$$\frac{MCAP_t}{GDP_t} = \sum_{i=1}^{N_t} \left(\frac{Q_{i,t}D_{i,t}}{GDP_t} * \frac{P_{i,t}}{D_{i,t}} \right) \approx \frac{D_t^{agg}}{GDP_t} * \overline{P_t/D_t}, \tag{4}$$

where $D_t^{agg} = \sum_{i=1}^{N_t} Q_{i,t}D_{i,t}$. We can then take logs on both sides and apply the Campbell and Shiller (1988) decomposition to the log price-dividend ratio:

$$ln\left(\frac{MCAP_t}{GDP_t}\right) \approx ln\left(\frac{D_t^{agg}}{GDP_t}\right) + \mathbb{E}\left(\sum_{\tau=0}^{\infty} \rho^{\tau}(dg_{t+\tau+1} - r_{t+\tau+1})\right), \tag{5}$$

where dg is log real dividend growth, r is log real total return, and $\rho = \frac{P/D}{1+P/D}$ is a linearization constant. Intuitively, Eq. (5) is an approximate present value identity for the entire stock market. It tells us that the size of the stock market relative to the economy is determined by three factors.

The first factor is the *current profit share* of listed firms, D^{agg}/GDP. If listed firms' profits and dividends constitute a large share of economic income, the size of the stock market—which reflects the present value of these profit and dividend streams—will also be large relative to the rest of the economy. The second factor is the *future profit growth* (or dividend growth) dg: stocks can be valued highly not only because profits are high today, but also if they are expected to be high in the future. The third factor r is the *discount rate*, which capitalizes these future profits, with lower discount rates increasing the present value of the profit stream and leading to higher market capitalization.

We evaluate the relative importance of these three drivers using a two-step procedure. First, we look at the correlations between market capitalization and its three determinants. As we cannot measure return and dividend growth expectations directly, we follow previous studies (Campbell and Shiller, 1988; Cochrane, 2008) and run predictive regressions of future dividends and future returns on current market capitalization. If high market capitalization predicts low future stock returns or high future dividend growth, this means that r and dg are relevant drivers of fluctuations in the size of the stock market. These correlations tell us about which forces tend to drive the year-on-year growth in the market cap to GDP ratio, but they do not necessarily tell us what drives its long-run trend. To this end, in the second step we look at the trends in those variables that are correlated with market capitalization in the right direction in order to determine the contribution of these trends to the long-run evolution of market cap.

5.1. Market capitalization, future returns, and dividends

Fig. 12 plots the correlations of market capitalization with the three components of Eq. (5): the current share of dividends in GDP, future growth of dividends, and future returns. As in Eq. (5), all the variables are in logs, and we calculate present value discounted sums $\sum_{\tau=0}^{\infty} \rho^{\tau} dg_{t+\tau+1}$ and $\sum_{\tau=0}^{\infty} \rho^{\tau} r_{t+\tau+1}$ by taking realized returns and dividends between year t and 2016, and assuming returns and dividend growth are equal to the respective country-specific sample mean after 2016.[7] We also adjust market cap and dividends to GDP for structural breaks so that all variables are stationary to avoid potentially spurious correlations, and postpone the questions of time series trends until the second step of the analysis in Sections 5.2 and 5.3. Not adjusting for structural breaks, however, leads to similar results.

The correlation between market capitalization, dividend share in GDP, and future returns is in line with the theoretical predictions of Eq. (5): a high market cap to GDP ratio means high current listed firm dividends relative to GDP, and low future equity returns. But market capitalization and future dividend growth are, if anything, correlated in the wrong direction: high market cap actually predicts low rather than high future dividend growth.

We further test these relationships by running predictive regressions of the following form:

$$r_{j,t+1} = \alpha_j^r + \beta^r ln(MCAP_{j,t}/GDP_{j,t}) + u_{j,t}^r \tag{6}$$

$$dg_{j,t+1} = \alpha_j^{dg} + \beta^{dg} ln(MCAP_{j,t}/GDP_{j,t}) + u_{j,t}^{dg}, \tag{7}$$

where j is a country index, α is a country fixed effect, and u is a Driscoll and Kraay (1998) standard error clustered by country and year, and adjusted for serial autocorrelation.

Table 3 reports the corresponding regression coefficients β^r and β^{dg} for a range of different specifications. The Campbell and Shiller (1988) decomposition in Eq. (5) tells us that the regression coefficient on future returns β^r should be negative, and β^{dg} on dividend growth should be positive. In the data, β^r is negative and statistically and economically significant, with a 10 percentage point increase in the market cap to GDP ratio predicting roughly 4 percentage points lower returns one year ahead.[8] But market capitalization does not predict high future dividend growth: in some specifications the dividend predictability is negative, and in others it is statistically insignificant. These results hold if we restrict the sample to the post-1985 time period (columns 3 and 4), control for common cross-country variation using year fixed effects (columns 5 and 6), and look at longer horizon returns (columns 9 and 10). Return predictability reflects both future changes in the risk premium and the safe rate (columns 7 and 8), and remains significant but somewhat weaker when we do not adjust for structural breaks (columns 5 and 6), consistent with US evidence on other stock return predictors (Lettau and Van Nieuwerburgh, 2008).

Taken together, this means that market capitalization correlates with changes in the current profit share and future returns, but not with changes in future growth. Together with the evidence of declining productivity in the US and other advanced economies (Fernald, 2015; Goldin et al., 2021), this suggests that increases in future expected—but not yet realized—dividend growth are a rather unlikely driver of the big bang. Therefore, we focus our analysis on the other two drivers and investigate whether the post-1980s capitalization increases could have

[7] In Fig. 12, we annualize the discounted sums of r and g by multiplying them by $1 - \rho$.

[8] A 10 percentage point increase is roughly 25% in relative terms, meaning a $0.25 \times 0.151 \times 1.048 \approx 0.0396$ fall in real total return using the coefficients in column 1.

