PORTFOLIO STRATEGY RESEARCH | October 13, 2020 | 5:29AM BST

GLOBAL STRATEGY PAPER NO. 45

Womenomics

Europe moving ahead

Sharon Bell, CFA
+44 20 7552-1341
sharon.bell@gs.com
Goldman Sachs International

Guillaume Jaisson
+44 20 7552-3000
guillaume.jaisson@gs.com
Goldman Sachs International

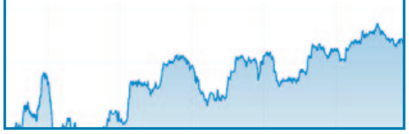
Peter Oppenheimer
+44 20 7552-5782
peter.oppenheimer@gs.com
Goldman Sachs International

Lilia Peytavin
+44 20 7774-8340
lilia.peytavin@gs.com
Goldman Sachs International

- Female labour force participation has risen in Europe in recent years, whereas in the US it has flat-lined since the late 1990s.
- Europe now has higher female participation compared with the US at every age from 30 to 59.
- The gender pay gap is smaller in all major European countries than in the US, and far smaller than in Japan.
- Moreover, in contrast to the US, Europe's pay gaps have narrowed in the last decade.
- Nonetheless, there is work to do. The pay gap remains large (12-18% in the large European countries), and most of the gap cannot be explained by observable factors.
- 31% of board members in STOXX 600 companies are now women vs. just 9% in 2005, but we have not seen much progress in terms of women CEOs/CFOs, or women managers.
- More women in senior roles is associated with stock price outperformance; we introduce a Europe Womenomics basket (GSSTWOMN).

NEW RESEARCH BASKET

We introduce our Womenomics basket **(GSSTWOMN)**, a basket of European companies with a high percentage of women at all levels.



Europe Womenomics in numbers

Signs of improvement…

+7% points

change in female Labour force participation rate in Europe in the last 15 years vs. flat in the US

30 to 59 years

age band where Europe now has a higher percentage of women in the workforce than in the US

51%

of the graduate workforce are women

9% in 2005 → 31% in 2020

of women on boards in STOXX 600

...but still more to go

12-18%

gender pay gap in most large European countries

2/3

of the pay gap cannot be explained by factors such as work experience, sector or type of job

7

companies in the STOXX 600 had 50% or more women on their board, in management and as employees, based on the latest available data

250bp pa

uplift to performance for stocks in 1Q by 'women managers' vs. 4Q since the GFC

Source: Bloomberg, Datastream, Eurostat, OECD, Haver Analytics, Goldman Sachs Global Investment Research

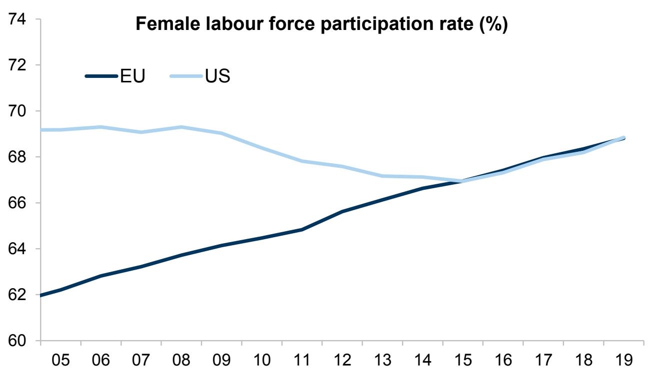
Europe overtaking the US

Labour participation rates for women in Europe on the rise

In Europe there are some tantalising signs of progress on women's contribution to the economy: most notably, participation rates for women in the workforce have risen dramatically and continue to move up. In many European countries they are now above rates in the US.

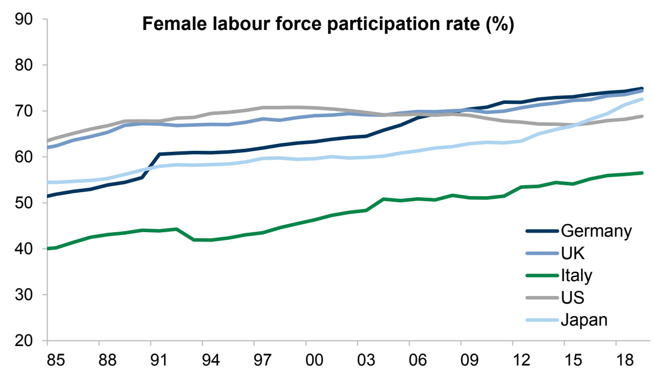
In comparison, the US has flat-lined in terms of female participation in the workforce since the late 1990s (Exhibit 1). In recent years countries such as the UK, France, Germany and Spain have seen a substantial rise in female participation, as has Japan (Exhibit 2). For a detailed discussion of the trends in Japan, see *Japan Portfolio Strategy: Womenomics 5.0: 20 Years On,* 16 April 2019.

Exhibit 1: Europe now identical to the US for female labour force participation
Participation rate: 15-64 years, UK is included in the EU figures



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

Exhibit 2: Since 1985 the female participation rate has increased in Europe but not in the US
Participation rate: 15-64 years



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

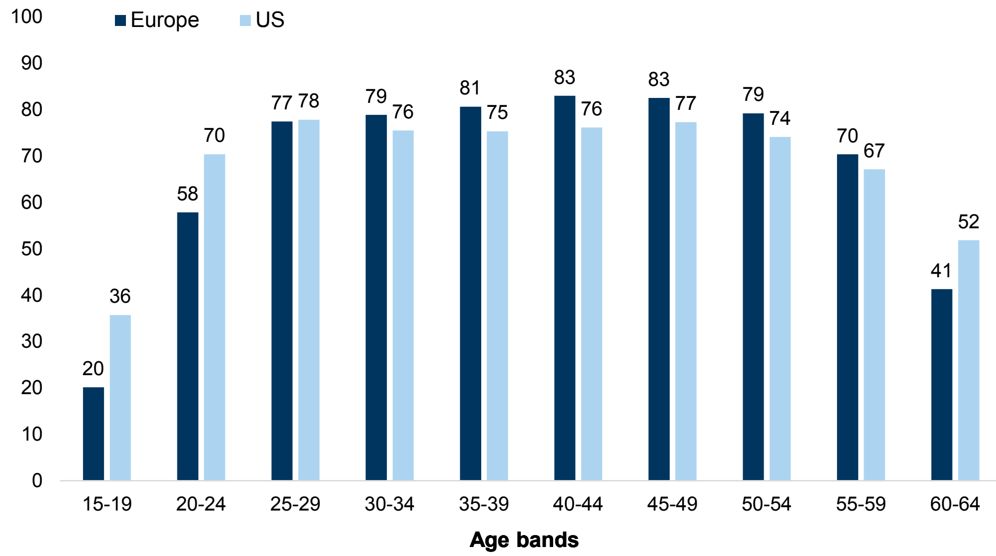
We discuss in the Appendix ("Europe and Japan say goodbye to their M-curves") some of the changes in Europe in recent years, and the differences across countries, which remain substantial: Sweden continues to enjoy the highest participation rates, while Italy (and Greece) remain well-below average for female labour force participation.

That said, all countries have seen participation rates rise, even if some are lagging, and the 'M-curve' – whereby women participate less in the labour force in their late 20s and 30s when their families are young and then returned later – has largely disappeared in the last two decades.

Europe: Higher female participation in every age band from 30 to 59

We find Europe has higher female labour market participation rates than the US in every age band from 30 to 59 inclusive (and is essentially identical to the US in the 25-29 age band).

Exhibit 3: Higher female participation in Europe at every age band from 30 to 59
Level in percentage points of female participation for each age band in 2019, UK is included in the Europe figures



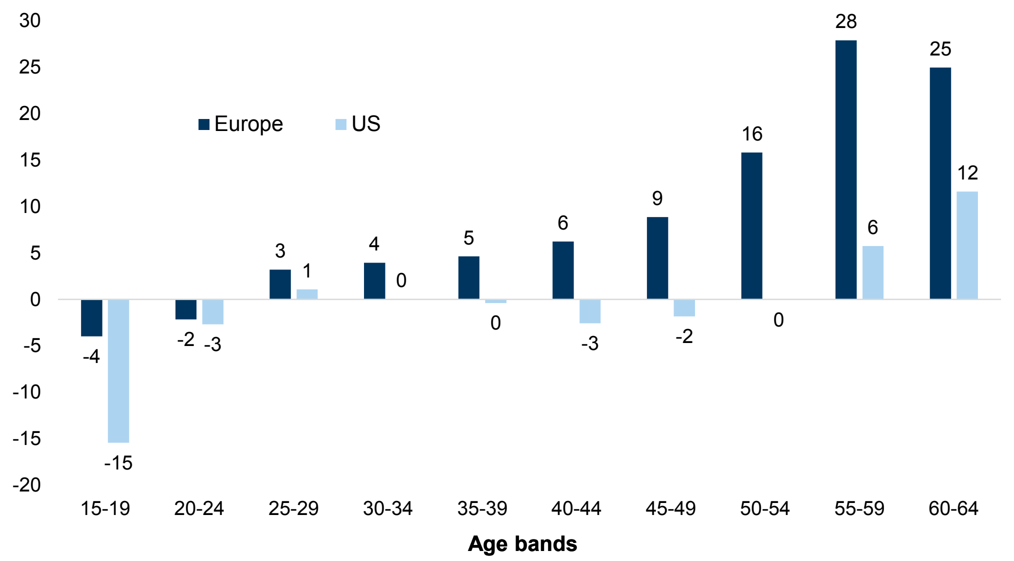
Source: OECD, Haver Analytics, Goldman Sachs Global Investment Research

There are **two** distinct reasons for Europe's participation rates improving while the US has stagnated:

1. **Women in older age bands (50-64 years old) are participating more** in Europe than they did in the past. This is partly a function of increased pension-entitlement ages, among other factors; but it is mainly a function of trends from the 1970s and 1980s when this cohort first entered the workforce. These trends happened slightly earlier in the US, so this is Europe 'catching up'.
2. The participation rate for **women in their 30s** is genuinely improving in Europe both in absolute terms and relative to the US, and this is true across European countries. This is not just Europe 'catching up', this is Europe taking the lead: participation rates for women in their 30s are now higher in Europe than in the US.

Both these trends can be seen in Exhibit 4, where we show the *change* in female participation per age group. We note that the first reason – women in older age groups staying in the workforce for longer – is if anything the bigger cause of higher female participation in Europe in recent years. This is despite political, media and policy attention tending to focus on the likelihood of women in their 20s, 30s or 40s returning to work after having children.

Exhibit 4: Female participation has risen in Europe for all prime age bands and especially for older workers
Change in percentage points in female participation for each age band between 2000 and 2019; UK is included in the Europe figures



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

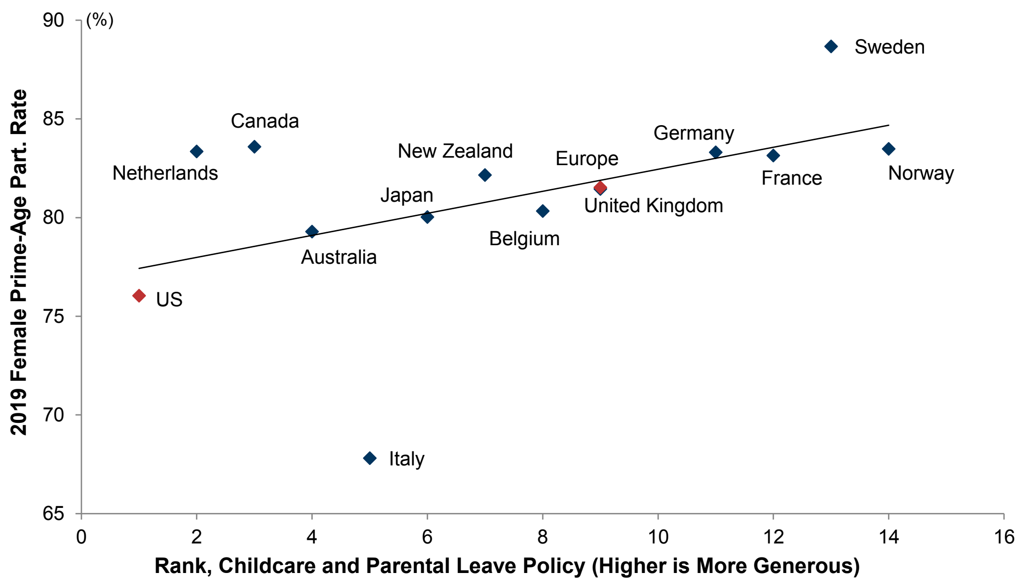
As an example of older women participating more, in 2000 it was relatively unusual for Spanish women aged 55-64 years to work: 22% did so and that percentage had been unchanged for the previous 30 years at that point. In contrast, the latest figures show 53% of Spanish women aged 55-64 are participating in the workforce.

