

GLOBAL STRATEGY PAPER NO. 56

The Postmodern Cycle

Positioning for secular change



- From the 1980s a **'Modern Cycle'** evolved driven by lower inflation, independent central banks, globalisation, lower volatility, longer cycles and higher profit shares of GDP.
- We are entering a new **'Postmodern'** cycle in which inflation is a bigger risk than deflation. We are also likely to see greater regionalisation, more expensive labour and commodities, larger and more active governments.
- Investment returns should be weaker in this cycle as higher interest rates imply smaller contributions for valuation. We expect a more **'Fat & Flat'** than a secular bull market with more focus on alpha than beta. Investors are likely to focus more on margins than revenues.
- Investors should focus on:
 - **'Adaptors'** that can adjust business models, and **'Enablers and Innovators'** that help to boost efficiency by reducing energy and labour costs.
 - **High/stable** margin businesses and companies that are beneficiaries of increased spending on **capex**.

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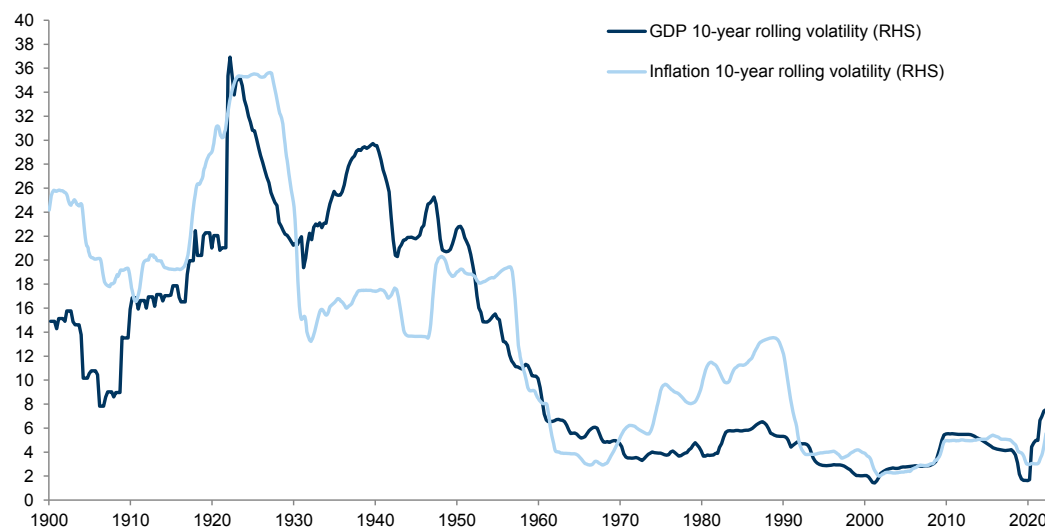
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The New Postmodern Cycle

Postmodernism ‘...an attitude of skepticism toward what it considers as the grand narratives and ideologies of modernism’ which ‘rejects the universal validity of binary oppositions, stable identity, hierarchy, and categorization’. Wikipedia

- **The traditional investment cycle** (pre 1980s) was generally short and volatile reflecting booms and busts and periods of high and low inflation and interest rates; investors typically required a high dividend yield to compensate for the risks in equity markets.
- **The ‘Modern Cycle’**, (from the early 1980s) was characterised by more stability and predictability. It benefited from sustained falls in inflation, interest rates and risk premia. Geopolitical tensions eased and supply side reforms accompanied waves of deregulation, the end of capital controls, deeper capital markets and stronger World trade growth. A new era of globalisation drove profit shares of GDP to record highs. Independent central banks and forward guidance contributed to longer and less volatile economic cycles (see [Exhibit 1](#)).
- **The ‘Post Modern’ cycle** (post the Pandemic) is likely to be driven by a different set of macro conditions and priorities, implying different styles of investment and opportunities.

Exhibit 1: Independent central banks and forward guidance contributed to longer and less volatile economic cycles.



Source: Goldman Sachs Global Investment Research

What will the new cycle be like?

The Modern Cycle was an era when markets repeatedly responded to policy interventions and investors were conditioned to expect policy support when growth was weak. Investment returns were heavily influenced by lower interest rates and, in the post financial crisis era, equity markets were increasingly driven by binary outcomes between competing factors such as ‘Growth and Value’ that reflected macro trends. As we exit the pandemic, a combination of factors shaping a new type of cycle **implying**

different styles of investment and opportunities. It is likely to reflect elements of classical cycles (higher inflation and higher government spending) together with entirely new developments around issues like ESG and decarbonisation. We should expect less binary outcomes in terms of factors and more idiosyncratic and alpha opportunities; in summary:

- The post financial crisis was driven by a negative demand shock as the private sector de-levered; this one is driven by a negative supply shock from the pandemic and the war in Ukraine. **This cycle is likely to be more inflationary.**
- Since the early 1980s interest rates and inflation have trended lower; they are now trending higher (albeit from record low levels) as we transition from QE to QT. **This cycle is likely to experience higher yields, both nominal and real.**
- The last 20 years was characterized by cheap and plentiful energy and labour; **both energy and labour supplies are becoming more scarce and more expensive.**
- Since the early 1980s we have seen a combination of deregulation, smaller government, lower taxes and rising profit shares of GDP; **we are entering a period of more regulation, bigger government (higher government shares of GDP), higher taxes and potentially lower profit shares of GDP.**
- Since the late 1980s we have been in an era of increasing globalisation triggered by technology (cheaper and more effective communication) as well as geopolitics (with the collapse of the Berlin Wall 1989, the entry of India in the WTO in 1995 and China in 2001). **We are entering an era of greater regionalisation driven by technology, cheaper and less labour-intensive production making on-shoring more viable and geopolitical tensions.**
- Since 2000 the share of capex to sales has trended down amid lower nominal GDP. **Demands to simplify supply chains from a security and ESG perspective, coupled with increased spending on defense and de-carbonisation is likely to push capex spend higher.**
- In the last cycle, weak nominal growth and record low interest rates have favoured growth strategies. **This cycle is likely to focus more on stability and sustainability of margins and earnings.**

How do these changes impact the investment environment?

In our Post Pandemic Cycle series we have argued that the characteristics of the market cycle are changing. In particular, we believe that:

- Investment returns should be weaker in this cycle as higher interest rates imply smaller contributions for valuation. We expect a **more 'Fat & Flat'** than a secular bull market with more focus on alpha than beta.
- The factor approach of **looking at the market purely through the binary lens of Growth versus Value is becoming less relevant; we are likely to see a more eclectic mix of factors and sectors driving the market.**
- **Capex growth is likely to trend higher** as investor priorities shift towards

more spending on defense, renewable energy and localised supply chains and reduced inequality.

We would focus on companies that can:

- **Innovate, Disrupt, Enable and Adapt**, irrespective of region or sector,
- **Sustain margins and dividend growth, and**
- **Boost productivity** by enabling solutions to scarce and expensive energy and labour.

Overall we believe that the Post Modern cycle will be driven by five key trends and themes, each offering specific opportunities for investors. These involve a shift from

1. Disinflation to inflation, and from negative to positive interest rates.

2. Globalisation to regionalisation.

3. Cheap & plentiful, to scarce and expensive labour and energy.

4. Low capex to more spending/larger government with more debt and intervention.

5. Growth to margin scarcity.

The secular shifts and opportunities

1. From disinflation to inflation

Increased asset diversification and more real asset exposure (i.e. commodity, real estate, infrastructure) and dividend compounders

The modern era of disinflation started in the early 1980s. When Paul Volker became Fed president in the summer of 1979 US inflation was over 11% but, unlike today, US 10 year yields reached nearly 16%. Restrictive monetary policy designed to reduce inflation by constraining demand heralded a prolonged period of low inflation and strong growth, supported by positive supply side reforms.

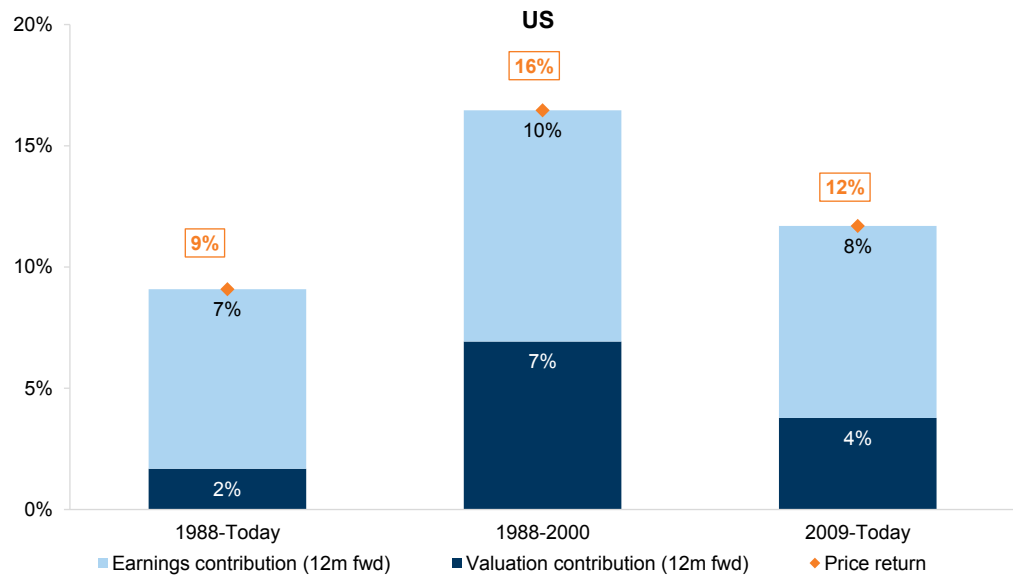
The downward trend in inflation, aided by the move towards independent central banks and inflation targets in the 1990s, accelerated following the collapse of the technology bubble in 2000 and the entry of China into the WTO in 2001.

Inflation took another leg down following the financial crisis in 2008 which, with the deleveraging of the private sector, prompted another major negative demand shock¹.

Equities performed strongly from the 1980s through to the end of the century and the collapse of the technology bubble. Over this period annualised returns were in the mid-teens and the valuation expansion accounted for over half of the returns as interest rates fell and valuations expanded ([Exhibit 2](#)).