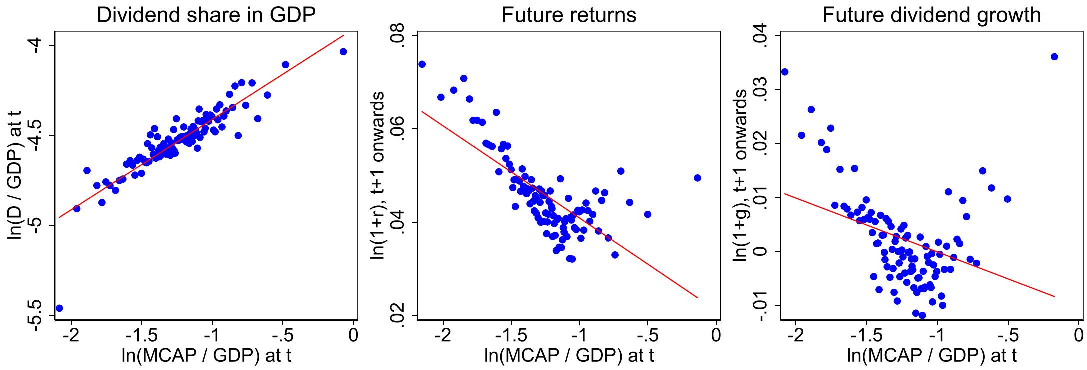

Fig. 12. Correlations between market cap, current dividend share, future returns, and future dividends.
Binned scatter plots of pooled full sample data (17 countries, 1870–2016), 100 bins. Each point represents the group-specific means of both variables after controlling for country fixed effects. All variables are winsorized at the 1% level. Market cap to GDP and dividends to GDP are adjusted for structural breaks.

Table 3
Stock market capitalization as a predictor of equity returns and dividends.
This table reports the results of regressing future equity returns and dividend growth on today's market cap. The market cap to GDP ratio is adjusted for structural breaks. r is total real return, dg is real dividend growth, er is excess return, and r^{safe} is real government bond return, all measured in logs. All regressions include country fixed effects, and those in columns (5) and (6) additionally include year fixed effects. Standard errors are clustered by country and year and adjusted for autocorrelation. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline		Post-1985		Year effects	
	r_{t+1}	dg_{t+1}	r_{t+1}	dg_{t+1}	r_{t+1}	dg_{t+1}
ln(MCAP$_t$/GDP$_t$)	−0.150***	−0.074*	−0.211***	−0.023	−0.098***	−0.060
	(0.036)	(0.041)	(0.048)	(0.069)	(0.032)	(0.053)
R^2	0.063	0.012	0.099	0.001	0.516	0.218
Observations	1869	1869	492	492	1869	1869
	(7)	(8)	(9)	(10)	(11)	(12)
	Risk premia and safe rates		5-year returns		No structural breaks	
	er_{t+1}	r^{safe}_{t+1}	$\bar{r}_{t+1,t+5}$	$\overline{dg}_{t+1,t+5}$	r_{t+1}	dg_{t+1}
ln(MCAP$_t$/GDP$_t$)	−0.128***	−0.046*	−0.097***	−0.042**	−0.039***	−0.009
	(0.031)	(0.026)	(0.023)	(0.018)	(0.011)	(0.015)
R^2	0.040	0.011	0.136	0.024	0.018	0.001
Observations	1869	1869	1768	1768	1869	1869

been driven by a lower equity discount rate (Section 5.2) or an increase in the dividend share of GDP (Section 5.3), and assess the relative contributions of these two factors (Section 5.4).

5.2. A declining discount rate

Safe interest rates have declined markedly over the long run (Del Negro et al., 2019; Holston et al., 2017; Schmelzing, 2020). Much of this decline happened after 1980, a similar time period to that of the market expansion during the big bang. This makes declining discount rates a natural candidate for explaining the cross-country market capitalization increases observed after the 1980s. But the relevant discount rate for equity is the sum of the safe rate and the market risk premium. Using the Gordon growth model, we can calculate the equity discount rate $\mathbb{E}(R_{t+1})$ as the sum of the expected dividend-price ratio and expected future cashflow growth:[9]

$$\mathbb{E}(R_{t+1}) = r^{safe} + \text{Risk premium} \approx \mathbb{E}(D_{t+1}/P_t) + \mathbb{E}(\tilde{g}_{i,t+2}). \quad (8)$$

The left-hand panel of Fig. 13 shows the long-run trend in a simple proxy of the equity discount rate and a lower bound for the expected return on equities if expected cashflow growth is larger than zero—the dividend-price ratio D/P. The dividend-price ratio has declined over the long run, falling from 5% in the early 20th century to a low of 2% in 1990 before recovering to around 3% in 2016. Earnings-price ratios—which allow us to look

[9] This is a levels version of the Campbell and Shiller (1988) decomposition derived by Blanchard (1993). Here $\tilde{g}_{i,t+2}$ is the annuity value of future dividend growth, calculated as $\tilde{g}_{t+2} = w_1\mathbb{E}g_{t+2} + w_2\mathbb{E}g_{t+3} + \ldots + w_\tau\mathbb{E}g_{t+\tau+1}$. $g_t = D_t/D_{t-1} - 1$ is the year-on-year cashflow growth and $w_t = (1+g)^{\tau-1}(r-g)/(1+r)^\tau$ are the weights, where g and r are the average dividend growth and return rates.