In the space of one generation, for this cohort working has become typical rather than unusual. The same is true in Germany and France, and to a lesser extent in the UK. And this is not a small cohort: **a third of all women employed in Europe today are aged 50 years or over.**

Why have women in these age bands started working in such numbers? In our view, it is partly policy-driven (older retirement ages, legislation against age discrimination) and partly a result of cultural changes that began 40-50 years ago. We discuss this in Appendix 2: Why women are working for longer, including the older age groups.

For younger women, we think the better provision of childcare and the better terms of parental leave in most European countries, relative to say the US, are a causal factor in leading to higher female participation rates (Exhibit 5). This is something our US economists have highlighted as a reason for participation in the US lagging most other advanced economies.

Exhibit 5: Countries with longer parental leave and more public child care spending have higher female prime-age participation rates
Europe is the equal-weighted average of the European countries present in chart



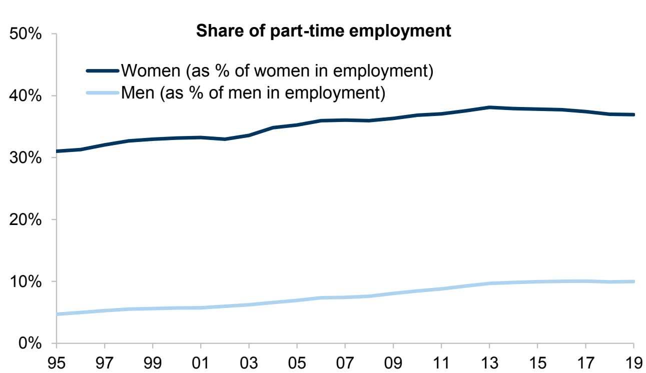
Source: OECD, Haver Analytics, Goldman Sachs Global Investment Research

Isn't it all part-time?

Women in Europe have a higher part-time rate than women in the US. The differences here are large, as Japan Equity strategist Kathy Matsui has pointed out in her Womenomics research: in Japan, 56% of women employed work part-time, whereas in Europe, the rate is 34% and in the US 17%.

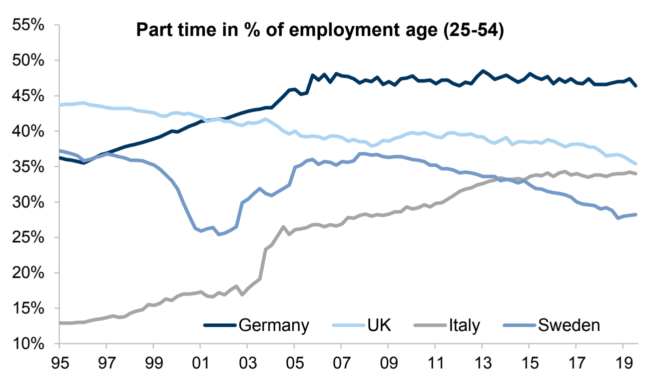
In all regions the percentage of men working part-time is in the mid single-digits; that said, it is slightly higher in Europe than in either the US or Japan, and it has been rising slightly in Europe (Exhibit 6).

Exhibit 6: Women are much more likely to be working part-time than men
Figures are for EU 15 countries, incl. UK



Source: Eurostat, Goldman Sachs Global Investment Research

Exhibit 7: Part-time rates differ markedly across Europe
Women aged 25-54



Source: Eurostat, Haver Analytics

All this said, we find little evidence that the higher part-time rate of EU-based women is a clear causal factor in increasing the female labour market participation rate.

The higher part-time rate for women in Europe has been the case for some time – it hasn't markedly risen in recent years even as participation rates have. Also, rates of part-time work vary considerably across Europe, and even the change over time has been different by country and not necessarily associated with more or less labour force participation.

In the Appendix, we show two very different examples: Italy, where more part-time work has clearly been associated with greater female participation in the workforce, and the UK, where the opposite has been true as part-time work for women has fallen while female participation has risen.

It is really about women and men working more flexibly

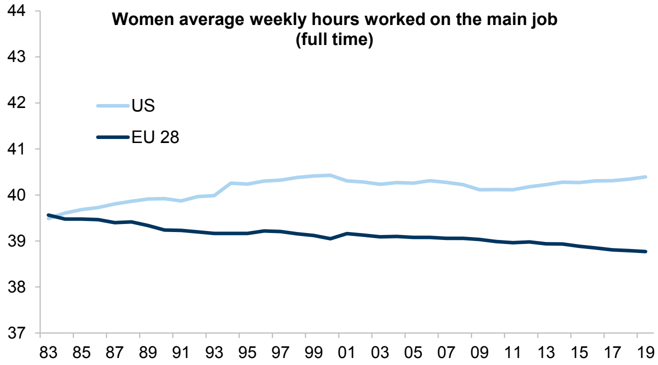
One other contrast with the US is the number of hours worked by full-time employees. In the US, hours for full-time employees have risen since the early 1980s by 1 hour per week for women, whereas for women in Europe it has fallen by 1 hour per week (Exhibit 8). Women in the US and Europe both worked about the same number of hours per week in the early 1980s (39½ hours) but now women in Europe in full-time employment work 2 hours less on average per week than women in the US.

Men have also seen a similar (if less dramatic) change: men in the US have seen hours per week rise by about 30 minutes since the early 1980s, whereas men in Europe have seen their working hours decline by almost 1 hour.

So a household with a man and woman both working full time in aggregate work 3½ hours less in Europe per week than a similar household would in the US, or than a similar couple in Europe did 30 years ago. That is significant when it comes to caring responsibilities.

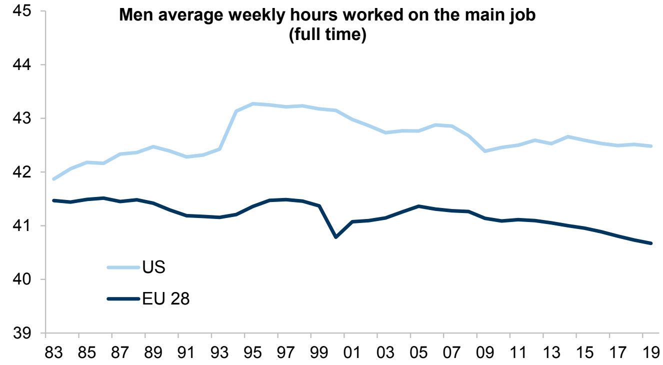
Indeed, it may be the flexibility of men and the cultural acceptance of men taking a greater share in the care-related work in households which has empowered women in Europe to increase their participation in the workforce. Of course, the causality may equally go the other way – men are working fewer hours by function of women taking on a greater role in paid employment.

Exhibit 8: Women in Europe are working fewer hours now than in the 1980s ...



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

Exhibit 9: ... and European men have reduced their hours slightly too



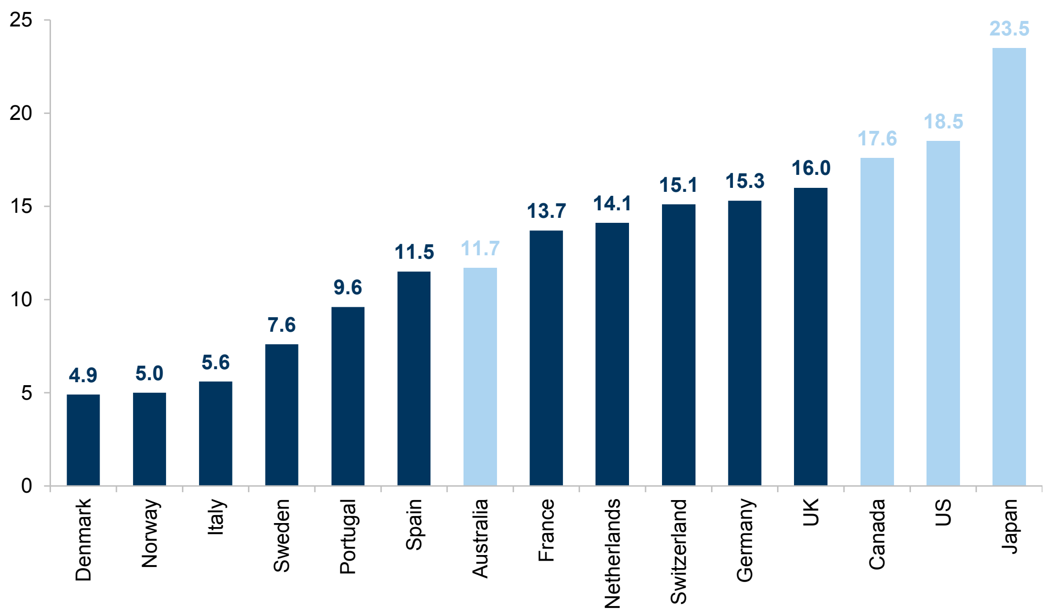
Source: Haver Analytics, OECD, Goldman Sachs Global Investment Research

The pay gap: Still there, still large and still largely unexplained

The gender pay gap remains large across Europe, with most countries being in the 12-18% band (women are paid on average 12-18% less than men). The Nordic countries tend to be lower (Exhibit 10).

Italy has a low gender pay gap but the OECD ascribes this to 'selection effects' – only more highly-qualified female workers tend to remain in the labour force, inflating female median earnings – rather than being driven more by a compressed wage structure and low levels of earnings inequality more generally (as would be the case in the Nordic countries, for example).

Exhibit 10: The gender pay gap across DM countries exhibits some dispersion
As of 2019 for Canada, Japan, Norway, Sweden, UK and the US, all remaining are as of 2018 or earlier

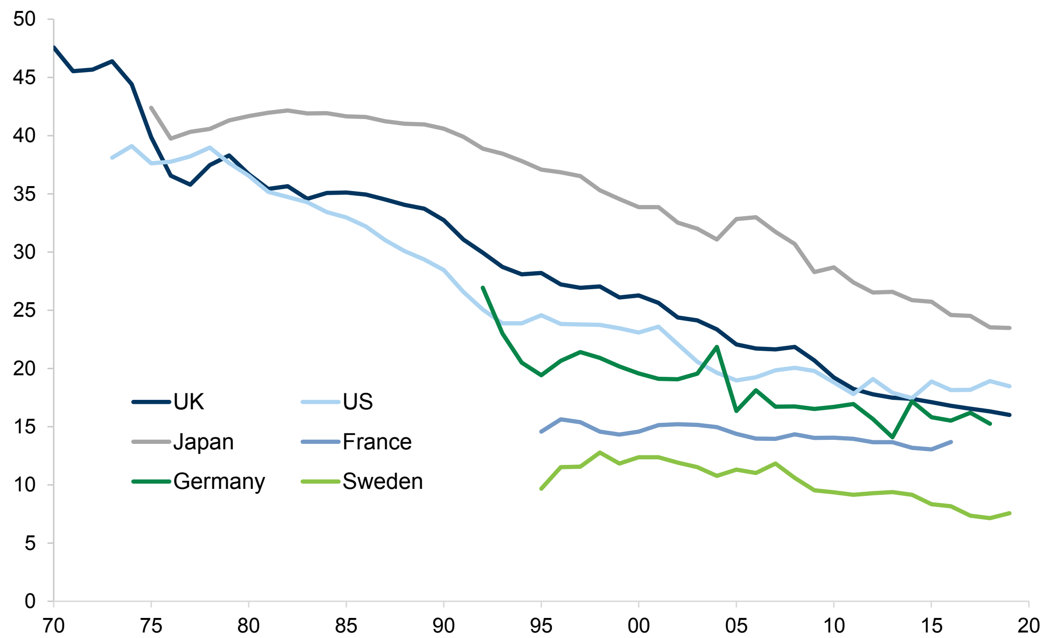


Source: OECD, Goldman Sachs Global Investment Research

The good news – for Europe – is that the pay gap is lower in all the European countries shown above than in the US or Canada, and considerably lower than in Japan. In *Closing the gender gaps 2.0: Fresh data show more work to do,* 23 October 2019, our colleagues in the Global Markets Institute discussed the large and persistent gender pay gap in the US. They calculated that if this wage gap were to narrow by roughly 2 percentage points every 10 years – consistent with performance over the past decade – it would take another 100 years for women to reach wage parity with men on an economy-wide basis.

As we show in Exhibit 11, pay gaps have fallen considerably in developed countries but most of the falls occurred through the 1970-2010 period. The pay gap has fallen at a slower pace in the decade since the GFC, and actually ticked up in the US, again something our US colleagues have highlighted.