Exhibit 2: Equities performed strongly from the 1980s through to the end of the century and the collapse of the technology bubble

Return decomposition



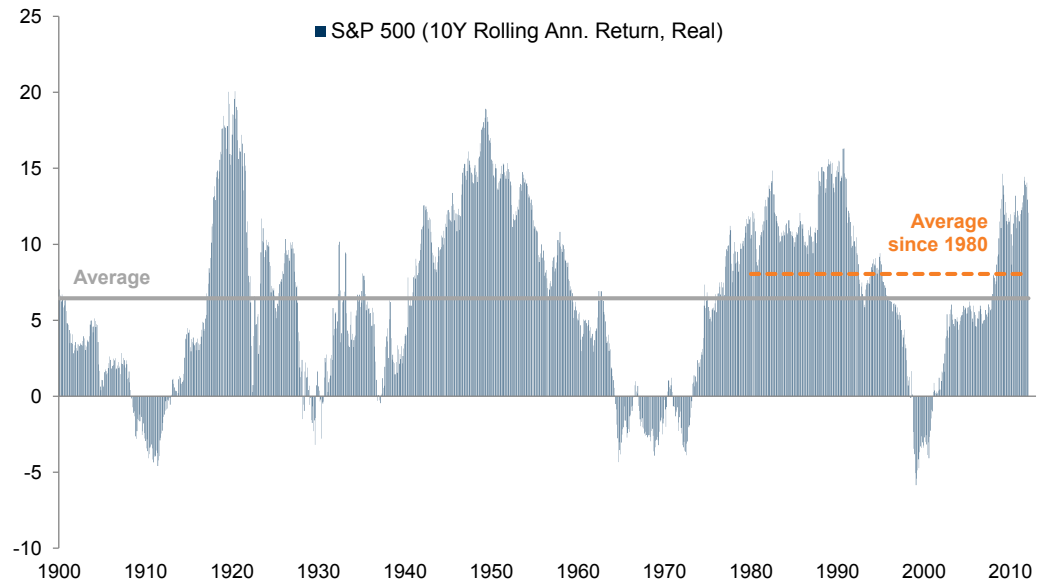
Source: Datastream, Goldman Sachs Global Investment Research

As a result, 10 year real returns in US equities bought between 1982 and 1992 annualised at around 15% ([Exhibit 3](#)).

¹ The impact of the financial crisis was a demand collapse estimated to be around one-sixth of GDP in 2010 alone and over \$2trillion of assets in financial institutions were written down (Oxenford 2018).

Exhibit 3: 10 year rolling real returns in US equities bought between 1982 and 1992 annualised at around 15%

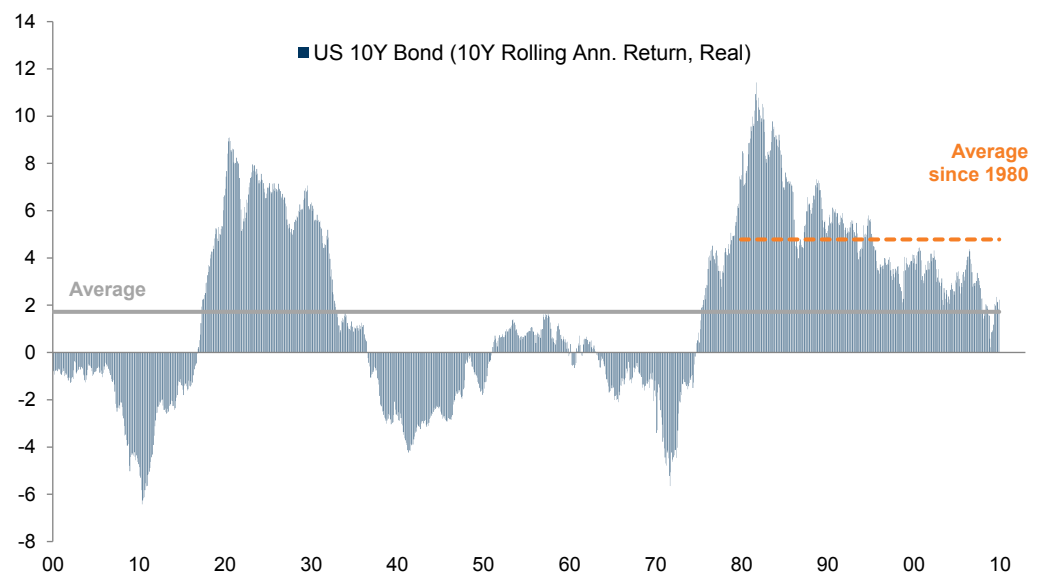
US equities 10 year subsequent real returns (rolling)



Source: Haver Analytics, Goldman Sachs Global Investment Research

Even after the trauma of the financial crisis, equities continued the secular bull market supported by ever lower interest rates; **the total return of S&P was positive in 17 of the past 19 years**. But of course the collapse in inflation and interest rates benefited bond returns too. As Exhibit 4 shows, 10 year real annualised returns for bonds bought in the early 1980s also reached double digits and have averaged around 5% since then.

Exhibit 4: Bonds also achieved remarkable returns



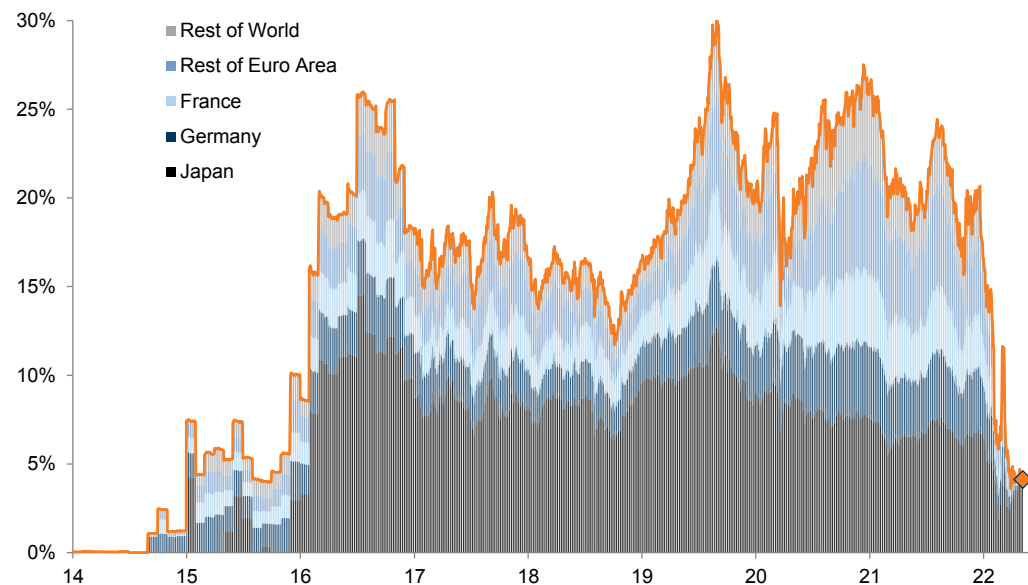
Source: Haver Analytics, Goldman Sachs Global Investment Research

The difference in the environment post the pandemic is striking. While demand was temporarily hit as a result of lock downs, it proved to be delayed rather than reduced. Household balance sheets were strong as a function of forced savings and furloughs and the **negative supply shock has been more significant and persistent**. The war in Ukraine has further disrupted supply chains. **These supply shocks are more inflationary.**

The shift in inflation expectations and trends towards higher interest rates in both nominal and real terms are likely to change the investment landscape, resulting in a **'fatter & flatter' (wider trading range and lower returns) market environment in comparison to the secular, valuation led, bull market that preceded it**. Under these conditions, investor focus should focus less on top line growth (less scarce in an environment of higher nominal GDP) and focus more on dividend and margin sustainability.

While aggregate financial asset returns are likely to be lower, inflationary risks should force investors up the risk curve and into more 'real' assets. This is important in the current context because years of disinflation and QE has resulted in many investors increasing exposure to government bonds. Bond term premia collapsed and risk premia in equities increased and in roughly one quarter of all government debt had a negative yield.

Exhibit 5: The fraction of global negative-yielding bonds has collapsed
Proportion of negative yielding global bonds



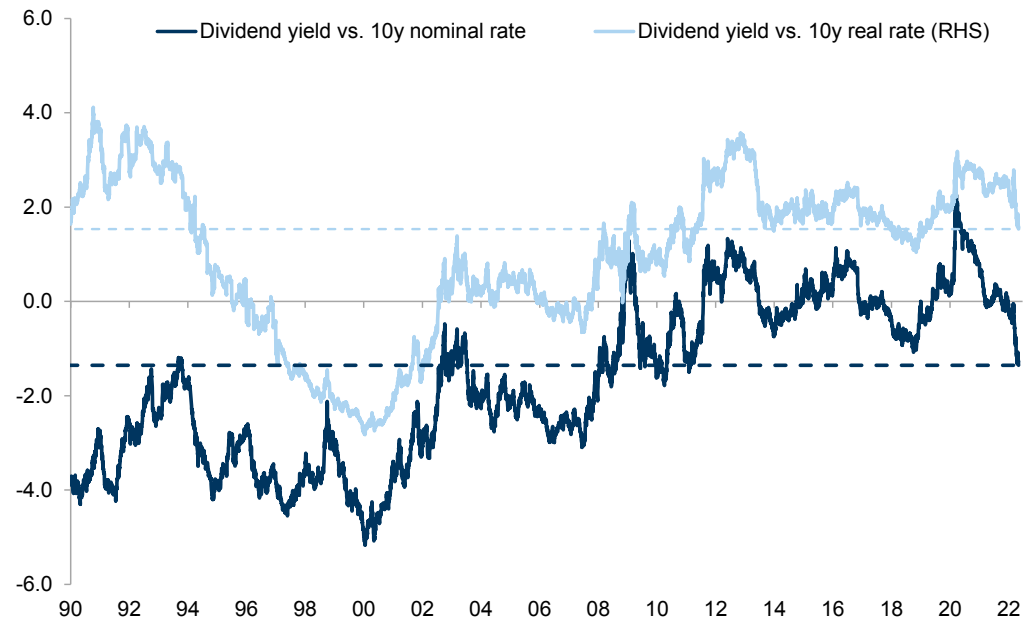
Source: Bloomberg, Goldman Sachs Global Investment Research

When higher inflation is that main tail risk, the process should reverse, pushing up term premia while reducing risk premia.

As [Exhibit 6](#) shows, the gap between dividend yields and nominal or real yields remains above the average since 1990. While equities may not have much upside in absolute terms, the risk balance has shifted, thereby raising their relative attractiveness in portfolio allocation towards real assets and equities.