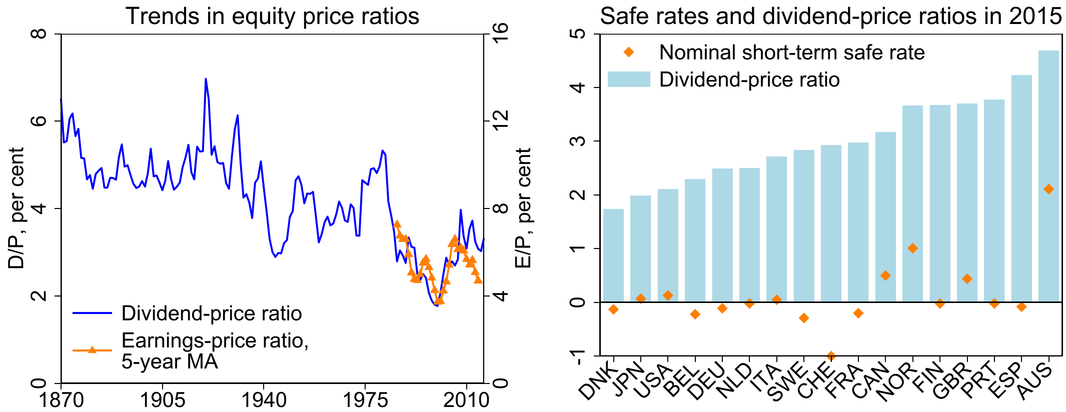

Fig. 13. Simple proxies for the risky and safe discount rate.
Left-hand panel shows unweighted averages of 17 countries, with earnings-price ratios calculated from firm-level microdata in Compustat Global and North America. Right-hand panel shows the level of the dividend-price ratio and nominal short-term interest rate in 2015.

through changes in corporate payout policy, such as the increasing use of stock buybacks during recent decades (see Grullon and Michaely, 2002; Megginson and Von Eije, 2008, and Appendix D.2)—show a similar declining pattern from the 1980s onwards.

Still, these declines—especially the part that occurred after the 1980s—are not as marked as the decline in the safe rate, which fell from historically high levels in the aftermath of the 1970s stagflation to around zero by 2015. The right-hand panel of Fig. 13 shows the level of the dividend-price ratio and the nominal safe rate in 2015. Assuming positive inflation, the nominal safe rate provides an upper-bound estimate of the real safe rate. For all the countries in our sample, the dividend-price ratio is much higher than the safe rate and the differences are substantial, on the order of magnitude of several percentage points. This suggests that even though the equity discount rate has decreased, equity risk premia were still sizeable and the discount rate was still relatively high in 2015.

In addition to studying the trends and levels of the raw data, we also estimate the expected return $\mathbb{E}(R)$ and the trend real safe rate r^{safe}. To do this, we first estimate expected cashflow growth by constructing a long-run forecast of future dividends. This forecast is the average of two proxies from Kuvshinov and Zimmermann (2020), the first of which forecasts future dividends using current asset valuations within a flexible time-varying VAR specification, and the second of which equates the long-run dividend growth rate to a long-run GDP growth forecast.[10] For the safe rate, we extend the Del Negro et al. (2019) estimates of the trend long-term real government bond yield to the 17 countries in our sample.

The resulting expected return estimate, pictured as the blue line in the left-hand panel of Fig. 14, displays a similar trend to the dividend- and earnings-price ratios but a slightly smaller long-run decline due to moderate increases in the expected cashflow growth offsetting some of the decline in equity price ratios (Eq. (8)). Like with the dividend-price and earnings-price ratios, the post-1980s decline in the expected equity return is much smaller than that in the safe rate (dark green area). Correspondingly, the difference between the two, the equity risk premium (light blue area) has increased materially since 1990. These broad cross-country patterns are mirrored in country-level data. The right-hand panel of Fig. 14 shows the change in the real safe rate and the risk premium, as well as their sum, the expected return, between the 1980s and 2015. In all countries, the trend real safe rate has declined while in all bar three, the risk premium has increased. No country registers a large risk premium decline. These patterns hold regardless of the way we measure the expected risky and safe returns in the data.

The post-1980s trends in risky and safe discount rates are consistent with existing evidence on the falling safe rate, stable return on productive capital, and a rising equity premium in the US (Caballero et al., 2017; Gomme et al., 2015; Summers and Rachel, 2019). Existing literature offers several explanations for these trends, which center around either a higher demand or a lower supply of safe investments—both factors that would push down the safe rate and increase the risk premium (Caballero et al., 2017; Farhi and Gourio, 2018; Kuvshinov and Zimmermann, 2020). The increases in the market cap to GDP ratio may have actually contributed to the increases in demand for safety by increasing the volatility of equity wealth relative to income (right-hand panel of Fig. 3), thereby increasing the risk exposures of equity investors and risk premia.

Taken together, these trends mean that even though low equity discount rates have contributed to the increases in market capitalization during the big bang, they are unlikely to be its main driver. We next explore a third poten-

[10] We use the average of these two forecasts to provide a balanced perspective. The trend decline of expected returns using the long-run GDP growth forecast is somewhat stronger than that using the VAR dividend forecast, since the dividend share in GDP has increased (Section 5.3), but it is not clear whether the dividend share will keep increasing over the longer run, hence our use as the GDP growth forecast as an additional metric. For more detail on the expected risky and safe return estimation, see Kuvshinov and Zimmermann (2020).