Exhibit 11: Gender pay gaps have fallen over time, but the steepest declines were pre-2010



Source: OECD, Goldman Sachs Global Investment Research

Note on pay gap definitions

- The **OECD** uses the median pay of women compared with the median pay of men for full-time workers.
- The **European Commission** uses full- *and* part-time workers per hour wages and takes the average pay rather than median.

This can create sizeable differences in the estimate of the pay gap; for example, the OECD gender pay gap for France in 2016 was 13.7%, but it was 15.3% based on the EC data.

The European Commission figures tend to show a higher gender pay gap: i) they include part-time workers – who are generally paid less per hour – and a higher number of women work part-time, ii) the average tends to be much higher than the median for men given that the positive skew in the distribution of male earnings is larger than for female earnings. For the international comparisons in the exhibits above, we used OECD data only because these are available across countries and have more history; but we are aware this tends to understate the gap.

Pay gap still (largely) unexplained

Women as a group do not share all the same average characteristics as men as a group: they may have fewer years' experience – especially if they have taken time out of paid employment to care for young families – and they may work in lower-paid industries, or in lower-paid roles within those industries. These differences may help to account for the pay gap.

That said, in their October 2019 paper our colleagues in the Global Markets Institute found that most of the gap remained even controlling for factors such as these.

The same is true in Europe. A 2018 working paper from Eurostat used microdata to assess how much these observed characteristics accounted for the pay gap in Europe. They found that, once accounting for things such as age, experience, type of employer, education level, the sector of the employer (sectoral gender segregation) and the employee's type of work (occupational gender segregation), **69% of the pay gap on average for the EU was still unexplained**.

At the EU level, the overall *explained* gender pay gap is 5% compared with an actual pay gap of 16%, meaning 11% is unexplained.

We think there are two main explanatory factors (both statistically significant):

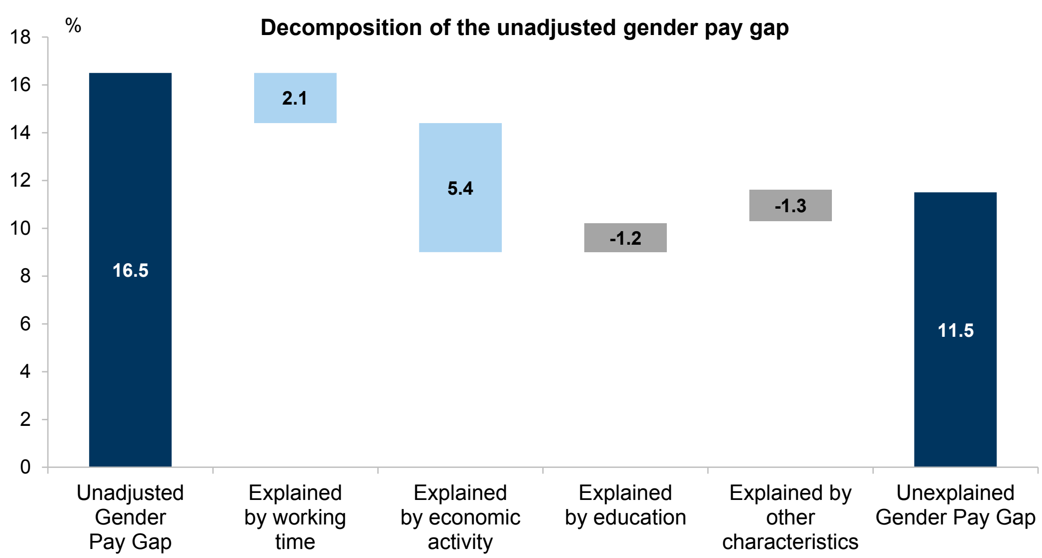
(i) Economic activity, i.e., the sector or industry where women work more predominately than men.

(ii) 'Working time', i.e., the fact that men work full time in greater numbers or are less likely to have taken a career break.

That said, it should be stressed, as we show in the chart below, that over two-thirds cannot be explained by any of these factors based on the Eurostat study. Indeed, based on education level, women should be paid more than men (there is a negative explanation to this factor).

Exhibit 12: The adjusted gender pay gap remains largely unexplained

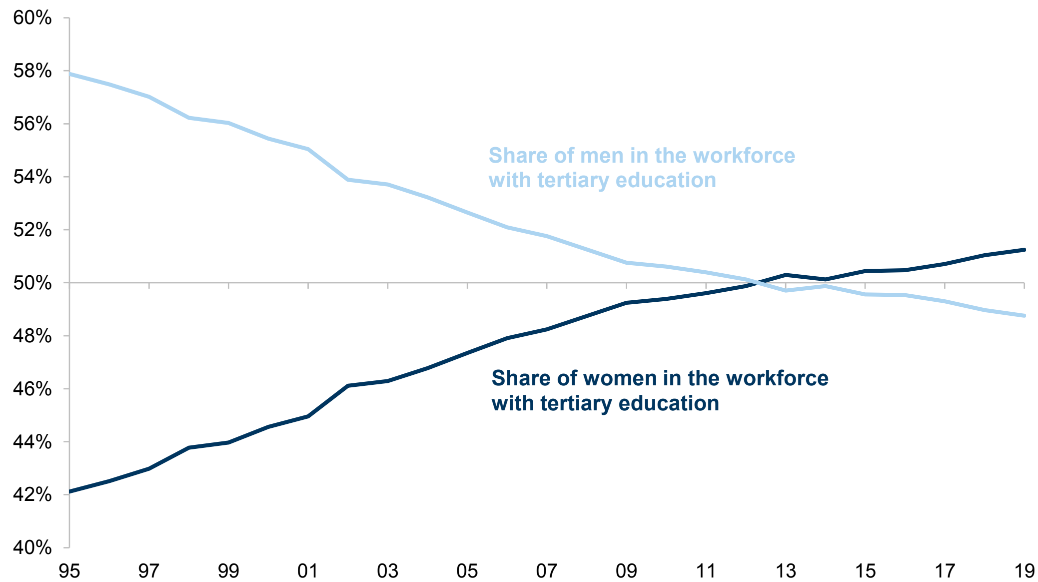
Difference between male and female hourly earnings as % of male hourly earnings, UK is included in the EU figures



Source: Eurostat, Goldman Sachs Global Investment Research

Within the European labour force, a growing share of workers have tertiary education: around a third today compared with 20% in 1995. Of workers with degrees, women make up slightly over 50%.

Exhibit 13: Women with tertiary education have overtaken men in the labour force
Figures are for EU 15 countries, incl. UK



Source: Eurostat, Goldman Sachs Global Investment Research

A recent study from the Bank of England also looked at pay gaps, with respect to gender and ethnicity. The table as published in their report on unadjusted pay gaps is shown in Exhibit 14 (red highlights are our own). The median hourly pay is higher for white men than all other groups and c.20% higher than for white women. Pay for white men is higher at all percentiles and is also very positively skewed, meaning that a few people in this group earn very highly.

Exhibit 14: UK: White men have higher pay in all pay bands and a very high positive skewness in their pay distribution, compared with other groups
Summary statistics for hourly earnings (£) across gender and ethnicity groups*

Statistics	White male	White female	Ethnic minority male	Ethnic minority female
Mean	13.6	10.4	12.9	11.1
25th percentile	7.6	6.0	6.9	6.4
Median	10.9	8.4	10.0	9.1
75th percentile	16.4	12.7	15.7	13.6
Standard deviation	14.4	8.6	11.1	8.4
Skewness	46.3	20.4	13.9	16.0

*The ethnic minority pay gap is small in the unadjusted data, but adjusting for compositional effects the pay gap is as large as the gender pay gap.

Source: Bank of England

In the Bank of England working paper the authors also decompose the gap between pay for men and women and find: *"..around half of that gap can be accounted for by compositional effects, arising from the different characteristics of either the worker or the job they are carrying out. That leaves around 11 percentage points of the pay gap unaccounted for by these factors. In other words, around half of the gender pay gap is difficult to justify on fundamental grounds, consistent at least with some significant degree of gender pay "bias"".*

The Bank of England study looked at ethnicity as well as gender. They found the ethnicity pay gap in the UK is a relatively modest 5% over their sample period, smaller than for gender. However, this is no longer the case when the researchers adjust for compositional effects. Compositional effects should mean that ethic minority workers are paid more than white employees: ethic minority workers tend to be employed in regions with higher pay levels and tend to have higher qualifications.

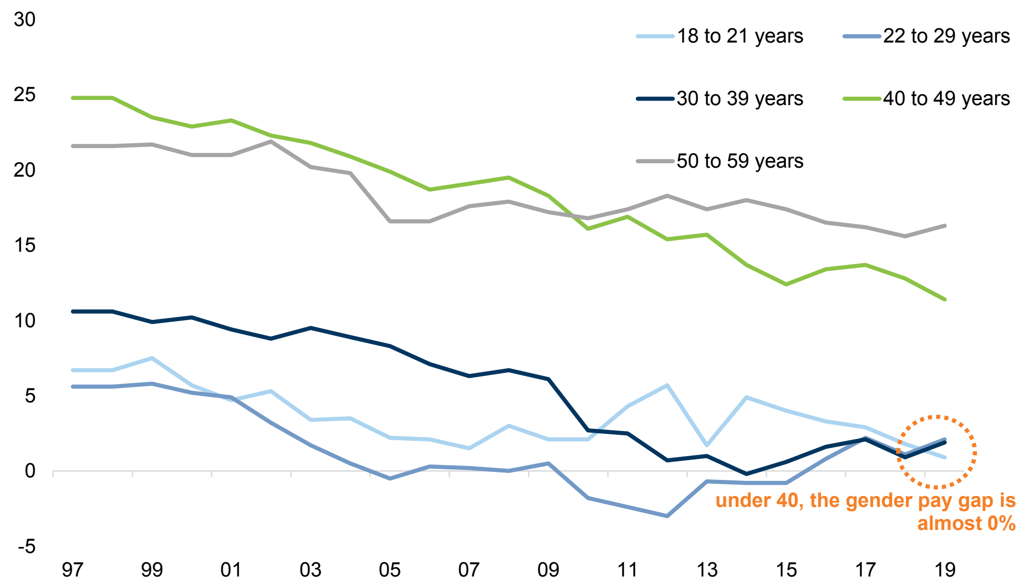
They find that the unexplained ethnicity pay gap is as large as the unexplained gender pay gap (c.10%). For a further discussion on economic inequities across race and reducing these, see *Top of Mind: Investing In Racial Economic Equality,* 16 July 2020.

Younger women have caught up faster

Another point is age. UK data from the ONS points to a very low gender pay gap (close to zero) for full-time employees under 40. But a still substantial pay gap for those over 40 - although this too has been coming down.

We need to be a little careful, as women in younger age bands tend to be more highly qualified than men in those bands; so the pay gap for younger women may actually still be there adjusting for education levels. Nonetheless, we find it reassuring - that when something is observed, and measured pay gaps can be more or less eliminated.

Exhibit 15: The gender pay gap has fallen almost to zero among full-time employees under 40
Gender pay gap for full-time median gross hourly earnings (ex overtime), UK, April 1997 to 2019



Source: ONS

This tallies with the BoE research too, suggesting that for men and women the biggest differences are often at the highest end of the pay scale (more likely to apply to workers over 40).

The pay gap for older women may reflect legacies of bias in previous decades; if that is the case then eventually this should disappear. That said, we do think greater household responsibilities mean women are less represented in the higher echelons of employment (more applicable to the over 40s). And we also think there could be lingering bias against older women meaning they are given less opportunity for leadership roles even if bias has largely disappeared for younger cohorts.

Main points from pay gap research

From the studies above and analysis from our GS colleagues (*US* and *Japan*) on the gender pay gap we find:

- Gender pay gaps are large. In most developed countries they range from 10% to 20%; Japan is an exception at the upper end, with the Nordic countries at the lower end.
- Women earn less than men across the entire pay distribution.
- The pay gap is bigger (and more persistent, i.e., it hasn't fallen over time) at the upper end of the pay distribution.
- There is an exceptionally large right-tail skew for white men in particular (some individuals earn very highly).
- The pay gap is most persistent for workers over 40; under 40 in the UK - for workers in full-time roles - the pay gap is close to zero.

- In most countries pay gaps have fallen in the last 20-30 years. But the majority of the falls happened pre-2007. Pay gaps have stagnated (or moved down very slightly) for over the past decade.
- Some of this gap – between a third and a half – can be explained by compositional effects (what occupation women and men do, the hours they work, their location, levels of experience, etc.). But a large share is unaccounted for and the studies ascribe this gap to bias.