Exhibit 6: Equities still have some cushion compared to real rates

S&P 500 24m fwd dividend yield - US 10y rates

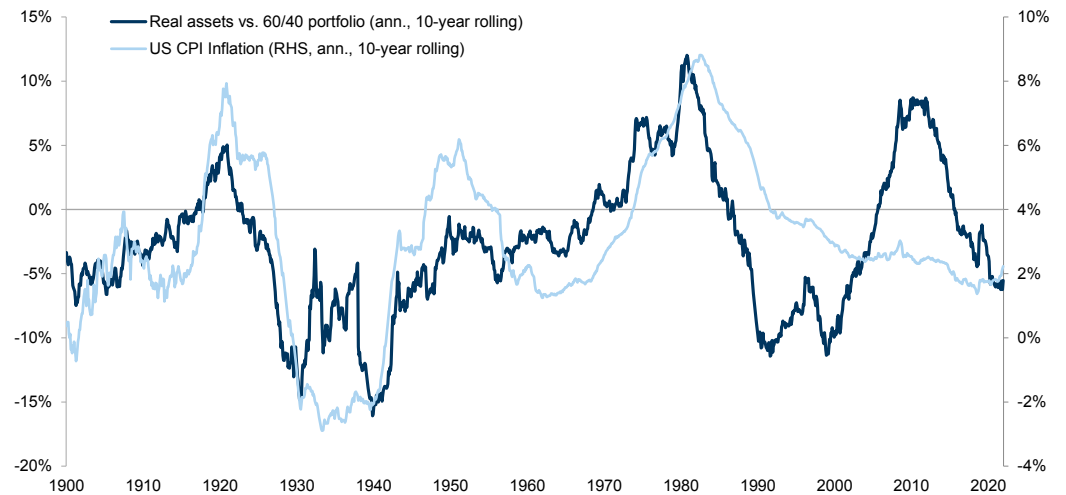


Source: Datastream, I/B/E/S, Bloomberg, Goldman Sachs Global Investment Research

In addition, real assets become more attractive in general and help to diversify.

Exhibit 7: Real assets have outperformed a 60/40 portfolio in periods of high and rising inflation

Total return performance



Note: Real assets is an average of S&P GSCI/ broad commodities index (TR) since 1900, Gold since 1939, FTSE NAREIT since 1970, S&P Global Infrastructure since 2000. Kenneth French sector portfolios before.

Source: Datastream, Bloomberg, Goldman Sachs Global Investment Research

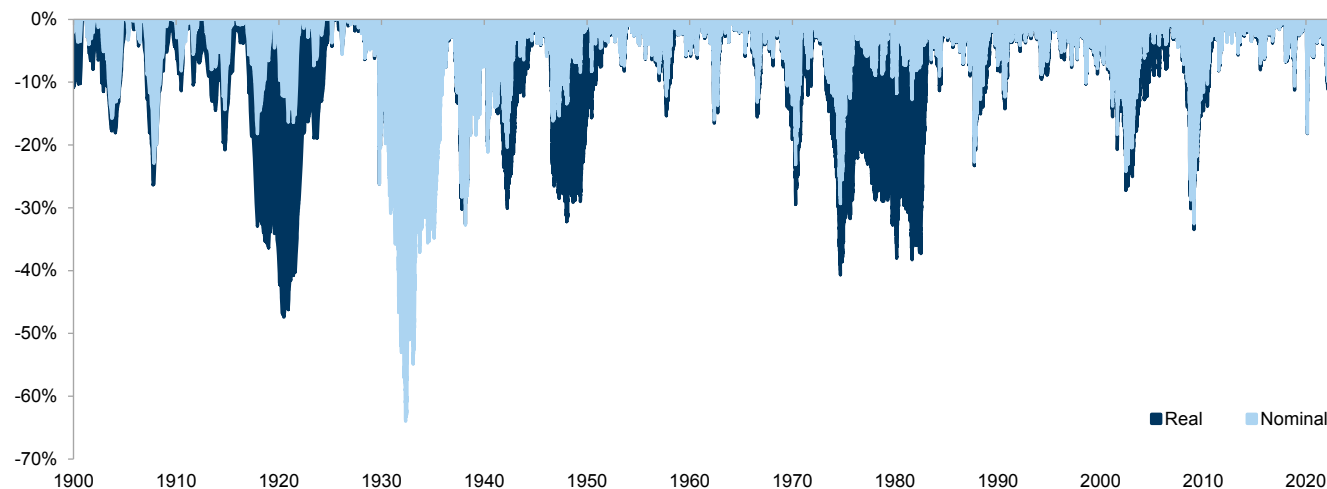
The consequences and investment implications:

Higher inflation, and in particular stagnation, in the pre 'Modern era' was a poor

environment for classic 60/40 (equity and bond) returns. As [Exhibit 8](#) shows, the main periods of negative real and nominal returns during these phases have been in periods of higher inflation.

Exhibit 8: There have been several prolonged periods of poor real returns for US 60/40 portfolios

Maximum 10-year rolling drawdown of a US 60/40 portfolio

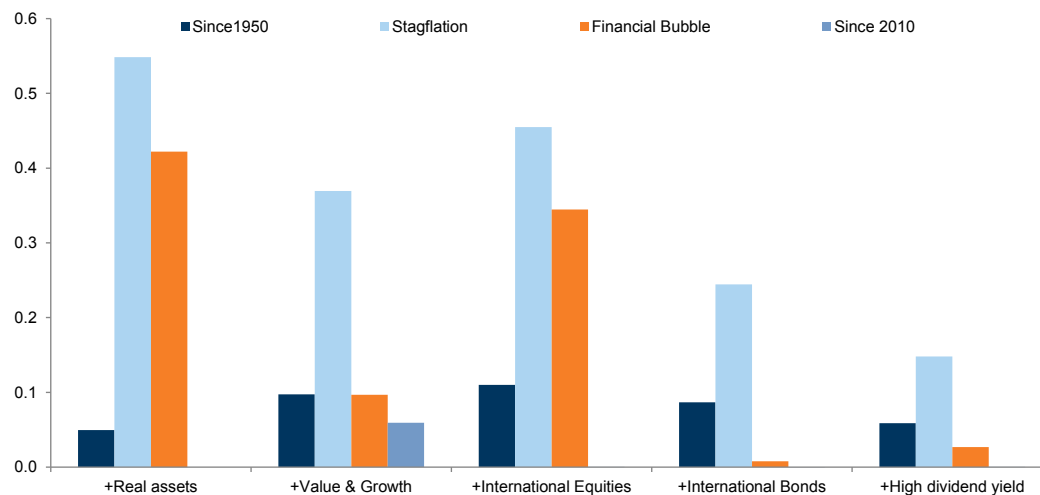


Source: Bloomberg, Haver Analytics, Goldman Sachs Global Investment Research

As [Exhibit 9](#) shows, in stagflationary periods (the light blue column) adding real assets to a portfolio and increased diversification has enhanced returns.

Exhibit 9: During 60/40 'lost decades' our 5 strategies would have materially enhanced Sharpe ratios

Improvement in optimal Sharpe ratio from adding assets to a US balanced portfolio (monthly returns)



Source: Datastream, Haver Analytics, Goldman Sachs Global Investment Research

In these periods, three important observations can be made. Investors should:

- 1. Increase diversification across regions, factors and sectors**
- 2. Increase exposure to real assets**
- 3. Increase exposure to 'dividend compounders' - companies that can secure a stable and sustainable real income stream.**

2. From Globalisation to Regionalisation

'Enablers, Innovators and Adaptors'; selected technology and capex beneficiaries

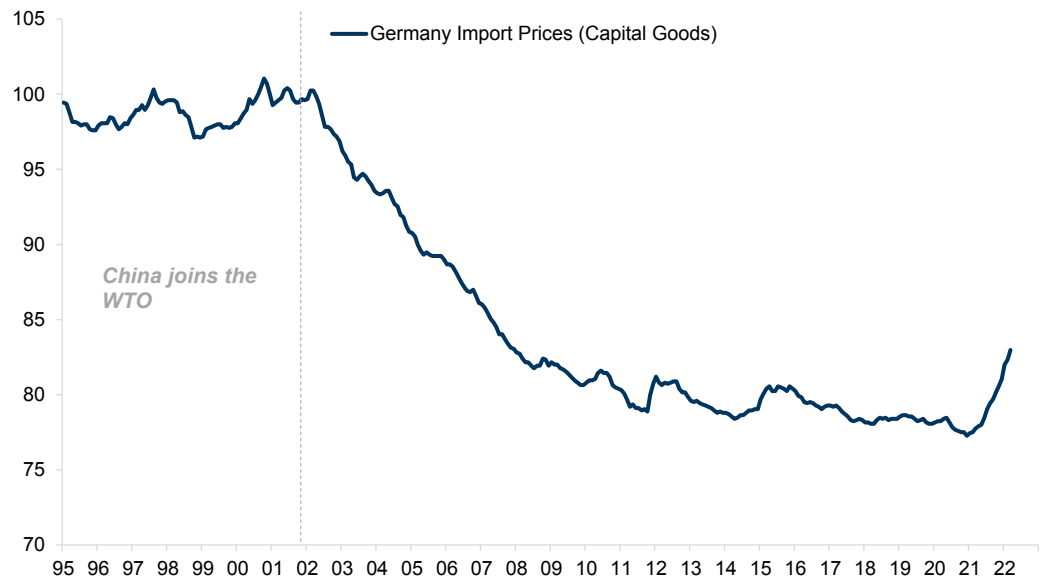
At the same time as the macro environment is shifting, the geopolitical environment is also evolving in a way that is very different to the one that shaped the secular bull market of the 1990s and 2000s. The economic problems of the 1970s helped to bring in sweeping economic reforms in the 1980s. The Reagan and Thatcher 'revolutions' resulted in waves of deregulation, lower unionisation, privatisation, lower taxes and the end of credit controls.

The pivotal Uruguay Round of GATT, that took place in 1986, included services and capital as well as textiles and agriculture and was the first time that developing countries played an active role. **This marked the start of a new era of globalisation that was to expand rapidly following the collapse of the Berlin Wall in 1989, the signing of NAFTA in 1994, India joining the WTO in 1995 and, finally, followed by China joining in 2001. Between 1995 and 2010 the pace of world trade growth grew at twice the pace of World GDP².**

The outsourcing of manufacturing to lower cost regions of the world boosted World trade and profit shares of GDP and the cost of importing capital goods back to the West dropped dramatically. Germany, for example, was a significant beneficiary (see [Exhibit 10](#)).

² Occasional Paper Series - Global value chains: measurement, trends and drivers

Exhibit 10: Germany import prices decreased since China joined the WTO



Source: Haver Analytics, Federal Statistical Office, Goldman Sachs Global Investment Research

At the same time, employment in manufacturing collapsed, even in the more manufacturing based economies like Germany.