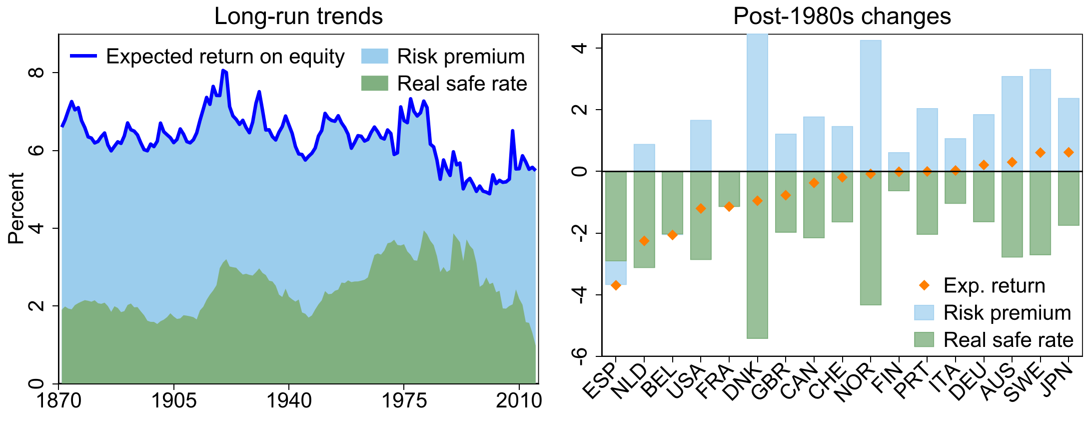

Fig. 14. Expected equity returns, safe rates, and risk premia.
The expected equity return is the dividend-price ratio plus expected cashflow growth calculated as the average of a VAR forecast of future dividends and a forecast of long-run GDP growth. The safe rate is the trend long-term real government bond rate estimated using the Bayesian VAR method of Del Negro et al. (2019), and the risk premium is the difference between expected return and safe rate. See Kuvshinov and Zimmermann (2020) for more details. The left-hand panel shows trends in unweighted cross-country averages. The right-hand panel shows the differences between the levels in the 1980s and 2015.

tial driver of the post-1980s increases in market capitalization: a change in the profit share of listed firms.

5.3. A profit shift towards listed firms

The profits of US corporations have increased markedly over recent decades (Barkai, 2020). Our data allow us to put these recent US trends into a cross-country historical perspective, and show that the corporate profit boom is global, historically unprecedented, and a key driver of the post-1980s increases in market capitalization across advanced economies. We further show that these increases have been driven by higher profit margins rather than market shares, and that the profits of listed firms have grown much faster than other types of capital income.

We start by examining long-run trends in the ratio of listed firm profits to GDP. The solid blue line in Fig. 15 shows that the share of listed firm dividends in GDP has roughly tripled between the 1980s and 2015—an increase comparable to that in the market cap to GDP ratio. These recent increases are also mirrored in earnings data, which allow us to look through the impact of changes in payout policy on the trends. The orange diamonds in Fig. 15 show that measures of listed firms earnings, computed from Compustat Global and North America, display similar relative increases to dividends, measured either in our long-run data or in the same Compustat sample. Longer-run US data from Shiller (2015) show that the recent earnings increases are also unusually large and persistent relative to those observed historically since 1870 (see Appendix Fig. C.1). Appendix Fig. C.2 further documents that these increases in earnings were not accompanied by significant changes in leverage.

As the next step, we decompose the increase in listed firm profits to GDP into a quantity component and a price component. A rise in profits can either come from the rising market shares of listed firms, or a higher profit rate per unit of revenue. Starting with market shares, the left-hand panel of Fig. 16 displays the ratio of total sales of listed corporations to domestic gross output from national accounts in 1990 and 2016. We do not observe that listed firms have expanded their sales systematically relative to the gross output of their home economy. While listed firms have gained in importance in some countries, they have lost market shares in others. This finding aligns with Gutiérrez and Philippon (2019, 2020), who show that market leaders (stars) have not materially grown their market shares in the US and globally. Instead, the profit boom of listed corporations seems to be driven by an increase in profitability per unit of sales. The right-hand panel of Fig. 16 shows the sales-weighted average dividend per sale ratio in 1990 and 2016. We observe a strong increase in the profit margin of listed firms across advanced economies. This holds not only for the dividend-to-sales ratio, but also for other profitability measures such as net income to sales or market cap to sales (see Appendix Fig. C.3) and across sectors of the economy (see Appendix Fig. C.4). We conclude that the rise in listed firm profits relative to GDP is largely driven by an increase in the profit margin.

Prior studies suggest that the profit margins of US corporates have been high before (Barkai and Benzell, 2018; Traina, 2018). We replicate this result in the left-hand panel of Fig. 17. The profit margin of listed firms in the US a U-shaped pattern, with high levels in the 1950s, low levels in the 1980s and 1990s, and high levels again after 2010. Why did these high profit margins not translate into high profit shares and market capitalization during the 1950s? The reason for this is that, even though profit margins were high, listed firm sales were small relative to the rest of the economy. The right-hand panel of Fig. 17 shows the evolution of the estimated market share of listed corporations in the US, again measured using the sales to gross output ratio. Listed firms' market share was low in the 1950s at around one-third of gross output, increased in the 1960s and 1970s, and remained at around 50% of gross output throughout subsequent decades. The rising market

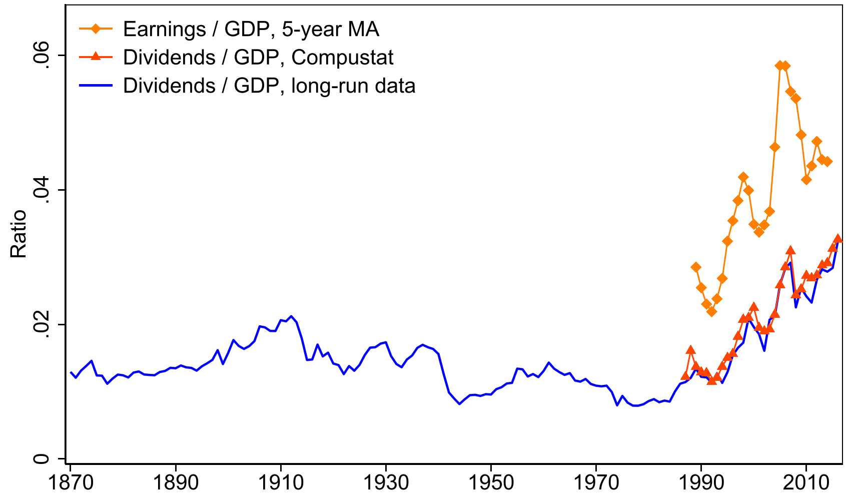

Fig. 15. Listed firm profit share over the long run.
Unweighted averages of 17 countries. Profit data are aggregated up from Compustat Global and Compustat North America and cover all listed firms with non-missing values for market cap, dividends, and earnings, scaled up to match our aggregate market cap data where necessary and dropping periods with insufficient coverage. Listed firm earnings are smoothed using a five-year moving average.