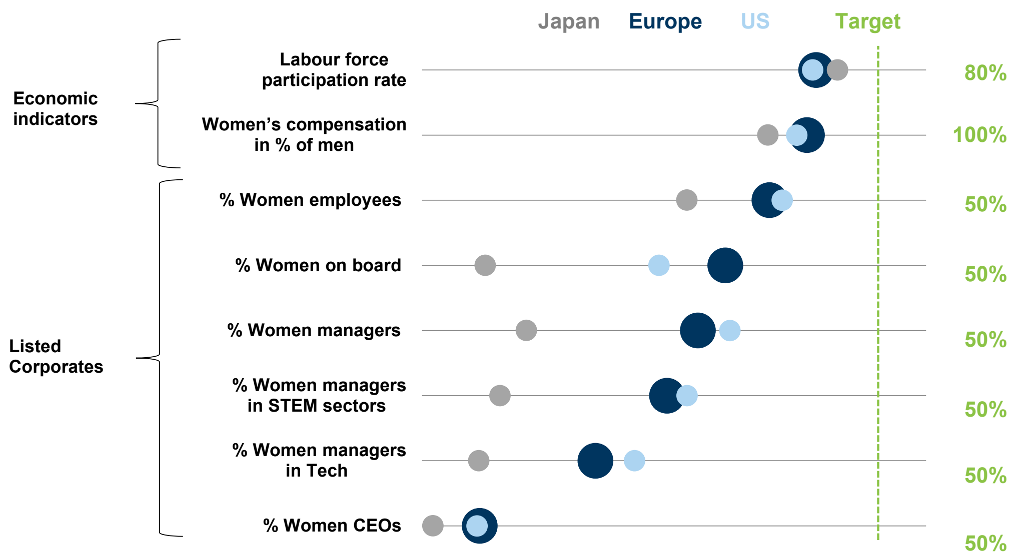
Of course, even if a gap can be accounted for by observed characteristics, that does not explain away inequalities or biases, as pointed out in the Bank of England working paper: *"Just because a pay gap can be explained by a set of individual and work-specific characteristics does not mean it is necessarily either reasonable or justifiable. Differences in these characteristics may themselves suggest inequalities or biases that need rectifying."*

Equities and equality: Moving slowly in the right direction

Conclusion: Based on listed company data, there have been improvements in female representation in recent years but it has been slow. Representation on boards has risen, and more so in Europe than in the US. But this is a highly targeted metric (by governments, policy-makers and the media). Other, less targeted metrics, such a prevalence of women CEOs or CFOs, or women managers, has moved by much less or not at all. Also, worryingly the Tech sector (which has doubled in size in terms of market cap in Europe in the last two years) is not a beacon of success when it comes to representation of women, especially at more senior levels.

Exhibit 16: Europe is moving in the right direction

All based on latest available data; usually 2019. Target for labour force participation is based on male participation

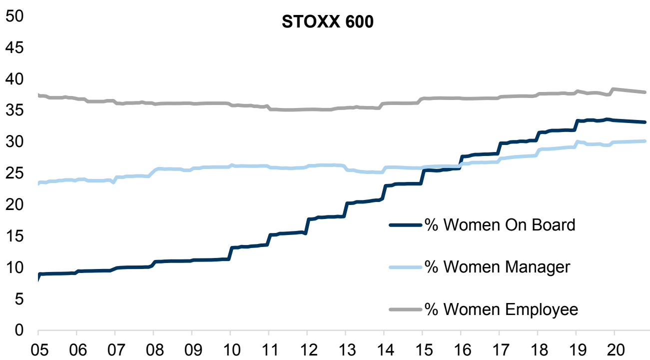


Source: OECD, Datastream, Haver Analytics, Goldman Sachs Global Investment Research

Improvement but mainly on the very 'targeted' statistics

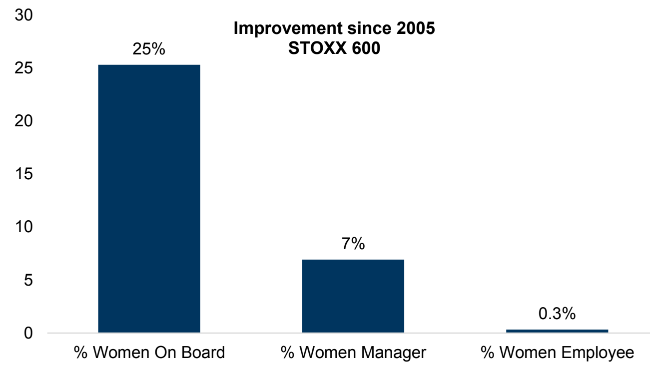
For Europe the percentage of women on company boards has improved sharply and consistently, moving up from 9% in 2005 to 31% in 2020. The percentage of women managers has risen, but by less, and the percentage of women employees has stayed roughly static at between 35% and 40% (Exhibit 20).

Exhibit 17: Europe (STOXX 600) - % of women on the board has risen sharply
%, equal weighted



Source: Datastream, Goldman Sachs Global Investment Research

Exhibit 18: The largest change in % of female representation has been at the board level
STOXX Europe, equal-weighted, Average % change in the proportion of women 2005-2020



Source: Datastream, Goldman Sachs Global Investment Research

Many European countries have legislation or quotas in place to require diversity on boards; for example, France implemented a quota in 2011 targeting a 40% female director ratio by 2017, which lifted their ratio from 17% to 40% today. Meanwhile, other countries, such as the UK, have seen improvements through the efforts of business coalitions and encouragement via their corporate governance code. See *GS SUSTAIN: Chart of the Week: Progress in board gender diversity,* 26 March 2018.

A combination of legislation, cultural pressure, media focus and the fact that it is relatively straightforward to adjust boards (there are few individuals on a board), as well as pressure from investors – with the rise of ESG funds and the focus on this metric – has led to an accelerated adjustment.

That said, there is the issue of overboarding - where women in particular sit on several boards. A recent MSCI study suggests that most female directors (78%) are not considered overboarded and serve on one to three boards. However, it is the case that a larger portion of women (22%) than men (12%) serve on three or more boards.

But, while 'women-on-boards' is a very targeted metric and has improved, others (such as the percentage of women managers or CEOs) have not shifted. The percentage of women CEOs is stubbornly low, at only 6% of all STOXX Europe 600 CEOs.

Just 23 of the 600 major listed companies (4%) in Europe have more than 50% women on their board. In contrast, 546 (91%) have more than 50% men on their board (some companies have exactly 50/50 or do not report).

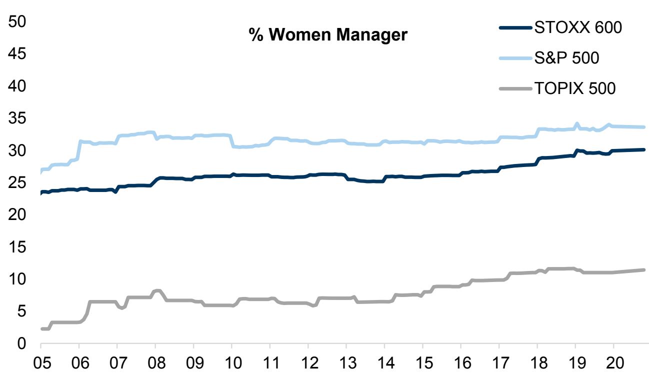
Based on the latest available data, only seven companies in the STOXX 600 had 50% or more women on their board, in management and as employees. In contrast, 333 companies in the STOXX 600 had 50% or more men at all three levels.

There is a large contrast between targeting high-profile statistics or adhering to quotas and making more profound improvements in representation in companies at all levels.

Europe outperforming the US and Japan ...

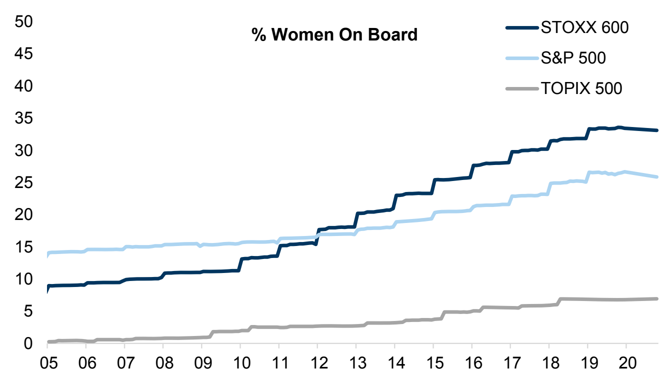
That said, Europe is doing well versus other regions. The percentage of women on the board for European listed companies has overtaken the US (and was always far above that in Japan). And the percentage of women managers in Europe is now close to the US, and again well ahead of Japan.

Exhibit 19: % of women managers in Europe is now close to the US
%, equal weighted



Source: Datastream, Goldman Sachs Global Investment Research

Exhibit 20: % of women on the board: Europe outperforming the US and Japan
%, equal weighted



Source: Datastream, Goldman Sachs Global Investment Research

Note on the data

When assessing women's progress in listed companies, we are reliant on company data. In Europe this is widely available. Close to 100% of European listed companies report the percentage of women on their boards; this has been the case since the early 2000s. Similarly, reporting levels for the percentage of women employees (c.95% of European companies report this) and the percentage of women managers (c.80%) is high. There is no definition for women managers, so it is subject to company discretion.

For S&P 500 and Topix 500 companies, the percentage of women on the board is a reported statistic for 95-100% of companies. But reporting on the percentage of women employees applies to just c.60-70% of S&P 500 companies and 40-50% for Topix. And the percentage of women managers is even less frequently reported. Also, prior to 5 years ago these statistics were reported by very few companies outside Europe.

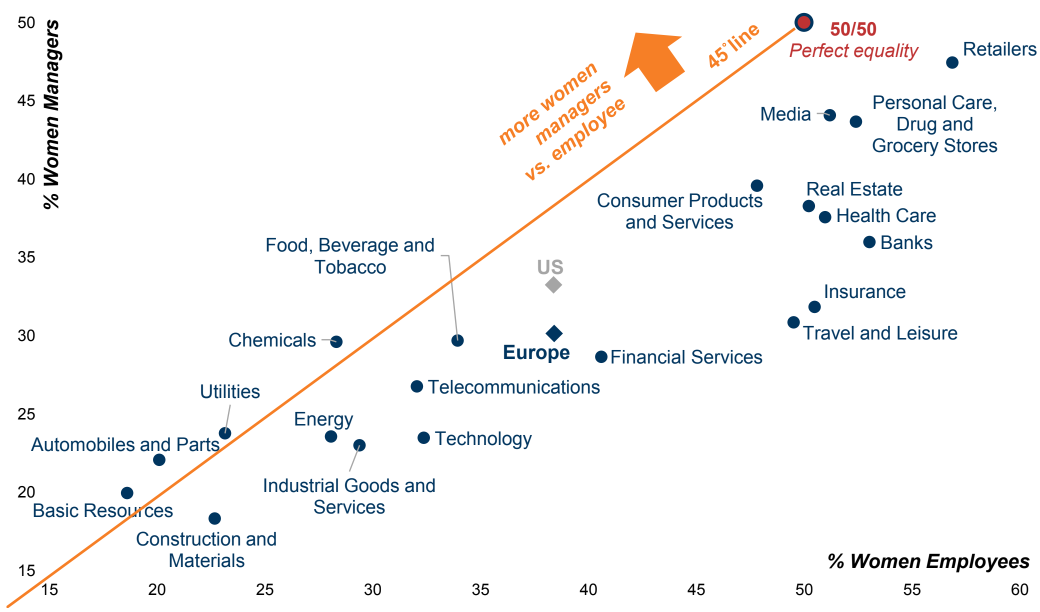
... But still more to go in every industry, and Tech is one of the worst

Certain industries have a high ratio of women employees, such as Retail, Media, Travel & Leisure, Healthcare, Financials and Consumer Staples, all of which have more than 50% women employees. But, in each case they have fewer than 50% women managers. Indeed, this mobility gap is often highest for high-paying industries such as Financials and Healthcare (Pharmaceuticals and Medtech).

In contrast, some industries have relatively few women employees but have no obvious mobility gap. The ratio of women employees is low in Autos, Basic resources, Utilities and Chemicals, but the ratio of women managers is higher than for women employees (they are above the line).

No industry comes close to the 'perfect equality' of 50/50 for both women managers and women employees; Media is the closest in Europe.