Exhibit 11: Employment in manufacturing collapsed since 1995

Euro Area Employment - Industry (SWDA, millions)

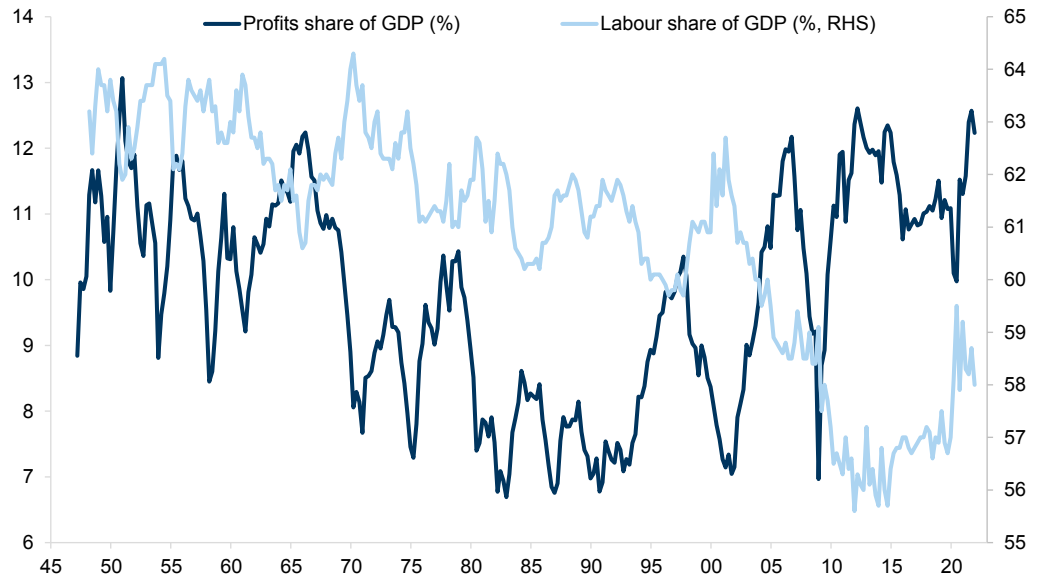


Source: Haver Analytics, Goldman Sachs Global Investment Research

The expansion of effective global labour supply resulted in a downward trend in labour shares of GDP while profit shares moved to record high levels.

Exhibit 12: The outsourcing of manufacturing boosted profits share of GDP while dampening labour share of GDP

United States

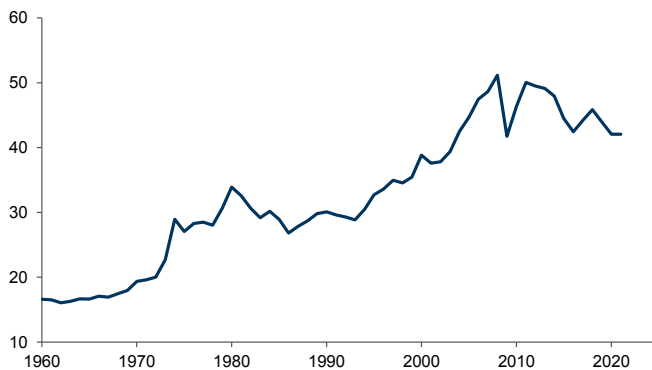


Source: Haver Analytics, Goldman Sachs Global Investment Research

In some ways the peak in globalisation in relation to World trade coincided with the financial crisis (see [Exhibit 13](#)). Since then World trade has slowed and trade share of GDP has also moderated (see [Top of Mind: \(De\)globalisation Ahead?](#)).

Exhibit 13: Global goods trade peaked as a share of GDP in 2008

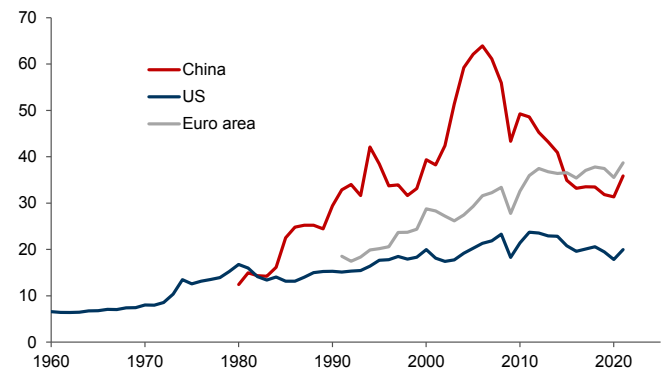
World merchandise imports plus exports, % of GDP



Source: IMF, World Bank, Goldman Sachs Global Investment Research

Exhibit 14: China's trade share of GDP has fallen sharply since 2006

Merchandise imports plus exports, % of GDP



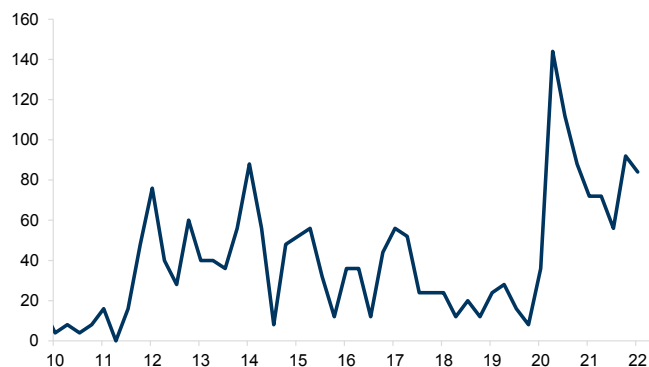
Source: IMF, World Bank, Goldman Sachs Global Investment Research

The current cycle looks likely to see an acceleration of this trend. **Growing ESG pressures, the focus on de-carbonisation and growing geopolitical considerations are likely to result in a move towards greater Regionalisation and on-shoring.**

Both the pandemic and the war have revealed the fragility and over reliance on just in time inventory systems and supply chains. Many companies actually are actively discussing de-globalisation, reshoring, and improving supply chain resilience (see [Exhibit 15](#) and [Exhibit 16](#)).

Exhibit 15: The US Manufacturing Renaissance last cycle was mostly Media driven...

Articles mentioning supply chain reshuffling in the Financial Times* - Count, annualised

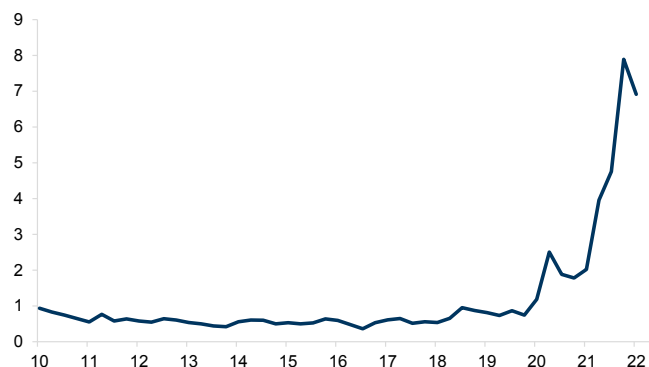


*Includes terms like “reshoring”, “nearshoring”, and “backshoring”.

Source: GS DataWorks, Goldman Sachs Global Investment Research

Exhibit 16: ...but now companies really are focused on improving supply chain resilience

Share of sentences mentioning supply chain reshuffling in Russel 3000 earnings call* - Index



*Includes terms like “reshoring”, “nearshoring”, and “backshoring”.

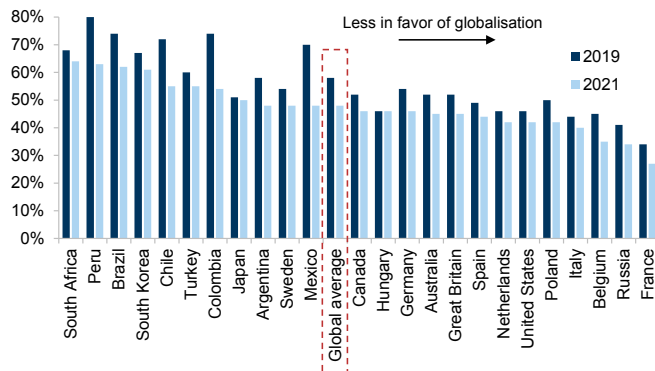
Source: GS DataWorks, Goldman Sachs Global Investment Research

The outperformance of US companies exposed to on-shoring relative to companies exposed to offshoring suggests that the market does expect some amount of reshoring in the years ahead.

Furthermore, public attitudes (and presumably government policy) has increasingly turned against the concept of globalisation.

Exhibit 17: Positive sentiment about globalisation has declined

% of respondents that agree with the statement “overall, globalisation is a good thing for my country”

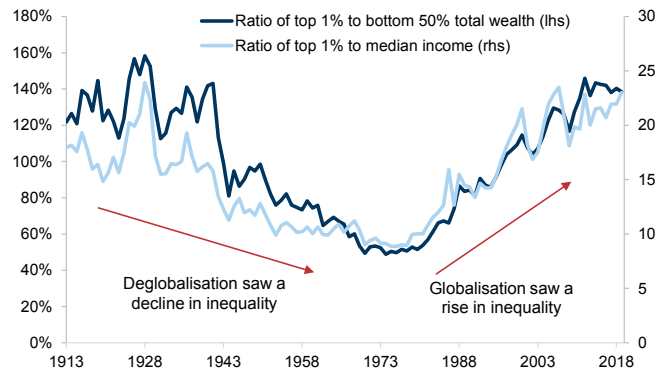


Ipsos World Opinion on globalisation and International Trade in 2021 (25-country survey for the WEF)

Source: Ipsos, Goldman Sachs Global Investment Research

Exhibit 18: Periods of increasing globalisation saw a rise in inequality

Ratio (United States)



Source: Distributional National Accounts, Goldman Sachs Global Investment Research

While the pandemic accelerated a number of trends that were already underway, in particular, the increase in digitalisation, online shopping, remote working and digital payments, the War in Ukraine is accelerating other trends that pre-existed the crisis. The ramping up of spending on non fossil fuel energy, for example, has become an issue of national security on top of a climate priority.

Legislation is starting to support the trend towards localisation. In the US, Senators Rubio and Warren have introduced a bill titled Strengthening Supply Chains for Service members and Security Act with the intention of reducing the US's, and the DoD in particular, reliance of foreign made pharmaceutical products.

There are similar pressures in the area of semiconductors. With considerable government funding potentially being passed in the U.S. and European countries signaling support for subsidising local semiconductor investments, we believe that re-shoring of certain parts of the supply chain will occur over the coming years.

Just as the 1970s saw an era of national champions (firms receiving special government support for security and political reasons) in the airline, banking and auto industries, so we are moving into an era of Regional champions in energy security, chip manufacturing and battery technology.

The consequences and investment implications:

More regionalisation is likely to mean more focus on Innovators and Enablers in the onshoring and supply chain regionalisation process. These will likely include ‘Innovators’ creating logistics solutions as well as technological implementations to build production using labour-saving techniques including robotisation. Regional champions are likely to get more support from governments in key ‘strategic’ industries.