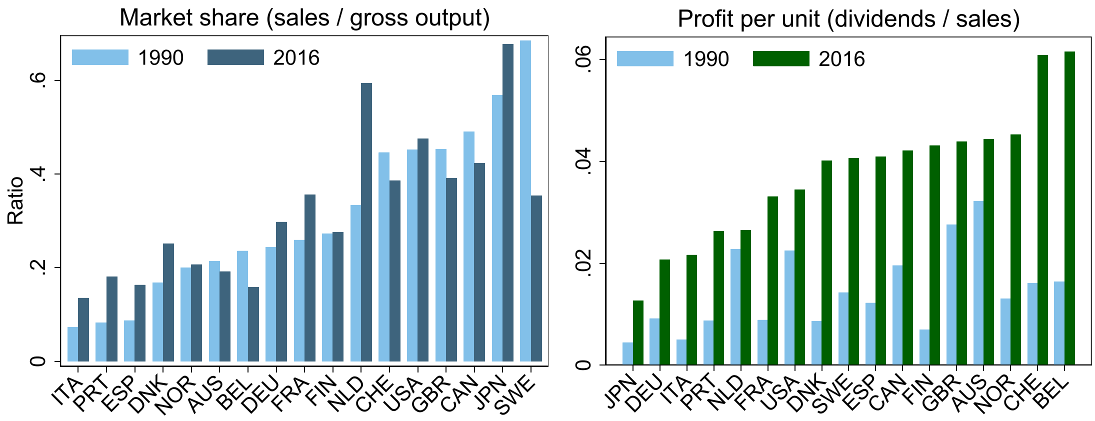

Fig. 16. Listed firm sales and profit per sale in 1990 and 2016.
The left-hand panel shows the ratio of listed firm sales to the country's gross output across 17 countries in 1990 and 2016. Countries are sorted by the listed firm market share in 1990. We calculate total listed firm sales in Compustat and rescale it by the coverage ratio of Compustat to total market cap to account for coverage changes in Compustat. The Compustat coverage in Italy, Portugal, Spain, and Sweden is still low in 1990, meaning that the 1990 figures for these countries should be interpreted with caution. For Portugal, we use 1994 data for the 1990 data point, as it is the first year with meaningful coverage. Gross output comes from the OECD STAN database, the EU KLEMS database, and the BEA. The right-hand panel shows dividends per unit of sales of listed firms in 1990 and 2016. The data are aggregated to the country level by weighting firm level data from Compustat by total sales.

share of listed firms was actually part of a much broader shift away from unincorporated businesses towards corporations (both C-corporations and S-corporations) in the US, which took place between 1950 and 1980 (see the left-hand panel of Appendix Fig. C.5). Thus, the negative impact of declining profit margins in the 1960s and 1970s was offset by the rising market share, with these two effects largely cancelling out to leave the listed firms profits and market capitalization shares and GDP stable throughout this time period.

The post-1980s increases in listed firm profits relative to GDP suggest that there has been a redistribution of income away from other sectors of the economy towards listed firms. This redistribution could have come about from either labor income or other forms of capital income. Karabarbounis and Neiman (2013) have shown that the share of labor income in GDP has fallen since the 1980s, and in a contemporaneous paper to ours, Greenwald et al. (2021) argue that the decline in the labor share is a key driver of the increase in US stock market capitalization. To investigate the contribution of this channel to the long-run cross-country increases in capitalization across countries, the left-hand panel of Fig. 18 shows the long-run evolution of three different capital share measures for six advanced economies. We take gross and net capital shares from Bengtsson and Waldenström (2018), and use the balance sheet net rental income data from Jordà et al. (2019) to further adjust these for rents.

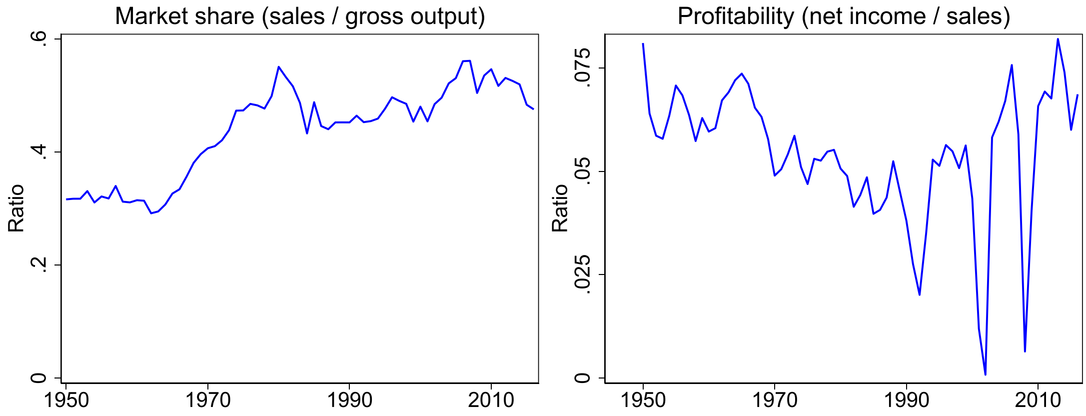

Fig. 17. Profitability and market shares of listed firms in the US.
The left-hand panel shows the ratio of listed firm sales to gross output in the US. The right-hand panel shows the sales-weighted average net income per unit of sales. Data cover all listed firms in the CRSP-Compustat Merged (CCM) dataset. To account for changes in coverage in the CCM database, we rescale sales by the ratio of CCM mcap to aggregate market cap. This implicitly assumes that the CCM sales to mcap ratio is representative of all listed equities.