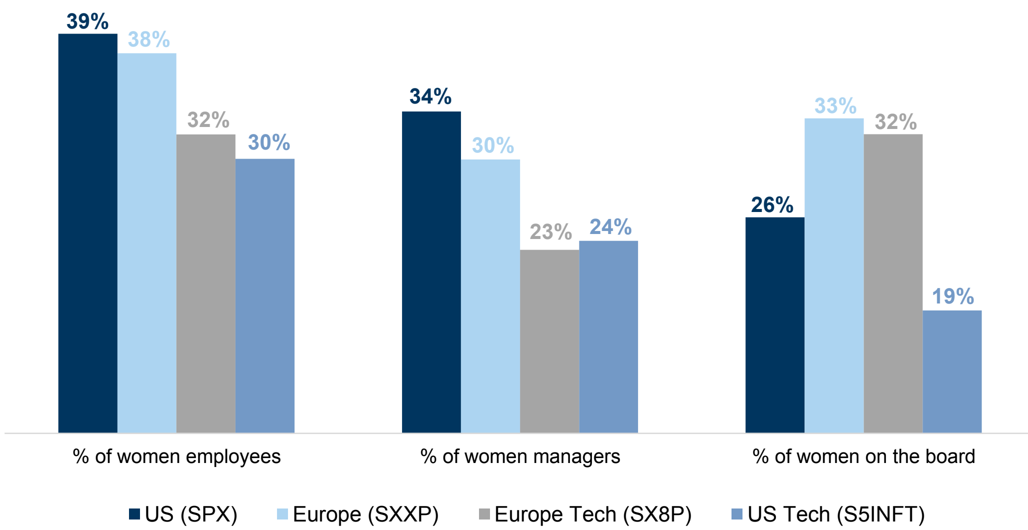
Exhibit 21: No industry is at 'perfect equality' with 50/50 women employees and managers



Source: Datastream, Goldman Sachs Global Investment Research

Technology is one of the worst sectors on this metric; as we show below; the percentage of women employees, managers and even board members is lower for the Tech sector in Europe than it is for the general European market.

Exhibit 22: Technology is one of the worst sectors with respect to proportion of women employees and women managers in both the US and Europe
Female representation



Source: Datastream, Goldman Sachs Global Investment Research

Alpha female: More women has benefited performance

More women = more performance

Yes, we find that over more or less any period since the GFC, having more women in senior positions as managers or on the board is associated with company outperformance relative to the sector. See Exhibit 23 and Exhibit 24.

Employing more women generally (not just at senior levels) has also been associated with outperformance (2008-2019), consistent with the work of our GS Sustain team; see *The PM's guide to the ESG revolution 2, ESG Building blocks,* 28 July 2020. However, we note that this was very much not the case during the months when Covid hit global economies. As discussed in the section on Covid and women, women employees tend to be more highly represented in certain industries or even parts of industries that have been hit hard by Covid-19, especially in service-related sectors and stocks. Even when we look at sector-relative female representation, it's still difficult to eliminate this factor entirely. We think this is a distortion rather than a reflection of the contribution of women.

Whatever time periods we take, the greater the representation of women ***higher up*** organisations, the better the performance uplift from having a larger percentage of women.

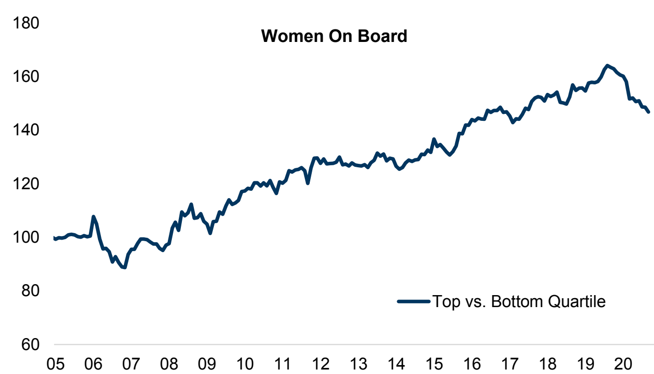
Exhibit 23: A higher % of women has been associated with outperformance

Annualised return of SXXP companies based on female representation within sector (Bark blue bar: Jan-2009 to Oct-2020 ; Light blue marker: Jan-2009 to Dec-2019)

Source: Datastream, Goldman Sachs Global Investment Research

Exhibit 24: This has been especially true for % of women on the board

Performance of 1Q vs. 4Q SXXP companies based on female representation within sector, rebalancing each year



Source: Datastream, Goldman Sachs Global Investment Research

That said, there should be a word of caution:

- We were not able to find any relationship between more women in a firm and higher ROE (nor did we find lower ROE). So it may be that a higher proportion of women is a signal of better quality / less risks more broadly, rather than something captured in one fundamental metric like ROE; stock price as an all-encompassing metric may better reflect the relationship.

- While the result (more women = better performance) is pretty robust for different time periods, it doesn't work for every industry. The Tech sector is a notable one where having more women in a firm has not been associated with better stock performance. As we noted above, the Tech sector has been slow to improve diversity metrics.
- The price outperformance may be a function of flows into ESG funds targeting diversity metrics, rather than more women producing better outcomes or lower risks. This is difficult for us to identify or separate. But even if this were the case, we continue to believe investors will value higher social and governance scores for companies, so companies that do perform well on these metrics should continue to attract both flows and a premium.
- Academic research is not especially conclusive and, while some studies show that employing more women means better performance, the evidence is far from incontrovertible. Indeed, a research review from Wharton University (Does Gender Diversity on Boards Really Boost Company Performance? 2017) summarising the results of two meta-analyses (Post and Byron (2015) and Pletzer, Nikolova, Kedzior, and Voelpel (2015)) stated: "The results of these two meta-analyses, summarizing numerous rigorous, original peer-reviewed studies, suggest that the relationship between board gender diversity and company performance is either non-existent (effectively zero) or very weakly positive."

That said, there may still be very good reasons for enhancing gender diversity even if the performance metrics are not compelling:

(i) Benefits may take a time to manifest.

(ii) The focus of investors and the investment fund industry on various ESG factors is rising, meaning that not enhancing gender diversity could be detrimental as investors add a risk premium to the stock price or don't invest at all.

(iii) General tail risk and adverse publicity from not having a diverse workforce.

(iv) A desire, regardless of economic benefit, to ensure equal opportunity for all.

These might all seem like weak reasons versus a large ROE or performance uplift, but the question can be turned on its head – more women at all levels does not detract from performance and may well add to it. So taking a moral, ethical stance, has no noticeable cost.

Europe Womenomics Basket: Companies with most women at all levels (GSSTWOMN)

We screen for companies with the following criteria, based on last reported numbers:

- % Women Employees > sector median (or STOXX top quartile: 50%)
- % Women Managers > sector median (or STOXX top quartile: 38%)
- % Women On Board > sector median (or STOXX top quartile: 40%)
- The highest % Women Managers / % Women Employees (the mobility gap is low)

We also look to make our basket sector Neutral and check liquidity of the constituents. The companies in the basket have on average 46% women employees (compared with 36% for SXXP), 40% women managers (compared with 28%) and 42% women on the board (compared with 33%).

Europe Womenomics Basket (GSSTWOMN): companies with a relative high share of women at all levels
Data based on latest available, usually 2019

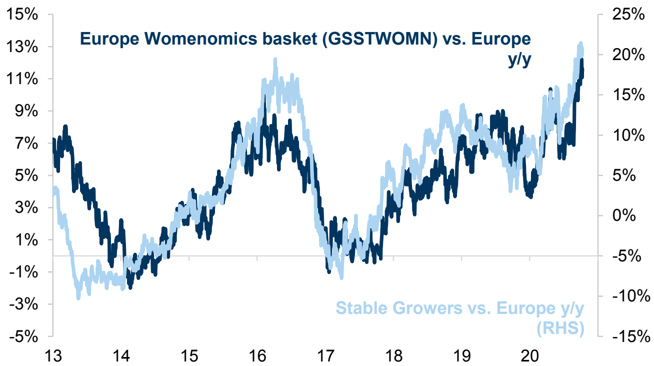
Name	Sector	Country	% Women Employees	% Women Managers	% Women On Board	% w. managers / % w. employees	Mkt Cap Bn EUR	P/E 12m fwd
Faurecia	Automobiles and Parts	France	33	24	40	75	5.3	17.2
SEB Group	Banks	Sweden	56	47	38	84	17.0	10.0
Swedbank	Banks	Sweden	63	54	45	86	15.7	9.8
Handelsbanken	Banks	Sweden	50	40	45	80	14.2	9.6
BHP Group	Basic Resources	United Kingdom	23	28	36	123	38.7	10.9
Air Liquide	Chemicals	France	26	29	42	112	63.2	25.0
DSM	Chemicals	Netherlands	28	29	50	104	26.3	29.4
Assa Abloy	Construction and Materials	Sweden	29	25	44	86	21.6	24.4
Nibe Industrier	Construction and Materials	Sweden	38	21	33	56	10.2	45.4
LVMH	Consumer Products and Services	France	73	65	40	89	207.9	33.6
L'Oreal	Consumer Products and Services	France	70	64	53	91	157.9	36.5
Hermes	Consumer Products and Services	France	68	61	50	90	80.4	55.6
Equinor	Energy	Norway	30	30	36	100	40.9	16.8
Neste	Energy	Finland	30	28	38	92	36.5	27.8
Schroders	Financial Services	United Kingdom	42	32	40	76	7.0	15.3
Standard Life Aberdeen	Financial Services	United Kingdom	46	36	42	78	6.1	15.7
Nestle	Food, Beverage and Tobacco	Switzerland	38	42	29	111	290.7	24.4
Diageo	Food, Beverage and Tobacco	United Kingdom	33	36	50	110	69.4	23.7
Pernod-Ricard	Food, Beverage and Tobacco	France	37	41	47	111	36.2	24.9
Remy Cointreau	Food, Beverage and Tobacco	France	44	44	42	99	7.8	58.0
Astrazeneca	Health Care	United Kingdom	50	45	33	91	121.6	23.3
Novo Nordisk	Health Care	Denmark	49	40	38	82	110.5	23.3
Essilorluxottica	Health Care	France	58	41	41	71	53.3	33.5
Genmab	Health Care	Denmark	59	38	33	64	20.7	49.4
Galapagos	Health Care	Belgium	61	38	33	62	8.1	NM
Amplifon	Health Care	Italy	71	43	40	60	7.2	52.6
Orpea	Health Care	France	83	65	45	78	6.2	27.3
Orion	Health Care	Finland	59	38	43	64	4.3	27.7
DSV Panalpina	Industrial Goods and Services	Denmark	39	33	43	85	32.9	33.3
Experian	Industrial Goods and Services	United Kingdom	44	30	33	68	29.9	36.5
Teleperformance	Industrial Goods and Services	France	49	44	43	90	15.9	31.2
Atlantia	Industrial Goods and Services	Italy	33	26	47	79	11.1	19.6
Rentokil Initial	Industrial Goods and Services	United Kingdom	25	28	38	112	11.0	36.1
Edenred	Industrial Goods and Services	France	52	40	36	77	10.4	33.5
AXA	Insurance	France	54	46	53	86	39.2	6.4
Sampo	Insurance	Finland	51	45	38	88	19.8	14.3
Vivendi	Media	France	51	49	55	97	29.6	20.2
Beiersdorf	Personal Care, Drug and Grocery Stores	Germany	54	48	33	89	24.8	31.4
Carrefour	Personal Care, Drug and Grocery Stores	France	56	41	44	74	11.3	10.5
Land Securities Group	Real Estate	United Kingdom	52	53	40	100	4.6	12.1
Kering	Retailers	France	63	55	64	88	73.5	27.0
Sap	Technology	Germany	34	26	50	79	163.5	24.0
Sage Group	Technology	United Kingdom	45	39	30	87	8.7	26.1
Auto Trader Group	Technology	United Kingdom	39	42	33	107	6.1	31.1
Simcorp	Technology	Denmark	32	35	33	109	4.5	43.8
Telenor	Telecommunications	Norway	37	30	44	81	19.7	14.6
Elisa	Telecommunications	Finland	32	36	43	114	8.3	23.9
Sodexo	Travel and Leisure	France	55	44	54	80	9.4	18.6
Fortum	Utilities	Finland	32	30	38	94	16.3	12.9
Hera	Utilities	Italy	27	33	33	123	4.5	14.8
List - average			**46**	**40**	**41**	**89**	**40.8**	**26.0**
STOXX 600 - median			**36**	**28**	**33**	**81**	**8.2**	**19.1**
%ile rank			*68%*	*79%*	*78%*	*64%*	*92%*	*70%*

Source: Datastream, Goldman Sachs Global Investment Research

There is a clear country skew in the constituents towards France and the Nordic region. France has a female board member quota and the Nordic region has for a long time had higher female labour participation, so we are not surprised by the skew.