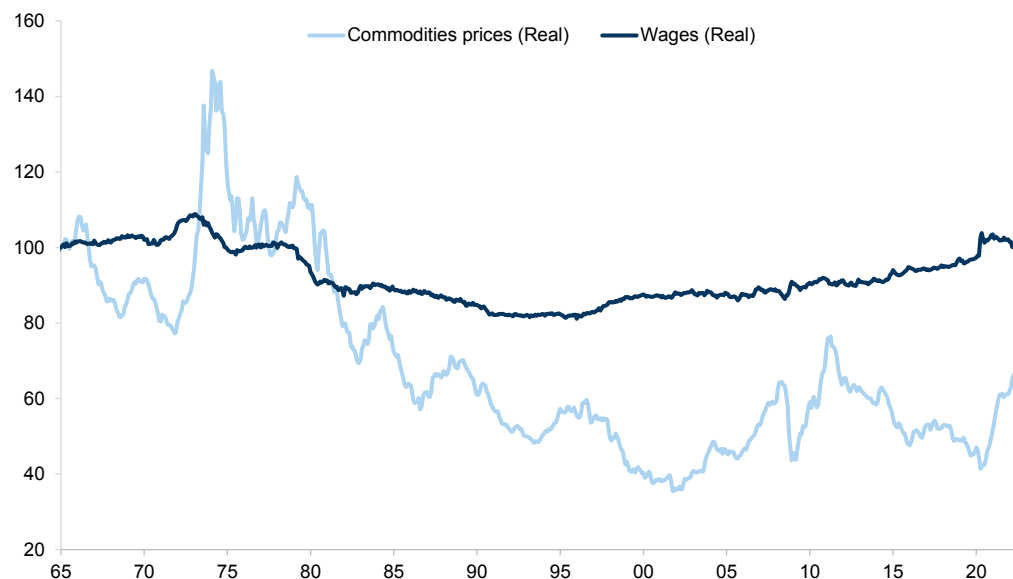
More local production is also likely to increase costs for some companies and will also raise the value that investors place on stable and sustainable margin businesses.

3. From cheap to scarce and expensive energy & labour

Prefer (i) High/Stable margin, (ii) Low labour Cost companies, (iii) 'Enablers and Innovators' - generating greater efficiency

Over the past 20 years, both commodities and labour have been in plentiful supply and have contributed to the disinflationary environment.

Exhibit 19: Abundance of labour and commodities have contributed to the disinflationary environment
CRB Spot Commodity Price Index and US Avg Weekly Earnings: Prod & Nonsupervisory (Total Private Industries). Deflated by US CPI



Source: Haver Analytics, Goldman Sachs Global Investment Research

Significant investment in the 1990s and 2000s meant that there was excess capacity in commodity exploration in the post financial crisis era. Meanwhile, globalisation pushed labour costs down in real terms, particularly for unskilled labour. **The combination meant an era of plentiful and cheap energy and labour with little incentive to invest.**

The trend towards globalisation, supported by both political and technological developments, allowed a significant outsourcing of lower skilled manufacturing jobs from Western economies.

The OECD calculates for example, that between 1990 and 2009 the share of labour compensation in National income fell in 26 out of 30 advanced countries with the median labour share of national income falling from 66.1% to 61.7%. In the UK, the ONS data show that the relative price of labour fell by around 20% between 2009 and 2015 as the labour supply increased by almost 4 million or 12.5%.

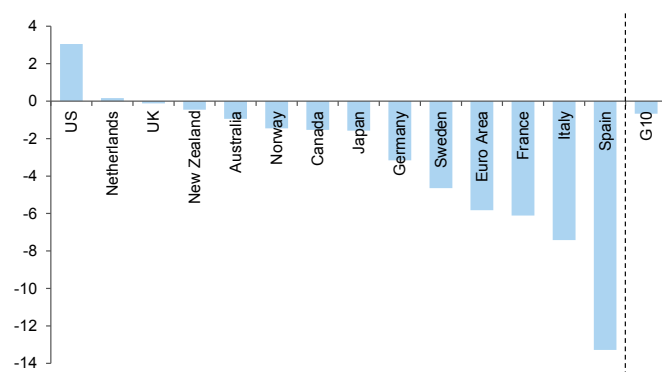
Meanwhile, the shale gas revolution resulted in record low natural gas prices in the US and had a profound impact on the energy industry. Following the collapse of the

technology bubble and then the financial crisis there was excess energy supplies and cheap prices with little incentive to invest.

The move towards more localisation has also supported a shift towards tighter labour market conditions. After many years of a declining trend in job postings, there has been a marked uptick since the pandemic. Unemployment has reached record low levels and in many countries wages are rising. **In a sign of the times, Amazon workers in a New York warehouse have voted to join a union for the first time in the US.** Work by our economists shows that the job to workers gap (the difference between the total number of jobs and the number of workers, scaled by the size of the labour force) has tightened since the start of the pandemic in all G10 economies except Japan, with a 1.5pp move in the G10 aggregate. It has increased the most in English-speaking economies, namely the US and Australia (2.5pp both), Canada (1.7pp), New Zealand (1.5pp), and the UK (1.4pp). In contrast, the gap in the Euro area is only 0.4pp higher than its pre-pandemic level, reflecting mostly a more moderate increase in new job openings.

Exhibit 20: The Jobs-Workers Gap Has Tightened Across Most G10 Economies

Latest Jobs-Workers Gap - Percent of labour force



Source: Haver Analytics, Goldman Sachs Global Investment Research

Exhibit 21: The Jobs-Workers Gap Has Tightened Across Most G10 Economies

Change in Jobs-Workers Gap from 2019Q4



Source: Haver Analytics, Goldman Sachs Global Investment Research

The consequences and investment implications:

Research starting with Habakukk (1962) has argued that labour scarcity, and the ensuing high wages, led to the adoption of machinery in the 19th century and that the take up was more rapid in the US than the UK because of greater **labour scarcity in the US.**

Scarcity of labour and commodities should incentivise more investment on technologies that help to make companies more efficient.

The shift in commodity and labour market dynamics have some interesting parallels with the 1970s. When President Nixon removed the US dollar from the gold standard in 1971 the price of gold rose dramatically and the price of oil in dollar terms fell. Soon afterwards, the 1973 emergency aid for Israel during the Yom Kippur war, triggered the oil embargo and the first oil crisis of the 1970s.

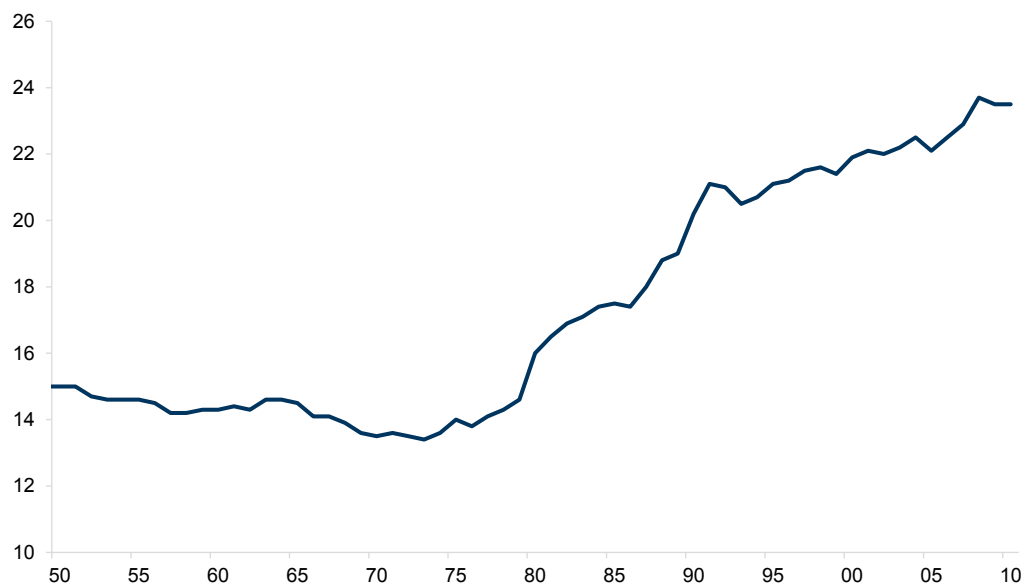
President Nixon’s response to this energy crisis was to start ‘Project Independence’ with the aim of the US being self-sufficient in meeting its own energy demands, a move that is being echoed across Western governments today. The program also called on

Americans to make sacrifices including lowering thermostats in homes.

High energy costs generated significant investment and innovation in energy efficiency. In the US, a number of laws were adopted to increase fuel efficiency in the auto sector for example the Energy Policy and Conservation Act (1975). By 1985 passenger cars were required to achieve fuel efficiency of 27.5 mpg and manufacturers would be required to pay a penalty of \$5 per vehicle for each 0.1 mpg in excess of the standards.

Exhibit 22: Fuel efficiency has increase by over 50% since 1950 with the biggest gains in the late 1970s and 1980s

Miles per gallon - Light duty vehicles, short wheelbase



Source: EIA, Goldman Sachs Global Investment Research

The US car manufacturers were slow to move away from large and fuel inefficient cars. The Japanese were faster at developing smaller and more efficient cars and gained market share. Furthermore, the rise in fuel costs also triggered investment in new technologies including the ethanol revolution in Brazil and the use of turbocharging, front wheel drive trains, lighter weight materials and also 8 speed automatic gearboxes. In other industries that were heavily energy consumptive, other savings were made. Tougher regulation, for example, helped the Swedish pulp industry reduce fossil fuel use by 70%.

In terms of labour, recent commentary from corporate managements shows a special focus on the risk to profits from rising wages. Indeed, with robust economic activity, unemployment particularly low, headline inflation on the rise and governments stepping in, we could expect wages to continue to rise. Our economists' Wage Tracker shows wage growth running at 1.6% in the Euro area and 5.4% in the US the fastest pace since 2008, and their Wage Survey Leading Indicator sits at the highest level since 2000.

Our US colleagues estimate that a 100 bp acceleration in wage growth would reduce S&P 500 EPS by just 1%, all else equal, in line with the historical relationship

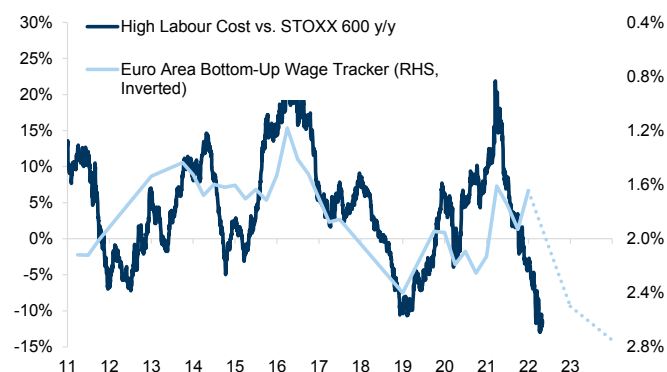
between earnings and wages. Small-caps are generally more exposed than large-caps, in large part because they have lower profit margins.