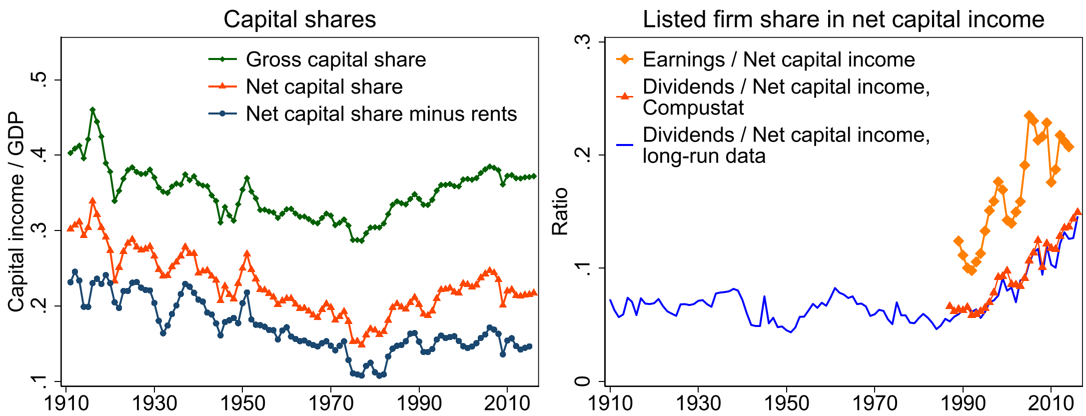

Fig. 18. Listed firm profits and capital income.
Unweighted cross-country averages. Data on gross and net capital income are from Bengtsson and Waldenström (2018) and cover Australia, France, Germany, Sweden, UK, and US. Rent data are from Jordà et al. (2019). Profit data are aggregated up from Compustat Global and Compustat North America and cover all listed firms with non-missing values for market cap, dividends, and earnings, scaled up to match our aggregate market cap data and dropping periods with insufficient coverage. Listed firm earnings are smoothed using a five-year moving average.

The trends suggest that changes in the capital share play relatively little role in explaining the rising listed firm profit share. While the gross capital share (green diamonds) has indeed increased substantially since the 1980s, the net-of-housing net capital share (blue circles) has remained broadly flat, in line with evidence in Rognlie (2015) and Gutiérrez and Piton (2020). Furthermore, both gross and net capital shares, if anything, have declined slightly over the long run and were much higher during the late 1930s—a time of low market capitalization—than they are today. Correspondingly, the right-hand panel of Fig. 18 shows that the ratio of listed firms' earnings to net capital income has increased markedly during the recent decades, rising from 10% in 1990 to 25% in 2015. These increases are historically unprecedented, with the ratio of listed dividends to capital income standing at an all-time historical high of 15%.

Within-capital-income shifts not only account for a large proportion of the time series trend, but also for cross-country differences in market capitalization increases during the big bang. Fig. 19a shows that countries with the highest post-1980s market capitalization increases also recorded the largest shifts within capital income towards listed firm profits, but generally did not record larger increases in the capital share. The left panel shows that while the US recorded increases in both the capital share and market capitalization, many European countries such as Sweden and the Netherlands recorded historically unprecedented increases in market capitalization despite falling net capital shares. The middle and right panels show that country-level changes in dividend and earnings shares are positive in every country and strongly correlated with the magnitude of the increase in stock market cap. With the exception of the US, the patterns in earnings and