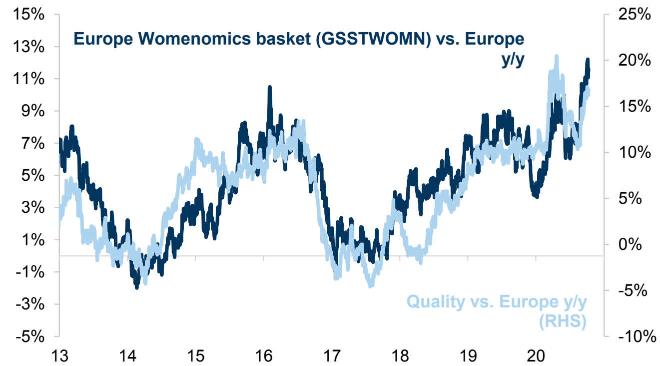
The basket has been a clear outperformer over time. That said, we have back-tested using current constituents and using current ratios of female representation. We also find that the basket's back-tested performance correlates very strongly with other 'quality' slices of the market. For example, the basket's performance correlates closely to the performance of our Stable Growers basket (GSSTGRTH) and our Quality basket (GSSTQUAL), which looks at other metrics such as low volatility of earnings and sales and quality of balance sheets.

Exhibit 25: Performance of our Europe Womenomics basket is correlated with Stable Growers (GSSTGRTH) ...
Back-test of yoy price performance relative to SXXP



Source: Bloomberg, Datastream, Goldman Sachs Global Investment Research

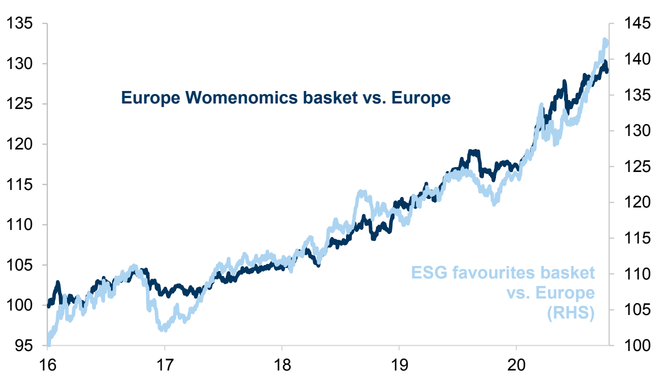
Exhibit 26: ... and with Quality (GSSTQUAL), which includes stability of growth and good balance sheets
Back-test of yoy price performance relative to SXXP



Source: Bloomberg, Datastream, Goldman Sachs Global Investment Research

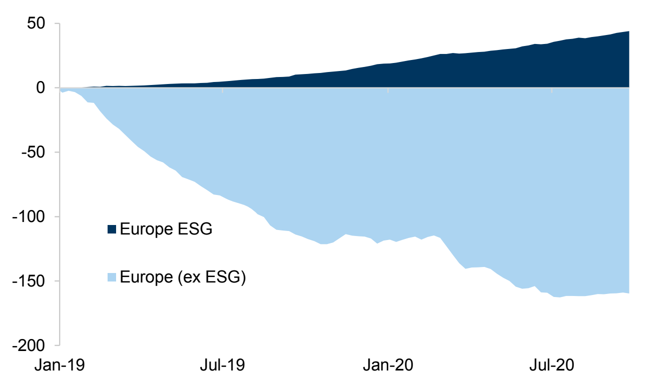
The basket also does well more broadly on ESG scores. Compared with the world, the basket ranks in the 75th percentile in terms of E&S scores (while the median company in STOXX 600 is ranked 60th percentile). We note that the basket is also correlated with ESG Favourites (GSXEESGF), as we show below. Again this would suggest that the theme is closely tied to flows into ESG funds; as we show in Exhibit 28, flows into ESG remain strong.

Exhibit 27: Our Europe Womenomics basket (GSSTWOMN) has tracked ESG Favourites (GSXEESGF)
Back-test of price performance relative to SXXP



Source: Bloomberg, Goldman Sachs Global Investment Research

Exhibit 28: ESG funds growing steadily, while all others are seeing outflows
Cumulative flows in equity funds, USD bn; UK is included in the Europe figures



Source: EPFR, Goldman Sachs Global Investment Research

Covid and womenomics

There are several dimensions along which the current pandemic could impact women differentially to men, and they are mixed in terms of implications. We do not see the pandemic in and of itself as disadvantaging women or negating/reversing the progress in recent years.

Two factors have hit women generally harder than men:

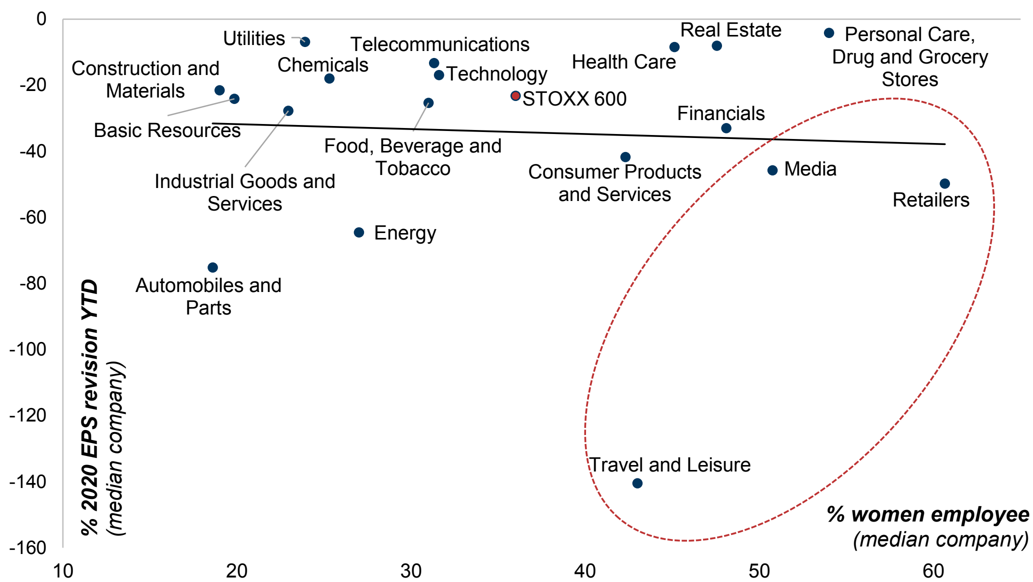
- During lockdown periods when **child and elder care have been less available,** women have often found themselves taking an even greater share of this responsibility. An ONS study found that in lockdown women in households with children aged under 18 years were delivering an average of 3 hours and 18 minutes of childcare, which includes time spent supervising children, while men contributed 2 hours.
- The **industries women work in** and the jobs they tend to do may have been harder hit by the lockdowns. For example, Retail and Travel & Leisure have high ratios of women employees; also, women work more part-time and these jobs may be easier to cut if and when jobs are cut.

But women may relatively benefit by:

- **The prevalence of women employees in the public versus private sector**; there are more women in the public sector, and these jobs may be stickier and pay less prone to falling in recessions
- The longer-term changes in society brought about, or accelerated, because of the pandemic. There is likely to be less commuting, more online work and working from home, and this should **enhance flexibility** for both men and women; as we noted above, it is the flexibility of both women and men that we think has been a determinant in increasing women's participation in the workforce in recent years.

There is a loose negative relationship between the percentage of women employees and the percentage change in EPS in 2020: certain sectors where women are heavily represented (Travel & Leisure, Media and Retail) have seen large profit declines; that said, so have Autos and Energy, which are industries that have relatively few women employees.

Exhibit 29: Some of the sectors where women account for a high share of employees have seen a large EPS hit

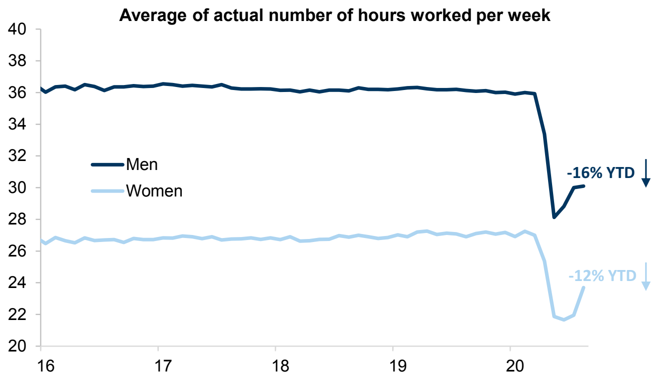


Source: Datastream, FactSet, Goldman Sachs Global Investment Research

We are unconvinced that women will lose out more than men from the Covid shock. For example, in the UK the number of hours worked for men and women has fallen by roughly the same proportion compared with their respective hours at the outset of the year. Indeed, the percentage fall for women is less than that for men. That said, the furlough scheme is still running (the proposed end is October) and redundancies in certain industries are likely to rise, so we have yet to see the true impact.

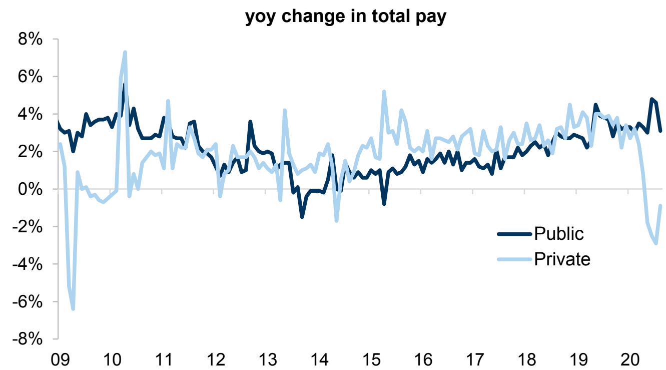
More women work in the public sector compared with men, and pay in the public sector has held up better (Exhibit 31). In the public sector, 35% of workers are men and 65% are women, whereas the private sector is made up of 58% men and 42% women (ONS, UK data). We find a similar ratio for France (over 60% of public-sector workers are women) and in Scandinavian countries the ratio is 65-75%.

Exhibit 30: Working hours for men and women have fallen by around the same amount in 2020
UK, Weekly date



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

Exhibit 31: Public-sector pay has held up better, and more women are employed in the public sector
UK, Weekly data



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

We would like to thank Victor Allard, an intern in the Portfolio Strategy team, for his contribution to this report.

Appendix

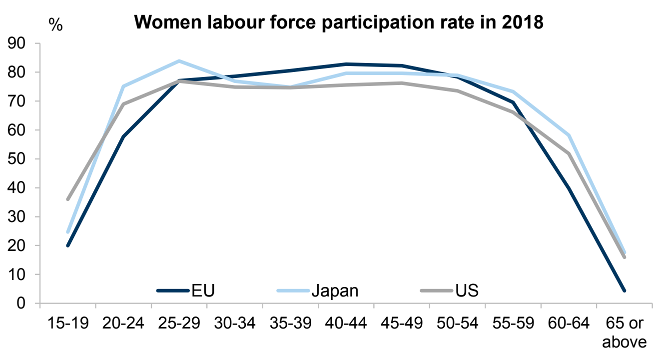
1. Europe and Japan say goodbye to their M-curves

We show the rate of participation by age group for the US, Europe and Japan (Exhibit 32). There are some interesting distinctions in these participation curves. For Japan there remains a distinctive 'M-curve' to the participation rate across the age groups, with women more likely to work in their 20s followed by a dip in their 30s and another rise when women reach their 40s and return to the workforce.

Our Japan Equity strategist, Kathy Matsui, discussed this in Japan Portfolio Strategy: Womenomics 5.0: 20 Years On, 16 April 2019. She points to the progress being made in normalising Japan's ubiquitous 'M-curve', which was even more pronounced in the past. This is thanks to a rise in the ratio of mothers returning to work after their first child, from 40% between 2005 and 2009 to 53% between 2010 and 2014.

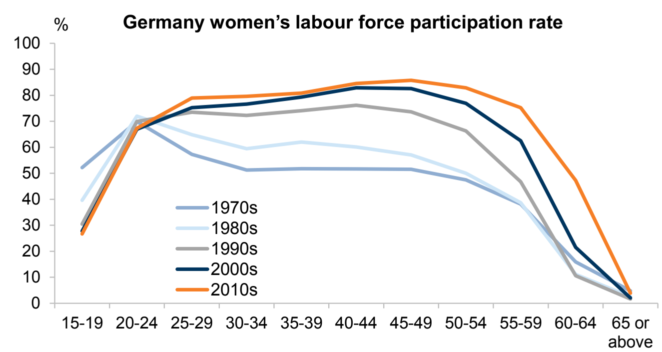
We show the curves over time for Germany in Exhibit 33. Germany had the same type of 'M-curve' in the 1970s and 1980s, but it has both risen and flattened out, although a small dip in participation when women are in their early-to-mid 30s is still visible.