The equity market currently appears only selectively concerned about labour costs. We expect wages will remain a key market focus in years ahead despite our economists' forecast that labour supply constraints will ease in coming months.

Similarly, we created a list of European domestic companies with high labour costs as a percentage of operating profits. High Labour Cost companies tend to underperform when our economists' wage tracker increases. Their forecasts point to further underperformance ([Exhibit 23](#)). Currently, High Labour Cost companies have underperformed the market and trade at a discount of about 10% to the market, based on a 12m fwd P/E.

Exhibit 23: Our High Labour Cost list is likely to underperform on rising wages

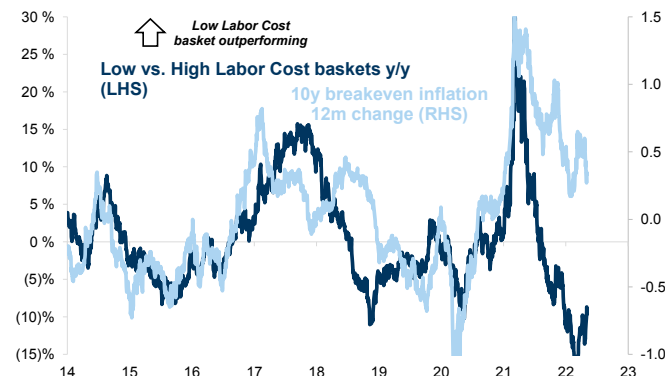
Relative performances



Source: Datastream, STOXX, Goldman Sachs Global Investment Research

Exhibit 24: Low vs. High Labor Cost baskets have seen a change in relationship with inflation expectations

Relative performance



Source: Bloomberg, Goldman Sachs Global Investment Research

Investors should focus on Innovators and Disruptors that will save money for companies, particularly in areas related to greater efficiency in energy and in labour substitution. This will include energy efficiency, including carbon storage, modular nuclear plans and battery storage. It should also raise investment in labour substitution, for example in machine learning, Robotics and AI.

4. From low capex to more spending / larger Governments

Prefer Fiscal infrastructure, Defense, Capex beneficiaries and de carbonisation exposure

The supply side reforms of the 1980s triggered a trend of smaller governments and less government spending. In his inaugural address in 1981, President Reagan famously said 'Government is not the solution to our problem, government is the

problem'. The opportunities to reduce the size of government spending were also enhanced by the fall of the Berlin Wall; in November 1989 President George HW Bush and Margaret Thatcher talked about a 'peace dividend'.

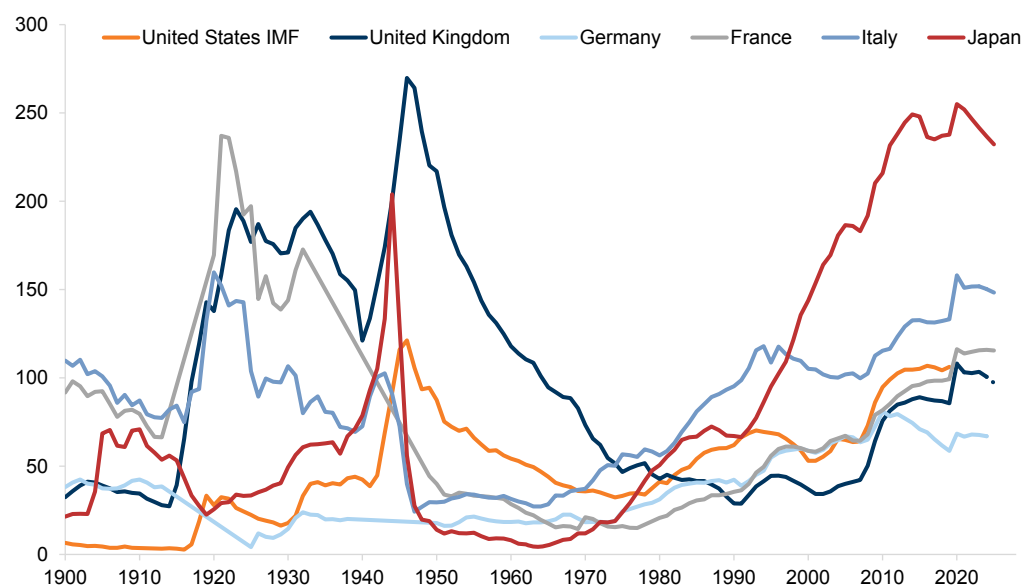
Following the collapse of the Soviet Union, in a speech to the Nation in 1991, President Bush announced plans to scrap US tactical nuclear weapons in Europe and Asia and called off long range nuclear bombers from 24 hour flights. The UK announced its 'options for change' policy of restructuring armed forces in the summer of 1990. US spending on defense fell between 1985 and 1993 and then remained flat between 1993 and 1999.

The declines in government spending relative to GDP meant that by 1997, under President Bill Clinton, the US recorded a budget surplus for the first time since 1969.

The financial crisis in 2008 resulted in massive fiscal support in many economies and a material shift towards higher public sector debt and lower private sector debt. However, fears about unsustainable deficits in European countries led to a new set of austerity measures in the continent spurred by the sovereign debt crisis. The pandemic shifted the policy priorities. The issues of moral hazard that weakened the case for fiscal support after the financial crisis were no longer relevant.

Exhibit 25: The issues of moral hazard that weakened the case for fiscal support after the financial crisis were no longer relevant

Debt % of GDP



Source: IMF, Haver Analytics, Goldman Sachs Global Investment Research

As a consequence, there has been an historic increase in government spending since the start of the pandemic. According to the IMF, 2020 experienced the largest one-year surge in debt since World War II with global debt rising to \$226 trillion and global debt as

a share of GDP increased 28% to 256% of GDP³.

Defense spending to increase

The current environment of heightened geopolitical risk and the war in Ukraine has further shifted many governments towards more spending. The German government has reset its post-Cold War foreign and security policy with the suspension of Germany's constitutional debt brake to create a EUR 100bn special fund to modernise Germany's armed forces in coming years. Germany has also stated that it would increase defense spend to the NATO commitment of 2% of GDP, implying a c.30% increase in the budget, from €53bn in 2021 to c.€70bn. This is a step-change in the approach to Defense spend in Germany, which has remained at 1.0%-1.5% of GDP since the early 1990s.

In the US, President Biden has signed a \$768 billion defense policy bill that represented a 5% increase in military spending; it was nearly \$50 billion larger than his original request, as both Democrats and Republicans believed Biden's proposal was insufficient to counter military advances by China and Russia. Now, in the wake of Russia's invasion of Ukraine, Republicans and some Democrats are likely to call for a larger allocation. At the same time, at the Central Financial and Economic Affairs Commission (CFEAC) meeting on April 26th, President Xi called for comprehensively strengthening infrastructure construction, in an effort to build a modern infrastructure system. He believed China's infrastructure conditions still fall short of what is needed for national development and security despite its achievements over the past decade, and called for stepping up infrastructure investment.

Energy transition spending to increase

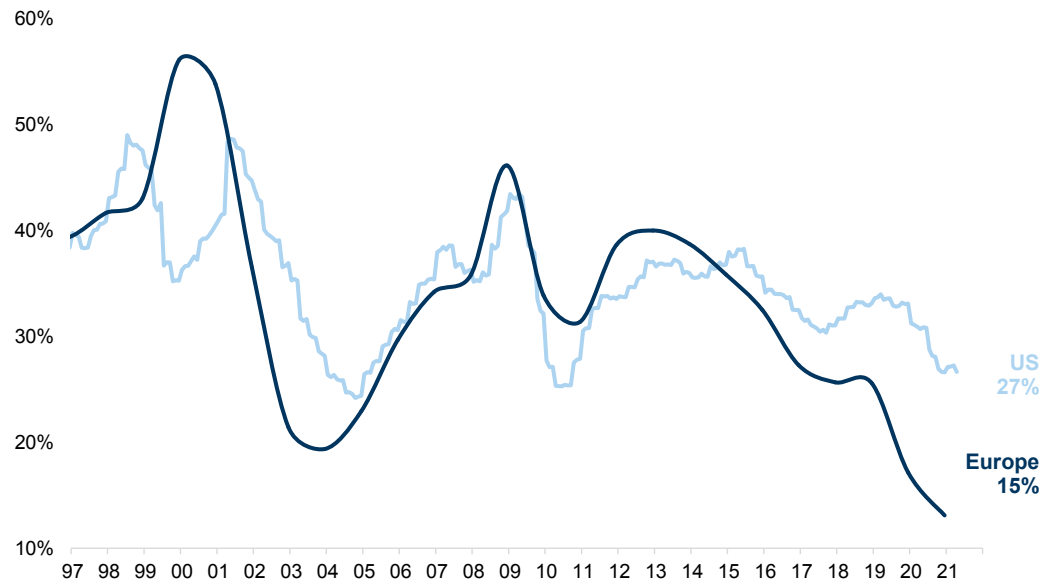
Meanwhile, the commitments to de-carbonisation, as well as renewed urgency to find energy security (particularly in Europe) are also likely to drive more spending. Our energy analysts highlight that between 2004 (post the technology bubble) and 2014 there was a period of energy exploration and mega-projects build-up that was driving resource expansion and a revival of non-OPEC growth. The current situation is the exact opposite, with seven years of hydrocarbon under-investment (2015-21), falling oil reserve life (-50% since 2014) and declining non-OPEC ex-shale, requiring a steeper Capex recovery in both long-cycle and short-cycle production.

The consequences and investment implications:

One of the most important implications of these changes is likely to be more Capex spending. Generally, Capex has slowed as a share of sales across the major markets since the start of this decade and, in particular, in the aftermath of the financial crisis. This is true even if we include spending on R&D (see Exhibit 26). A combination of weak nominal GDP, excess inventories (for example in commodities) and deflationary risks have discouraged traditional Capex expenditure.