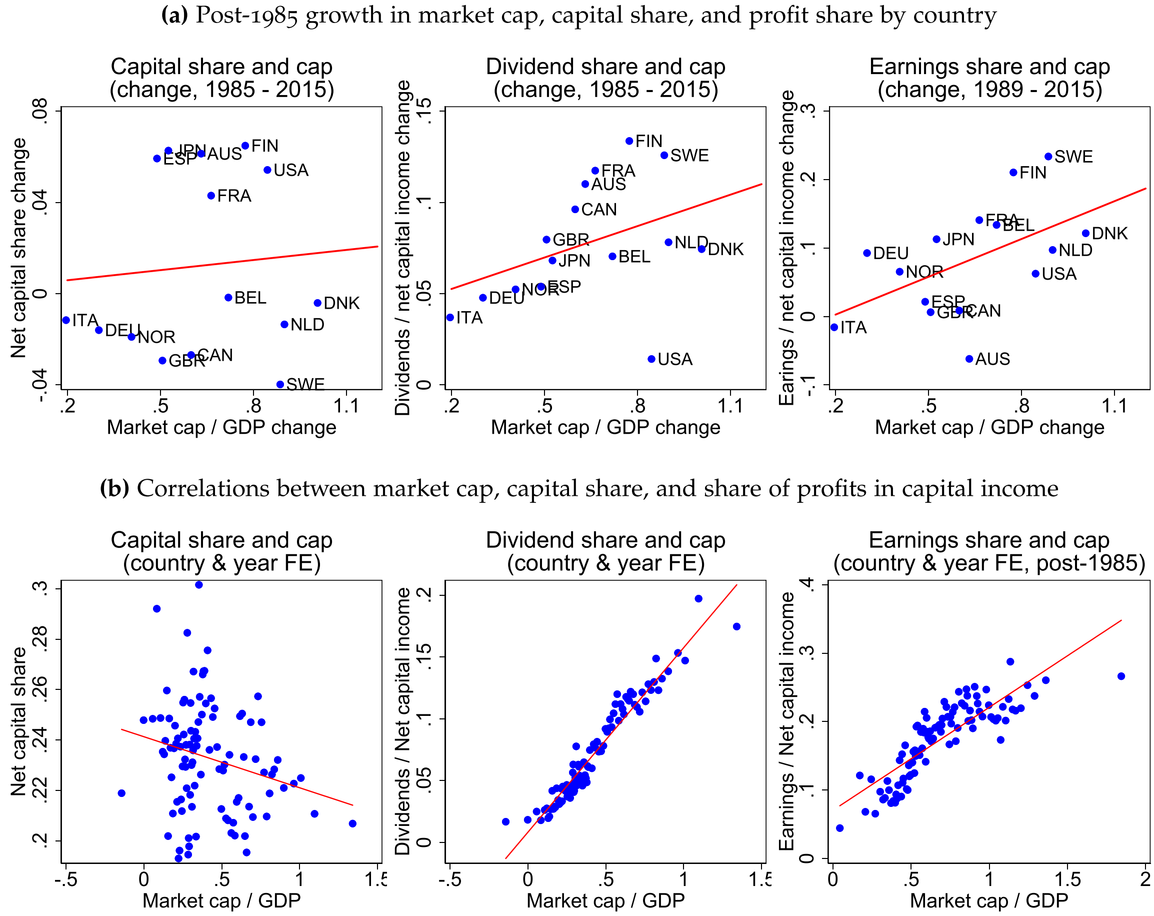

Fig. 19. Stock market capitalization, capital share, and profit share.
Capital share is net capital income / GDP, from Bengtsson and Waldenström (2018) adjusted for rents using data in Jordà et al. (2019). Dividend share is listed firms' dividends / GDP. Earnings share is listed firms' earnings / GDP, averaged over five years (Compustat Global and North America data). Panel (a): Country-level changes in capital, dividend, and earnings shares during the big bang. Earnings share change is for 1989–2016 to ensure consistency across countries Panel (b): Bin scatter plot, 100 bins, controlling for country and year fixed effects. Capital and dividend share for 1870–2016; earnings data for 1985–2016.

dividend shares are very similar, while the US shows much larger increases in the earnings share due to the more pronounced switch from dividends to buybacks as the means of shareholder compensation (Grullon and Michaely, 2002; Megginson and Von Eije, 2008, and Appendix D.2).

Fig. 19b shows that this importance of within-capital-income shifts applies not only to the big bang, but also holds for the full sample and when we absorb time trends and country differences using year and country fixed effects. It displays binned scatter plots of market cap against, respectively, net capital share in GDP, listed firm dividend share in net capital income, and listed firm earnings share in net capital income, divided into 100 bins. Capital shares are uncorrelated with market capitalization, while dividend or profit shares and market cap are strongly positively correlated.

What types of capital income might have fallen to compensate for the increase in listed firm earnings? Our analysis suggests that falls in interest expenses and corporate taxes were key. Fig. 20 shows the cross-country average corporate tax rate, as well as the post-1990 country-level changes in the interest expense to sales ratio. The left-hand panel shows that corporate tax rates declined considerably after 1980, meaning that corporations could distribute more money to shareholders without necessarily making higher pre-tax profits. But even pre-tax listed firm profits increased considerably, partly owing to large declines in costs in the form of interest expenses documented in the right-hand panel of Fig. 20. One common feature of these two trends is that they have the potential to generate an increase in corporate profitability while leaving capital shares largely unaffected. These declines in costs also help explain how profit margins and markups may have risen at a time of low price growth and steady or growing unit labor costs (Syverson, 2019). A detailed capital income breakdown for the US shown in the Appendix Fig. C.6 confirms that these tax and interest declines were

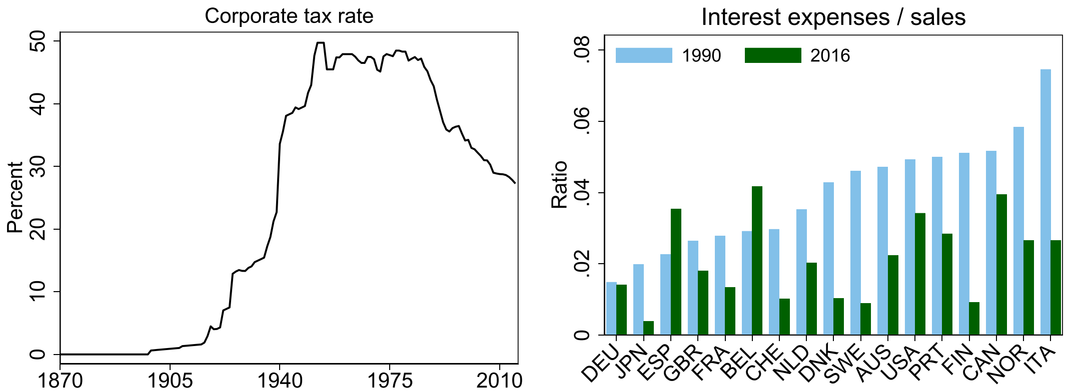

Fig. 20. Trends in corporate taxes and interest expenses.
Corporate taxes are from Jordà et al. (2019) and are an average of Australia, Canada, France, Germany, Japan, and the UK. Interest expenses and sales are sales-weighted averages of firm-level data from Compustat Global and Compustat North America. The Compustat coverage in Italy, Portugal, Spain, and Sweden is still low in 1990, meaning that the 1990 figures for these countries should be interpreted with caution. For Portugal, we use 1994 data instead of 1990 as it is the first year with meaningful coverage.

Table 4
Contribution of shifts in profits and discount rates to the big bang. This table shows the counterfactual evolution of the market cap to GDP ratio during the big bang under different scenarios. Counterfactual market cap is calculated as $D/GDP * 1/[\mathbb{E}(r) - \mathbb{E}(g)]$, where D/GDP are dividends paid by all listed firms relative to GDP, $\mathbb{E}(r)$ is the expected return on equities, and $\mathbb{E}(g)$ is expected real dividend growth. For all counterfactuals, expected real dividend growth is set to the sample average of 2.3%. The profit shift only counterfactual keeps the expected return at its 1980s average and allows the dividend-to-GDP ratio to increase to its 2015 level. The discount rate decline only counterfactual keeps the dividend-to-GDP ratio at its 1980s average and allows the discount rate to fall to its 2015 level. Columns (1) and (2) show the average market cap to GDP ratios for the specific time period across the pooled sample of 17 countries, and columns (3) and (4) display, respectively, the absolute and relative change in these ratios between the 1980s and 2015.