Exhibit 32: In Europe women are relatively more active during their prime working age
UK is included in the EU figures



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

Exhibit 33: Germany has been losing its 'M-curve'
Each line is the decade average

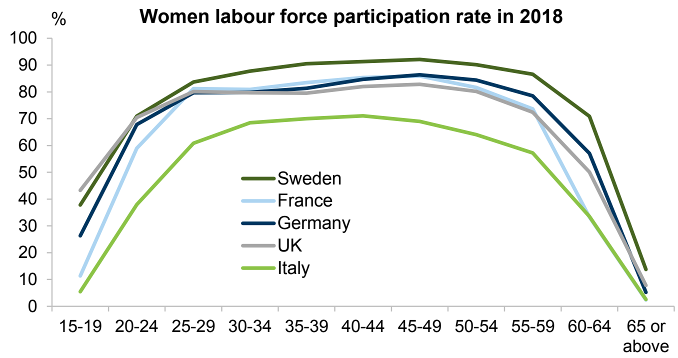


Source: OECD, Haver Analytics, Goldman Sachs Global Investment Research

Italy is improving but still lagging; Spain moves ahead; Sweden remains an outlier

The curves representing female participation across age groups look very different for some countries. Sweden has high participation across all ages; in contrast, Italy has low participation across all ages (Exhibit 34). That said, for the biggest economies in Europe – France, UK and Germany – the curves look roughly similar and are close to the EU average.

Exhibit 34: Women's labour force participation rates vary across European countries



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

The participation rate is distinctly lower in Italy than in most other places in Europe (Greece also has a low rate). This is true for men and women, although less so for Italian men. Italian participation for 15-64 year-old men is 75% vs. the European average of 79%; for women the figures are 56% and 68%. So a 4pp difference in participation for Italian men versus the EU becomes a 12pp difference for Italian women.

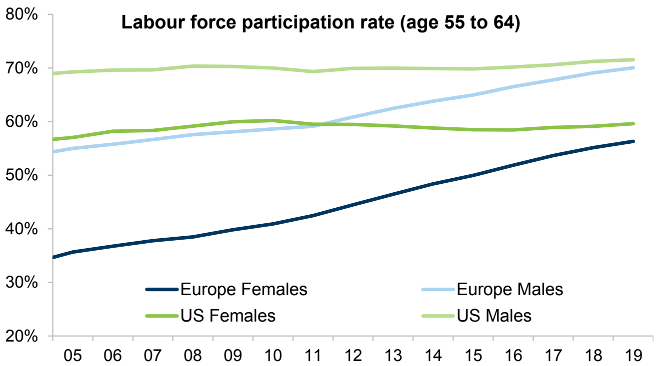
Has that difference diminished over time? Not really. It was about 16pp below the EU average for Italian women in the early 1990s and fell to about 11pp in 2003 but it has been static since then. Like elsewhere, the Italian female participation rate is rising but at the same pace as in the EU on average, the gap has not closed. Italy has a low participation rate for women but also a relatively low pay gap. We think this is because the Italian women participating in the workforce tend to have a high level of education and because a large number of public-sector jobs (more than half) in Italy are held by women, including doctors and academics.

2. Why women are working for longer, including the older age groups

The largest change in participation rates for women in Europe in recent years has been greater participation by women aged 50 and older. In Europe retirement ages have risen and participation rates for older workers have gone up for *both* men and women (more so for women).

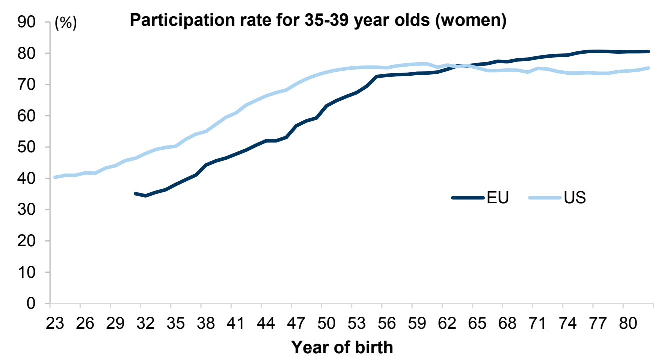
Women who are in their 50s and 60s now first entered the workforce in the 1970s and 1980s and were in their 30s by the 1990s. By the 1990s it was becoming more typical for women to work even when they had families and young children; this is evident in the participation rate for women aged 35-39 based on the year in which they were born (Exhibit 36).

Exhibit 35: Europe has been catching up with US participation in the older age groups for BOTH men and women
UK is included in Europe figures



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

Exhibit 36: Participation rate for European women in their late 30s trailed the US ... until those born in the 1960s were in their late 30s
Year of birth form 1923 to 1981; UK is included in the EU figures



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

That said, there is more to go here: the participation of European women in the 60-64 age group is considerably below that for US women (41% for the EU versus 52% in the US) and the participation rate for women over 64 is tiny in Europe (4%), whereas it is 15% in the US and 16% in Japan.

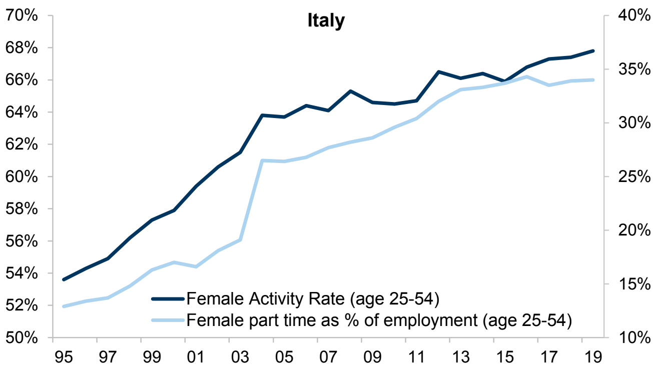
We would expect women across Europe currently in their 50s and 60s to carry on working longer than in previous generations: (i) economic reasons (pension entitlements have fallen and pension ages have risen); (ii) employers will seek older workers when an ageing population means fewer younger workers are available, as we have seen in Japan; this applies to men as much as women; and (iii) partly because the opportunities exist for this cohort of women which perhaps did not for previous generations and their expectations are commensurately higher.

There is also more legislation in place to protect against the discrimination of workers based on age. Since 2000, the EU has a directive banning – among others – discrimination on the basis of age in employment and occupation. The UK has had a ban on age discrimination in employment since 2006. That said, a recent parliamentary report highlighted that the law is not well enforced, and overt as well as subtle age discrimination exists despite these laws and that this is more so for women than for men.

3. Part-time work is not the reason for higher female participation

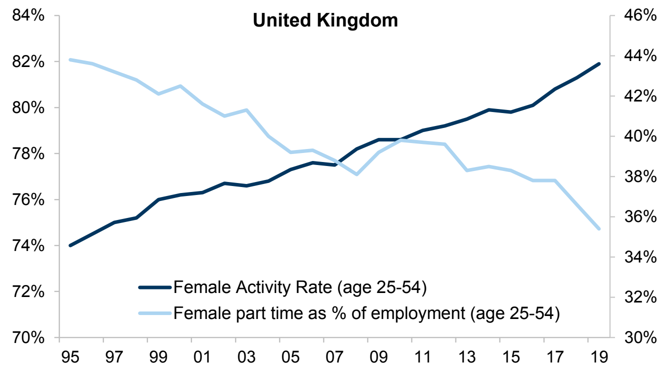
Germany has a high rate of women employed part-time: it is static at about half the female workforce since 2006 and yet since 2006 there have been significant increases in Germany in female participation (above the European average). We show two contrasting experiences in Italy and the UK (Exhibit 37 and Exhibit 38). In Italy the part-time rate for women has risen as female participation has risen, whereas in the UK the opposite is true – female participation has risen but the part-time rate has fallen modestly (albeit from a higher level).

Exhibit 37: In Italy greater female participation has occurred with a rising share of part-time work ...



Source: Eurostat, Goldman Sachs Global Investment Research

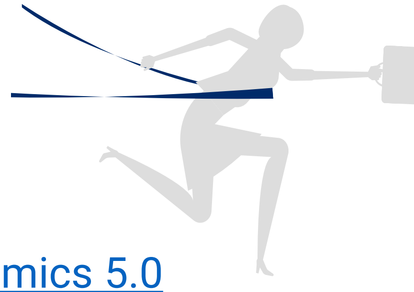
Exhibit 38: ... But it is the other way around in the UK: female participation has risen as part-time work share has declined

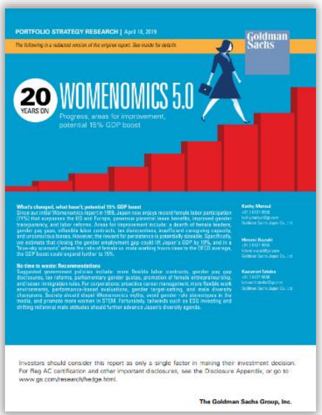


Source: Eurostat, Goldman Sachs Global Investment Research

Also, we are not convinced that women are reluctant to work part-time and really would desire a full-time job. The proportion of women part-time workers who consider themselves involuntary part-time workers (they would prefer full time) is around a fifth versus almost 40% for part-time men (Eurostat data). All that said, this does suggest that, while there has been a lot of progress on the female participation rate in Europe, there is more potential to utilise the economic resources of women in the workforce.

Related Research on Womenomics





1. [Japan Portfolio Strategy: Womenomics 5.0]
   (April 16, 2019)

2. [Australia and New Zealand Economics Analyst: Womenomics in Australia – Some Progress, but More Potential]
   (November 26, 2019)

3. [Global Markets Institute: Closing the Gender Gaps 2.0: Fresh Data Show More Work to Do]
   (October 23, 2019)

4. [Global Markets Institute: Closing the Gender Gaps: Advancing Women in Corporate America]
   (October 21, 2018)

5. [Japan Portfolio Strategy: Womenomics 4.0: Time to Walk the Talk]
   (May 30, 2014)

6. [Global Markets Institute: Giving Credit Where it is Due]
   (February 28, 2014)

7. [Japan Portfolio Strategy: Womenomics 3.0: The Time Is Now]
   (October 1, 2010)

8. [Global Economics Paper: Women Hold Up Half the Sky]
   (March 4, 2008)

9. [Japan Portfolio Strategy: Womenomics: Japan's Hidden Asset]
   (October 19, 2005)

10. [Japan Portfolio Strategy: Women-omics: Buy the Female Economy]
    (August 13, 1999)

Disclosure Appendix

Reg AC

We, Sharon Bell, CFA, Guillaume Jaisson, Peter Oppenheimer, Lilia Peytavin and Andrea Ferrario, hereby certify that all of the views expressed in this report accurately reflect our personal views, which have not been influenced by considerations of the firm's business or client relationships.

Unless otherwise stated, the individuals listed on the cover page of this report are analysts in Goldman Sachs' Global Investment Research division.

Disclosures

Equity basket disclosure

The ability to trade the basket(s) discussed in this research will depend upon market conditions, including liquidity and borrow constraints at the time of trade.

MSCI disclosure

All MSCI data used in this report is the exclusive property of MSCI, Inc. (MSCI). Without prior written permission of MSCI, this information and any other MSCI intellectual property may not be reproduced or redisseminated in any form and may not be used to create any financial instruments or products or any indices. This information is provided on an "as is" basis, and the user of this information assumes the entire risk of any use made of this information. Neither MSCI, any of its affiliates nor any third party involved in, or related to, computing or compiling the data makes any express or implied warranties or representations with respect to this information (or the results to be obtained by the use thereof), and MSCI, its affiliates and any such third party hereby expressly disclaim all warranties of originality, accuracy, completeness, merchantability or fitness for a particular purpose with respect to any of this information. Without limiting any of the foregoing, in no event shall MSCI, any of its affiliates or any third party involved in, or related to, computing or compiling the data have any liability for any direct, indirect, special, punitive, consequential or any other damages (including lost profits) even if notified of the possibility of such damages. MSCI and the MSCI indexes are service marks of MSCI and its affiliates. The Global Industry Classification Standard (GICS) were developed by and is the exclusive property of MSCI and Standard & Poor's. GICS is a service mark of MSCI and S&P and has been licensed for use by The Goldman Sachs Group.

Regulatory disclosures

Disclosures required by United States laws and regulations

See company-specific regulatory disclosures above for any of the following disclosures required as to companies referred to in this report: manager or co-manager in a pending transaction; 1% or other ownership; compensation for certain services; types of client relationships; managed/co-managed public offerings in prior periods; directorships; for equity securities, market making and/or specialist role. Goldman Sachs trades or may trade as a principal in debt securities (or in related derivatives) of issuers discussed in this report.