³ IMF's Global Debt Database

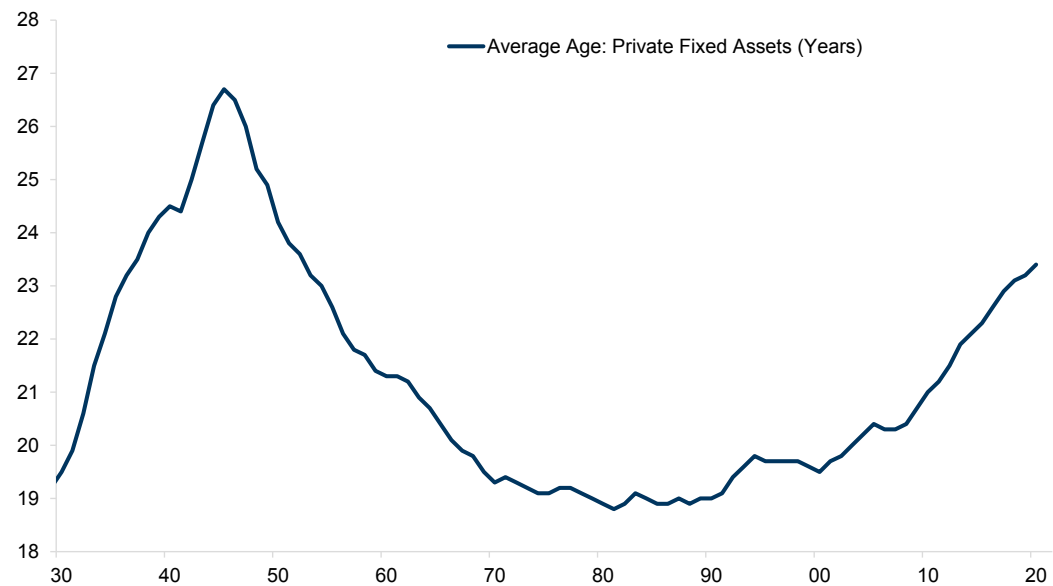
Exhibit 26: European firms are investing less than their US counterparts in future growth
 Growth Investment Ratio (Growth CAPEX + R&D / CFO)



Source: Datastream, Goldman Sachs Global Investment Research

Lower inflation reduced the incentive to invest, at least in physical capacity, and the average age of assets has risen and is c.5-years older than in the 1970s/80s.

Exhibit 27: The average age of assets has risen and is c.5-years older than in the 1970s/80s
 US Average Age: Private Fixed Assets (Years)

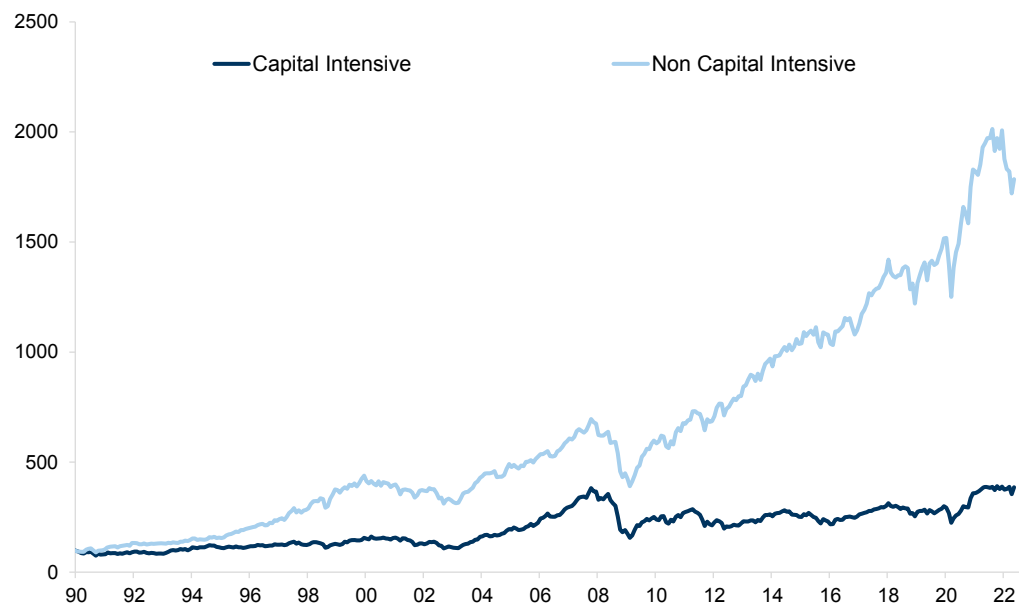


Source: Haver Analytics, Bureau of Economic Analysis, Goldman Sachs Global Investment Research

Corporate operating expense did rise in many cases as investors spent on technology rather than traditional capex but it didn't put downward pressure on margins overall as it was offset by lower costs elsewhere.

Capital light industries outperformed dramatically in the decade after the financial crisis.

Exhibit 28: Capital-light businesses have significantly outperformed those that employ heavy capital
World Capital vs. Non-Capital intensive. Price return (USD)



Capital-intensive: Electricity, Industrial Materials, Automobiles and Parts, Gas, Water and Multi-utilities, Industrial Metals and Mining, Telecommunications Service Providers, Leisure Goods, Construction and Materials, Oil Equipment and Services. Non-capital-intensive: Technology Hardware and Equipment, Medical Equipment and Services, Pharmaceuticals and Biotechnology, Household Goods and Home Construction, Beverages, Food Producers, Retailers, Tobacco, Software and Computer Services, Personal Goods

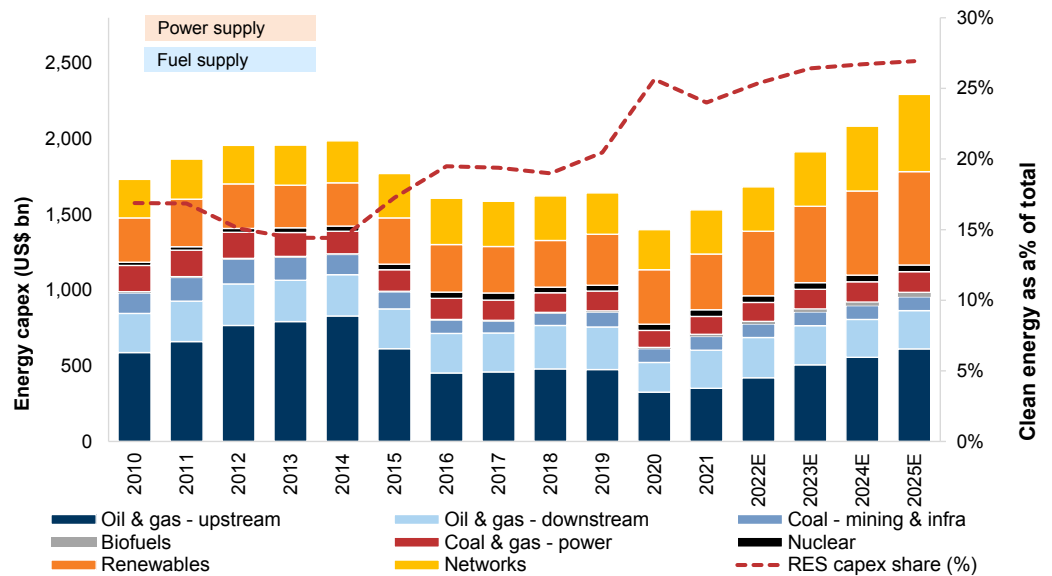
Source: Datastream, Worldscope, Goldman Sachs Global Investment Research

Of course spending on technology solutions is likely to remain very strong – and the incentive may be even higher in areas related to energy efficient and labour substitution. Our European capital goods analysts ‘capex tracker’ is showing a sharp increase in capex expectations over the next three years; the strongest capex is coming in Datacenters, Semiconductors, Airlines, O&G and Technology.

In addition, the shifts in the energy mix that will be required to achieve the ambitions to de carbonise by 2050 will be very capital intensive. Primary energy capex fell 35% over the past decade, and we expect it to grow 60% by 2025 to \$1.4 trn (from \$0.9 trn in 2021).

Exhibit 29: Primary energy capex fell 35% over the past decade, but our Equity Analysts expect it to grow 60% by 2025

Energy supply capex split by fuel and power supply source (US\$bn - LHS), and clean energy (renewables, biofuels) as a % of total (% - RHS)



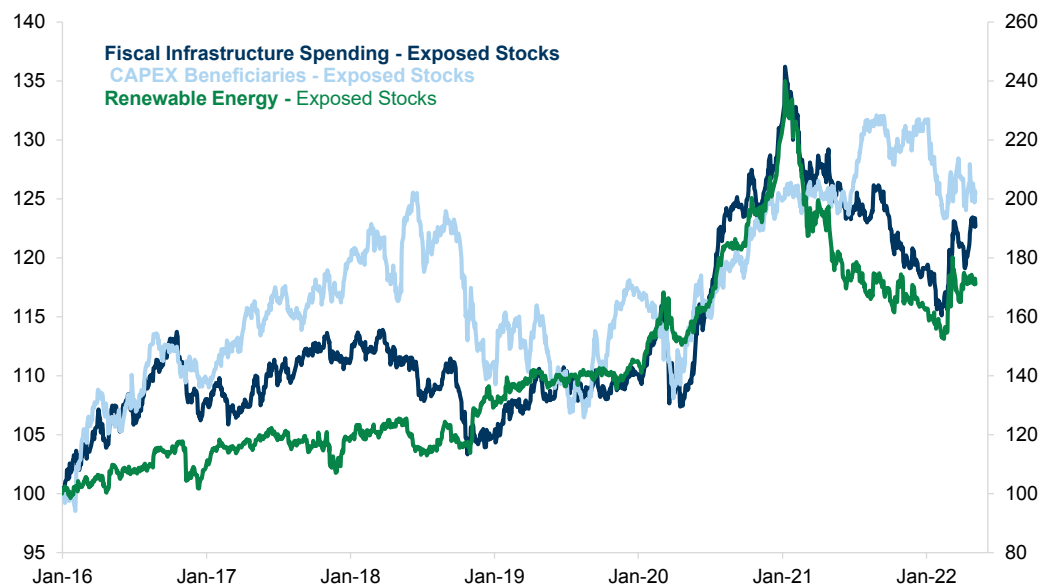
Source: IEA WEI (historicals), Goldman Sachs Global Investment Research

With the shift in emphasis on ESG investing and on de-carbonisation in particular, the focus has shifted in recent years to energy sustainability but it has, so far, been insufficient to offset the collapse in investment in the traditional energy space, given the smaller scale and higher capital intensity per unit of energy output. Our analysts argue that the average Capex intensity of low carbon energy developments is c.2x that of hydrocarbons, which further enhances the need for energy Capex. According to our energy analysts, there is a need for an incremental \$1.5trn pa Capex by 2032.

We would encourage investors to look for ‘Enablers’ and ‘Innovators’ - companies that are helping to find solutions to corporate problems by finding solutions that reduce costs and increase productivity.

We would also look to the beneficiaries of the move towards greater government spending and higher Capex. Many of the companies that are most sensitive to these themes have de-rated in recent months and offer reasonable value as well as attractive growth opportunities.