	(1)	(2)	(3)	(4)
	1980–1989 average	2015	Change in MCAP/GDP	Share of increase in the data
Actual MCAP/GDP	0.30	0.97	0.67	
Counterfactual MCAP/GDP:				
Profit shift only	0.26	0.74	0.48	71%
Discount rate decline only	0.26	0.32	0.05	8%
Combined	0.26	0.89	0.63	94%

the largest counterparts of the profit increases during the recent decades.[11]

When it comes to shifts from profits of unlisted businesses towards those of listed firms, the evidence is more mixed. In the US, the increases in profits of listed firms happened alongside those of other businesses with profit margins of listed and unlisted corporations, and of different forms of business (C-corporations, S-corporations, partnerships and sole proprietorships) all increasing materially since the 1980s (see Appendix Fig. C.7). In fact, Smith et al. (2019) identify the profit boom in unlisted “pass-through” businesses as one of the key drivers of income growth at the top of the income distribution. Outside of the US, countries registered much smaller increases in the total capital share and gross operating surplus to value added (Fig. 19 panel (a) and Gutiérrez and Philippon, 2018) and corporates did not lose market share to non-corporate businesses (Saez and Zucman, 2020). These trends suggest that the growth and profitability increases of unlisted businesses that we see in the US might be less pronounced in other countries.

To sum up, the big bang was accompanied by large increases in the listed firm profit share—the ratio of listed firms' earnings to GDP. These increases in profits were global, happened at a much faster pace than the economy-wide increase in capital shares, are comparable in size to those in market cap, and—especially in their cross-country scope—are historically unprecedented.

5.4. Accounting for the big bang

In this section, we quantify the contribution of individual drivers to the increases in the market cap to GDP ratio since the 1980s. To determine this, we run a simple counterfactual exercise of the following form: we allow either the profit share or the discount rate to vary with the actual trend observed in the data, but fix all the other market cap determinants at their 1980s levels. We then estimate the counterfactual market cap using a constant-growth Gordon

[11] Such a breakdown of capital income is to our knowledge not available in countries that follow the SNA instead of the NIPA national accounts guidelines, which only reports gross operating surplus.

model version of Eq. (5):

$$\frac{MCAP_t}{GDP_t} \approx \frac{D_t^{agg}}{GDP_t} * \frac{1}{\mathbb{E}(r_{t+1}) - \mathbb{E}(g_{t+1})}. \tag{9}$$

To ascertain the relative importance of the different channels, we compare the counterfactual increase in market cap obtained by varying the profit share D/GDP or the discount rate $\mathbb{E}(r)$, and keeping other factors constant to the actual increase observed in the data. Throughout this counterfactual exercise, we fix expected dividend growth $\mathbb{E}(g)$ at its long-run mean level of 2.3% p.a.[12]

Table 4 shows the actual market cap to GDP ratio before and after the big bang in the top row and the counterfactual market cap levels under various scenarios in the bottom rows. Column 1 shows the actual and counterfactual market cap levels during the 1980s, the decade before the big bang. Column 2 shows the average level after the big bang, in 2015. Columns 3 and 4 show the resulting market cap increases. Starting with column 1, the average level of market cap in the 1980s was around 30% of GDP. During this period, dividends were around 1% of GDP and expected equity returns were on average 6.1%. Plugging these into Eq. (9) gives us a counterfactual market cap to GDP ratio of $1/(6.1 - 2.3) \approx 0.26$, close to the ratio of 0.3 in the data, which is a starting point for all our counterfactual scenarios.

In the second row of Table 4, we allow the profit share D/GDP to increase to its 2015 average of 2.8%, while keeping the discount rate constant at 6.1%. This gives us a $2.8/(6.1 - 2.3) \approx 0.74$ counterfactual level of market cap in 2015, and a 48% of GDP increase in market cap during the big bang, which is around 71% of the total. In the third row, we allow the discount rate to fall from 6.1% to 5.5% while keeping dividends-to-GDP constant at 1%, which gives us a $1/(5.5 - 2.3) \approx 0.32$ counterfactual 2015 market cap level and a 5% of GDP increase, around 8% of the total. Together, these two factors amplify each other as higher cashflows are discounted at a lower rate. Allowing for both the profit shift and the discount rate decline in the bottom row results in a $2.8/(5.5 - 2.3) \approx 0.89$ counterfactual 2015 market cap level, and an increase of 63% of GDP accounting for 94% of the total increase in market cap during the big bang.[13]

6. Conclusion

This paper introduced a new dataset of stock market capitalization and its drivers—issuances, prices, dividends, profits and discount rates—covering 17 advanced economies between 1870 and 2016. A high-level investigation of the data reveals two broad eras of stock market growth: the period before the 1980s, during which the stock market grew at the same long-run rate as GDP and this growth was driven by equity issuance; and the period after the 1980s, during which capitalization growth accelerated far beyond that in GDP, with this acceleration driven by sharp persistent increases in stock prices at a time of slowing issuance.

We show that the key driver of these post-1980s increases in market capitalization is a profit shift away from other parts of the economy towards listed firms. This profit shift is driven by higher profit margins, goes well beyond the recently documented increases in capital income, and has been aided by falls in interest expenses and corporate taxes. These trends are consistent with broader patterns of increasing market power and profitability of large firms in the US and globally (Barkai, 2020; De Loecker et al., 2020; De Loecker and Eeckhout, 2018). We also show that low safe rates and falling discount rates have made a relatively small direct contribution to the big bang, but generated sizeable falls in interest expenses, which provided an important indirect contribution to the observed increases in profits and, through this, the expansion in market cap.

Supplementary material

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jfineco.2021.09.008

[12] Expected dividend growth is calculated as the average of the long-run forecast of dividends and real GDP growth, consistent with our estimate of the expected return in Eq. (8). See Section 5.2 and Kuvshinov and Zimmermann (2020) for more detail.

[13] Note that starting the counterfactual scenario before the 1980s would somewhat increase the relative contribution of the fall in the discount rate because expected equity returns started falling before 1980 (Fig. 14). Starting it later would increase the contribution of the profit shift relative to that of the discount rate. But regardless of the starting date, we are always able to explain almost all of the increase in market cap during the big bang, and the profit shift remains the dominant factor. Similarly, increasing the mean expected dividend growth results in larger counterfactual increases during the big bang and a higher explanatory power of both the profit shift and the discount rate change.

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