The following are additional required disclosures: **Ownership and material conflicts of interest:** Goldman Sachs policy prohibits its analysts, professionals reporting to analysts and members of their households from owning securities of any company in the analyst's area of coverage. **Analyst compensation:** Analysts are paid in part based on the profitability of Goldman Sachs, which includes investment banking revenues. **Analyst as officer or director:** Goldman Sachs policy generally prohibits its analysts, persons reporting to analysts or members of their households from serving as an officer, director or advisor of any company in the analyst's area of coverage. **Non-U.S. Analysts:** Non-U.S. analysts may not be associated persons of Goldman Sachs & Co. LLC and therefore may not be subject to FINRA Rule 2241 or FINRA Rule 2242 restrictions on communications with subject company, public appearances and trading securities held by the analysts.

Additional disclosures required under the laws and regulations of jurisdictions other than the United States

The following disclosures are those required by the jurisdiction indicated, except to the extent already made above pursuant to United States laws and regulations. **Australia:** Goldman Sachs Australia Pty Ltd and its affiliates are not authorised deposit-taking institutions (as that term is defined in the Banking Act 1959 (Cth)) in Australia and do not provide banking services, nor carry on a banking business, in Australia. This research, and any access to it, is intended only for "wholesale clients" within the meaning of the Australian Corporations Act, unless otherwise agreed by Goldman Sachs. In producing research reports, members of the Global Investment Research Division of Goldman Sachs Australia may attend site visits and other meetings hosted by the companies and other entities which are the subject of its research reports. In some instances the costs of such site visits or meetings may be met in part or in whole by the issuers concerned if Goldman Sachs Australia considers it is appropriate and reasonable in the specific circumstances relating to the site visit or meeting. To the extent that the contents of this document contains any financial product advice, it is general advice only and has been prepared by Goldman Sachs without taking into account a client's objectives, financial situation or needs. A client should, before acting on any such advice, consider the appropriateness of the advice having regard to the client's own objectives, financial situation and needs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests and a copy of Goldman Sachs' Australian Sell-Side Research Independence Policy Statement are available at: https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html. **Brazil:** Disclosure information in relation to CVM Instruction 598 is available at https://www.gs.com/worldwide/brazil/area/gir/index.html. Where applicable, the Brazil-registered analyst primarily responsible for the content of this research report, as defined in Article 20 of CVM Instruction 598, is the first author named at the beginning of this report, unless indicated otherwise at the end of the text. **Canada:** Goldman Sachs Canada Inc. is an affiliate of The Goldman Sachs Group Inc. and therefore is included in the company specific disclosures relating to Goldman Sachs (as defined above). Goldman Sachs Canada Inc. has approved of, and agreed to take responsibility for, this research report in Canada if and to the extent that Goldman Sachs Canada Inc. disseminates this research report to its clients. **Hong Kong:** Further information on the securities of covered companies referred to in this research may be obtained on request from Goldman Sachs (Asia) L.L.C. **India:** Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (India) Securities Private Limited, Research Analyst - SEBI Registration Number INH000001493, 951-A, Rational House, Appasaheb Marathe Marg, Prabhadevi, Mumbai 400 025, India, Corporate Identity Number U74140MH2006FTC160634, Phone +91 22 6616 9000, Fax +91 22 6616 9001. Goldman Sachs may beneficially own 1% or more of the securities (as such term is defined in clause 2 (h) the Indian Securities Contracts (Regulation) Act, 1956) of the subject company or companies referred to in this research report. **Japan:** See below. **Korea:** This research, and any access to it, is intended only for "professional investors" within the meaning of the Financial Services and Capital Markets Act, unless otherwise agreed by Goldman Sachs. Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (Asia) L.L.C., Seoul Branch. **New Zealand:** Goldman Sachs New Zealand Limited and its affiliates are neither "registered banks" nor "deposit takers" (as defined in the Reserve Bank of New Zealand Act 1989) in New Zealand. This research, and any access to it, is intended for "wholesale clients" (as defined in the Financial Advisers Act 2008) unless otherwise agreed by Goldman Sachs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests is available at: https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html. **Russia:** Research reports distributed in the Russian Federation are not advertising as defined in the Russian legislation, but are information and analysis not having product promotion as their main purpose and do not provide appraisal within the meaning of the Russian legislation on appraisal activity. Research reports do not constitute a personalized investment recommendation as defined in Russian laws and regulations, are not addressed to a specific client, and are prepared without analyzing the financial circumstances, investment profiles or risk profiles of clients. Goldman Sachs assumes no responsibility for any investment decisions that may be taken by a client or any other person based on this research report. **Singapore:** Goldman Sachs (Singapore) Pte. (Company Number: 198602165W), which is regulated by the Monetary Authority of Singapore, accepts legal responsibility for this research, and should be contacted with respect to any matters arising from, or in connection with, this research. **Taiwan:** This material is for reference only and must not be reprinted without permission. Investors should carefully consider their own investment risk. Investment results are the responsibility of the individual investor. **United Kingdom:** Persons who would be categorized as retail clients in the United Kingdom, as such term is defined in the rules of the Financial Conduct Authority, should read this research in conjunction with prior Goldman Sachs research on the covered companies referred to herein and should refer to the risk warnings that have been sent to them by Goldman Sachs International. A copy of these risks warnings, and a glossary of certain financial terms used in this report, are available from Goldman Sachs International on request.

European Union: Disclosure information in relation to Article 6 (2) of the European Commission Delegated Regulation (EU) (2016/958) supplementing Regulation (EU) No 596/2014 of the European Parliament and of the Council with regard to regulatory technical standards for the technical arrangements for objective presentation of investment recommendations or other information recommending or suggesting an investment strategy and for disclosure of particular interests or indications of conflicts of interest is available at https://www.gs.com/disclosures/europeanpolicy.html which states the European Policy for Managing Conflicts of Interest in Connection with Investment Research.

Japan: Goldman Sachs Japan Co., Ltd. is a Financial Instrument Dealer registered with the Kanto Financial Bureau under registration number Kinsho 69, and a member of Japan Securities Dealers Association, Financial Futures Association of Japan and Type II Financial Instruments Firms Association. Sales and purchase of equities are subject to commission pre-determined with clients plus consumption tax. See company-specific disclosures as to any applicable disclosures required by Japanese stock exchanges, the Japanese Securities Dealers Association or the Japanese Securities Finance Company.

Global product; distributing entities

The Global Investment Research Division of Goldman Sachs produces and distributes research products for clients of Goldman Sachs on a global basis. Analysts based in Goldman Sachs offices around the world produce research on industries and companies, and research on macroeconomics, currencies, commodities and portfolio strategy. This research is disseminated in Australia by Goldman Sachs Australia Pty Ltd (ABN 21 006 797 897); in Brazil by Goldman Sachs do Brasil Corretora de Títulos e Valores Mobiliários S.A.; Ombudsman Goldman Sachs Brazil: 0800 727 5764 and / or ouvidoriagoldmansachs@gs.com. Available Weekdays (except holidays), from 9am to 6pm. Ouvidoria Goldman Sachs Brasil: 0800 727 5764 e/ou ouvidoriagoldmansachs@gs.com. Horário de funcionamento: segunda-feira à sexta-feira (exceto feriados), das 9h às 18h; in Canada by either Goldman Sachs Canada Inc. or Goldman Sachs & Co. LLC; in Hong Kong by Goldman Sachs (Asia) L.L.C.; in India by Goldman Sachs (India) Securities Private Ltd.; in Japan by Goldman Sachs Japan Co., Ltd.; in the Republic of Korea by Goldman Sachs (Asia) L.L.C., Seoul Branch; in New Zealand by Goldman Sachs New Zealand Limited; in Russia by OOO Goldman Sachs; in Singapore by Goldman Sachs (Singapore) Pte. (Company Number: 198602165W); and in the United States of America by Goldman Sachs & Co. LLC. Goldman Sachs International has approved this research in connection with its distribution in the United Kingdom and European Union.

European Union: Goldman Sachs International authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority, has approved this research in connection with its distribution in the European Union and United Kingdom.

General disclosures

This research is for our clients only. Other than disclosures relating to Goldman Sachs, this research is based on current public information that we consider reliable, but we do not represent it is accurate or complete, and it should not be relied on as such. The information, opinions, estimates and forecasts contained herein are as of the date hereof and are subject to change without prior notification. We seek to update our research as appropriate, but various regulations may prevent us from doing so. Other than certain industry reports published on a periodic basis, the large majority of reports are published at irregular intervals as appropriate in the analyst's judgment.

Goldman Sachs conducts a global full-service, integrated investment banking, investment management, and brokerage business. We have investment banking and other business relationships with a substantial percentage of the companies covered by our Global Investment Research Division. Goldman Sachs & Co. LLC, the United States broker dealer, is a member of SIPC (https://www.sipc.org).

Our salespeople, traders, and other professionals may provide oral or written market commentary or trading strategies to our clients and principal trading desks that reflect opinions that are contrary to the opinions expressed in this research. Our asset management area, principal trading desks and investing businesses may make investment decisions that are inconsistent with the recommendations or views expressed in this research.

We and our affiliates, officers, directors, and employees, will from time to time have long or short positions in, act as principal in, and buy or sell, the securities or derivatives, if any, referred to in this research, unless otherwise prohibited by regulation or Goldman Sachs policy.

The views attributed to third party presenters at Goldman Sachs arranged conferences, including individuals from other parts of Goldman Sachs, do not necessarily reflect those of Global Investment Research and are not an official view of Goldman Sachs.

Any third party referenced herein, including any salespeople, traders and other professionals or members of their household, may have positions in the products mentioned that are inconsistent with the views expressed by analysts named in this report.

This research is focused on investment themes across markets, industries and sectors. It does not attempt to distinguish between the prospects or performance of, or provide analysis of, individual companies within any industry or sector we describe.

Any trading recommendation in this research relating to an equity or credit security or securities within an industry or sector is reflective of the investment theme being discussed and is not a recommendation of any such security in isolation.

This research is not an offer to sell or the solicitation of an offer to buy any security in any jurisdiction where such an offer or solicitation would be illegal. It does not constitute a personal recommendation or take into account the particular investment objectives, financial situations, or needs of individual clients. Clients should consider whether any advice or recommendation in this research is suitable for their particular circumstances and, if appropriate, seek professional advice, including tax advice. The price and value of investments referred to in this research and the income from them may fluctuate. Past performance is not a guide to future performance, future returns are not guaranteed, and a loss of original capital may occur. Fluctuations in exchange rates could have adverse effects on the value or price of, or income derived from, certain investments.

Certain transactions, including those involving futures, options, and other derivatives, give rise to substantial risk and are not suitable for all investors. Investors should review current options and futures disclosure documents which are available from Goldman Sachs sales representatives or at https://www.theocc.com/about/publications/character-risks.jsp and https://www.fiadocumentation.org/fia/regulatory-disclosures_1/fia-uniform-futures-and-options-on-futures-risk-disclosures-booklet-pdf-version-2018. Transaction costs may be significant in option strategies calling for multiple purchase and sales of options such as spreads. Supporting documentation will be supplied upon request.

Differing Levels of Service provided by Global Investment Research: The level and types of services provided to you by the Global Investment

Research division of GS may vary as compared to that provided to internal and other external clients of GS, depending on various factors including your individual preferences as to the frequency and manner of receiving communication, your risk profile and investment focus and perspective (e.g., marketwide, sector specific, long term, short term), the size and scope of your overall client relationship with GS, and legal and regulatory constraints. As an example, certain clients may request to receive notifications when research on specific securities is published, and certain clients may request that specific data underlying analysts' fundamental analysis available on our internal client websites be delivered to them electronically through data feeds or otherwise. No change to an analyst's fundamental research views (e.g., ratings, price targets, or material changes to earnings estimates for equity securities), will be communicated to any client prior to inclusion of such information in a research report broadly disseminated through electronic publication to our internal client websites or through other means, as necessary, to all clients who are entitled to receive such reports.

All research reports are disseminated and available to all clients simultaneously through electronic publication to our internal client websites. Not all research content is redistributed to our clients or available to third-party aggregators, nor is Goldman Sachs responsible for the redistribution of our research by third party aggregators. For research, models or other data related to one or more securities, markets or asset classes (including related services) that may be available to you, please contact your GS representative or go to https://research.gs.com.

Disclosure information is also available at https://www.gs.com/research/hedge.html or from Research Compliance, 200 West Street, New York, NY 10282.