Exhibit 30: Our Europe Fiscal Infrastructure Spending basket has traded closely with our Europe CAPEX beneficiaries and our Europe Renewable Energy baskets
Europe strategy baskets (relative price performance to STOXX 600)



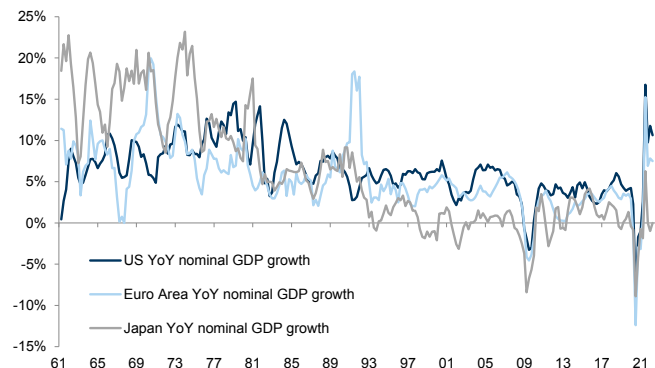
Source: Bloomberg, STOXX, Goldman Sachs Global Investment Research

Last cycle, companies were reluctant to invest at a time when economies were stagnating. The end of the commodity boom was another headwind for CAPEX, since Energy and Basic Resources have historically been significant contributors to the overall capital expenditure. We would expect CAPEX to pick up as many industries are already close to full capacity. So, companies will have to invest to: (1) meet the ambitious net-zero emissions target, (2) increase their output and meet all the pent-up demand, (3) improve productivity in a tighter labour market environment, (4) localise production after decades of globalisation, and (5) bring back the inventories to where they were, and possibly beyond, as just-in-time production and zero inventory systems have been challenged by the pandemic.

5. From growth to margin scarcity.

Prefer High & Stable margin, Stable growers In the past cycle, nominal growth and earnings trended lower since aggregate demand weakened and lower inflation became a dominant driver ([Exhibit 31](#) and [Exhibit 32](#)).

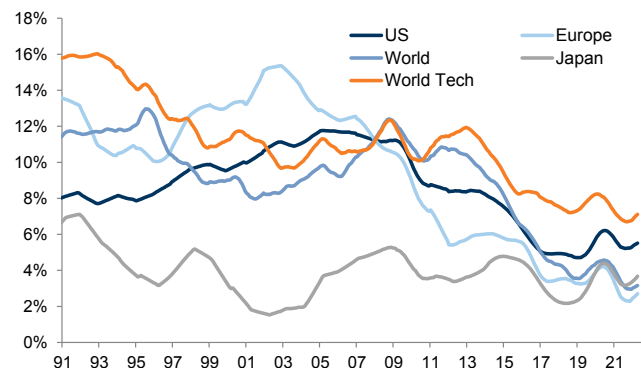
Exhibit 31: Long-term nominal GDP has been low until recently
y/y nominal GDP growth. Germany is used for EA before 1995.



Source: Haver Analytics, Goldman Sachs Global Investment Research

Exhibit 32: Top-line growth has fallen along with declining nominal GDP

y/y sales growth (10y rolling average), Market ex Financials

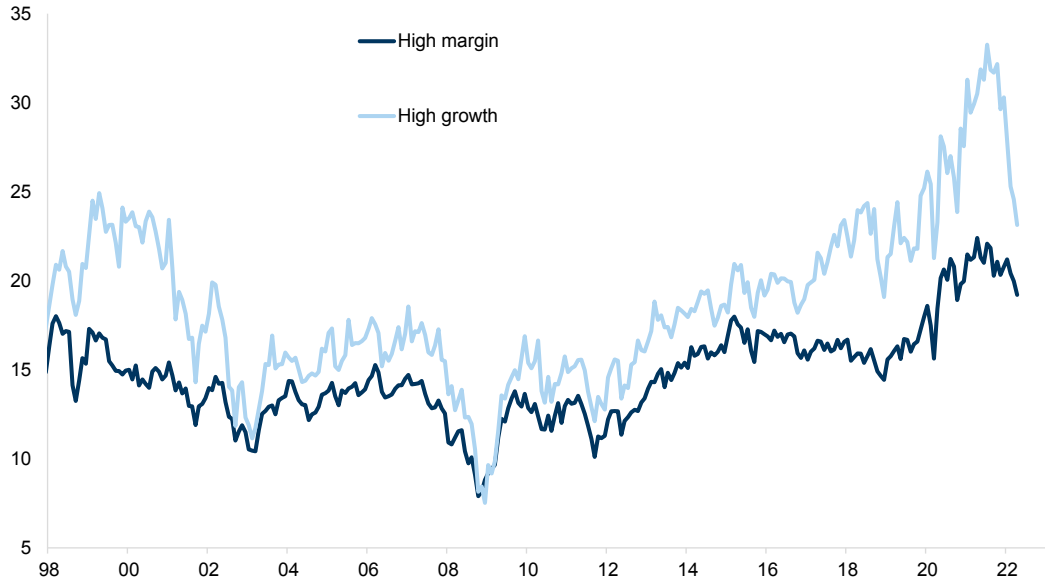


Source: Datastream, Worldscope, Goldman Sachs Global Investment Research

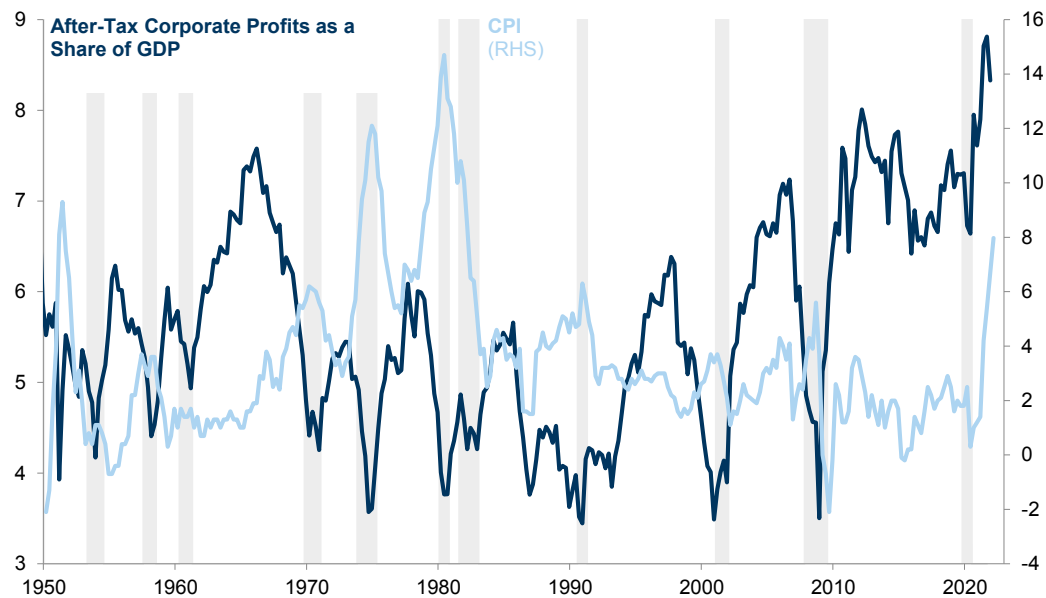
We also believe that we are transitioning from a decade of focusing on top-line growth to a cycle where investors will focus increasingly on margins. In the deflationary dominated cycle post the financial crisis, weak aggregate demand and lower inflation pushed nominal GDP and average earnings growth down. The scarcity of top-line growth made it more valuable and this was further enhanced as interest rates fell, pushing up the relative value of longer-duration assets. In the current environment, with higher inflation, nominal GDP is higher and top-line growth is less scarce. Instead, the higher inflation puts greater value on margins and lower volatility of margins. As Exhibit 33 shows, the gap in valuation between high sales growth and high margin companies has started to narrow.

Exhibit 33: The gap in valuation between high sales growth and high margin companies has started to narrow in Europe

NTM P/E. High growth defined as sales growth >8% and high margin as NIM margin >15%.



Source: Datastream, STOXX, Goldman Sachs Global Investment Research

Exhibit 34: Margins should come down as inflation picks up

Source: US Bureau of Economic Analysis (BEA), Haver Analytics, Goldman Sachs Global Investment Research

The consequences and investment implications:

Investors should focus on companies irrespective of sector or region that can secure margins and generate good compound returns in an environment of lower index returns. Quality, sustainable dividend growth will become more valued as investors increasingly focus on compounded returns over time. Strong balance sheets and relatively low payout ratios also make this a more attractive strategy than in the cycle post the financial crisis.

References

The Cold War: Costs and Results, M. Harrison, Warwick University

Soaring cybersecurity Capex + Harvesting season (follow-up), F.Theis, Goldman Sachs GMD

Stagflation Series #3 - Agriculture & Commodity Capex Industrials, A. Samuelson, J. Revich, Goldman Sachs GMD

The Labour Share in G20 Economies, International Labour Organization, OECD

Labour Scarcity, Technology Adoption and Innovation: Evidence from the Cholera Pandemics in 19th Century France, F. Raphaël, CESifo Working Paper No. 9528

When Does Labour Scarcity Encourage Innovation?, D. Acemoglu, Journal of Political Economy, Vol. 118, No. 6 (December 2010)

US Economics Analyst: How Much Fiscal Drag? (Phillips), Goldman Sachs GIR

Occasional Paper Series - Global value chains: measurement, trends and drivers

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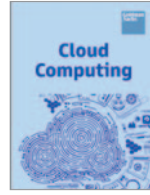
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Gene editing



5G: From Lab to Launchpad



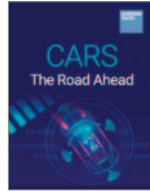
Climate Change



Carbonomics



Cars: the road ahead



ESG Sector Roadmaps



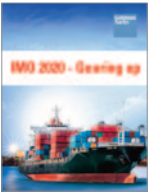
The Rise of Renewables



Shale Scale to Shale Tail



IMO 2020



The Genome Revolution



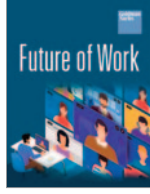
Digital Health



Sustainable ESG Investing



Future of Work



Drones



Space



Factory of the Future



eSports: From Wild West to Mainstream



Music in the Air



EVs: Back to Reality



Venture Capital Horizons



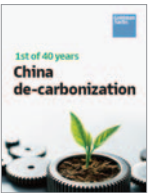
ESG



Womenomics



China de-carbonization



Future of Learning



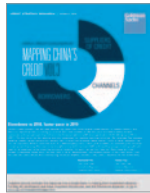
New China, Old China



China A Shares



China's Credit Conundrum



Top Projects



Made in Vietnam



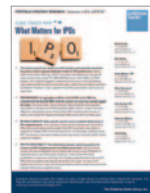
What the Market Pays For



The Competitive Value of Data



What Matters for IPOs



Top of Mind



...and more

