Absolute Return Partners

The Absolute Return Letter

November 2019

How to invest in a low growth world

Part 2 of 2

Computing power can be expected to double every two years as a result of increases in the number of transistors a microchip can contain.

Moore's Law

The devil's advocate

Do you recall that, in part 1 of this Absolute Return Letter, I argued that GDP growth will remain painfully low for many years to come *unless* we can somehow get productivity growth flying again? The argument was based on the simple fact that, at the most fundamental level, there are only two drivers of GDP growth (a view that I will actually challenge later in this paper), and one of the two – workforce growth – has started to shrink in many countries and will continue to do so for many years to come.

In the second part of this paper – the one you are holding in your hands now – I will zoom in on the other basic driver of GDP growth – productivity growth – and I will ask two very simple questions: *In the digital age, does it really matter that the workforce will shrink? Won't robots just replace humans in the work process?*

Before having a shot at those questions, please allow me the joy of playing devil's advocate for a minute or two. Think back to the mid-1990s and think of this wonderful new gadget called *the internet* which was only made possible because of a new technology called *digitisation*.

Now, look at the impact digitisation (more so than the internet) had on productivity growth. The ten years from the mid-1990s to the mid-2000s have gone down in history as one of the fastest growing ten-year periods *ever* as far productivity is concerned, and the reason is simple - productivity growth exploded as a result of the first wave of digitisation. Fast productivity growth led to robust GDP growth, even if workforce growth had already started to slow in many countries, but productivity growth slowed again and has been rather pedestrian since the mid-2000s (Exhibit 1).

We are now in the early stages of the second wave, and rarely a day passes by without me asking myself why productivity growth is so ordinary in the midst of the digital revolution. How come advanced robotics, AI, smartphones, blockchain, IoT, driverless cars and other new disruptive technologies have had nowhere near the impact on productivity that everybody expected? In the following, I shall do my best to answer that question.

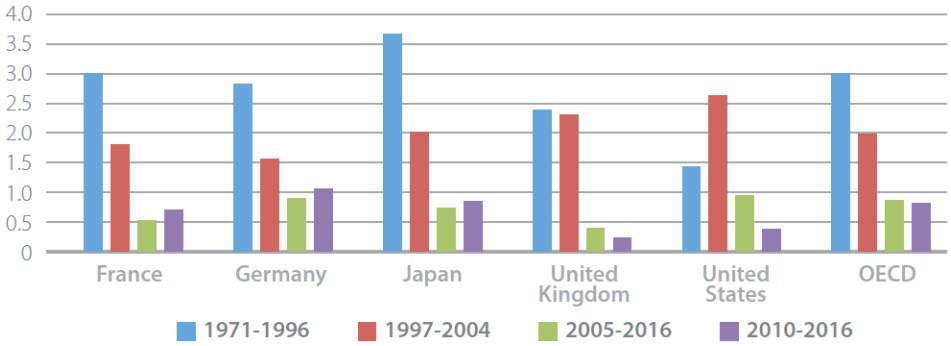

Exhibit 1: Compound annual growth rate of real GDP per hour worked
Source: "The Productivity Paradox", Oxford Martin School

ARP+

Before I begin to untangle that mystery, allow me to mention ARP+ again. As you may recall, we launched it earlier this year in response to new and tighter regulations as to what we can and cannot share with you in the Absolute Return Letter, assuming we don't charge for it (which we won't).

Provided I don't get run over by a bus or, what is probably more likely in my case, fall off my bicycle (again), the Absolute Return Letter will continue to be freely available for years to come.

Having said that, sometimes I cannot be as explicit as I would like to be, and that is where ARP+ enters the frame. For what I believe is a very reasonable amount of money, I can be much more overt when discussing the opportunity set. You can subscribe to ARP+ here.

The link between automation and productivity

Given how lethargic productivity growth has been for the past 15 years or so, it is very tempting to conclude that digitisation has had precisely the opposite effect on productivity than everybody expected. "No wonder", my cynical wife would argue. "With all these youngsters glued to their iPhones, it is not difficult to understand why."

The smartphone generation certainly appears to be lost for words the moment their phone runs out of battery power and, to quite a few in the younger cohorts, Instagram seems to be more important than a decent evening meal. I still don't buy my wife's argument, though. You may recall from part 1 of this Absolute Return Letter that there are two measures of productivity – labour productivity and total factor productivity (TFP) with the latter measuring different components of productivity.

One of those components is capital, but simply throwing more capital into the work process won't necessarily improve TFP. Only if output grows faster than input – i.e. if the inputs are used more efficiently – will TFP improve. In addition to capital, you have a string of less quantifiable input

factors affecting TFP as well – factors such as education, infrastructure, government bureaucracy, etc. Of those factors, advances in technology has, over time, proven to be the most important.

The evidence is pretty overwhelming that the adoption of robots has had a very positive impact on TFP. To shed light on that, allow me to bring up a study conducted by the Centre for Economic Policy Research (CEPR). CEPR measured direct efficiency gains amongst robot adopters as well as indirect gains through reallocation of labour from non-adopters to adopters.

As you can see in Exhibit 2 below, without the adoption of robots, TFP would have doubled from 1990 to 2016 – not tripled, as it actually did. As you can also see, direct technology efficiency gains explain about two-thirds of the total gain in TFP, whereas gains due to labour reallocation explain the remaining one-third.

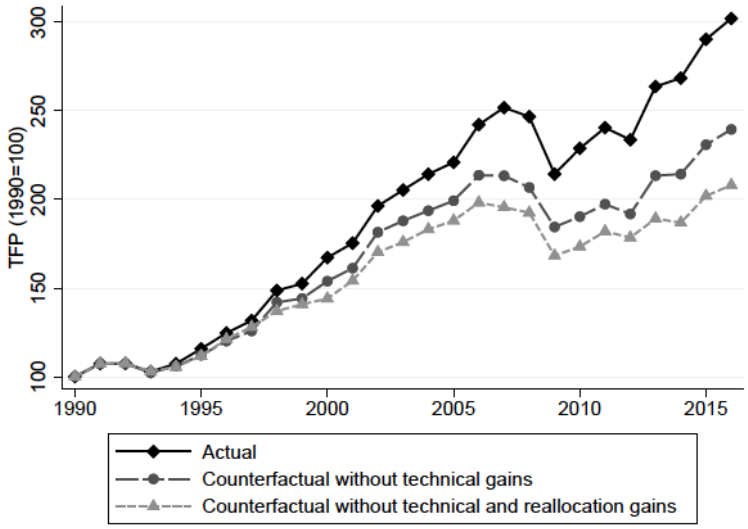

Exhibit 2: Counterfactual evolution of aggregate TFP
Source: *VoxEU.org*

If you look at job creation amongst robot-adopters vs. non-adopters, a similar picture emerges (Exhibit 3). Whereas simple (but overly simplistic) logic would suggest that the adoption of robots kills jobs, precisely the opposite has happened. As you can see, robot adopters have created many new jobs over the last 20 years, whereas non-adopters have not.

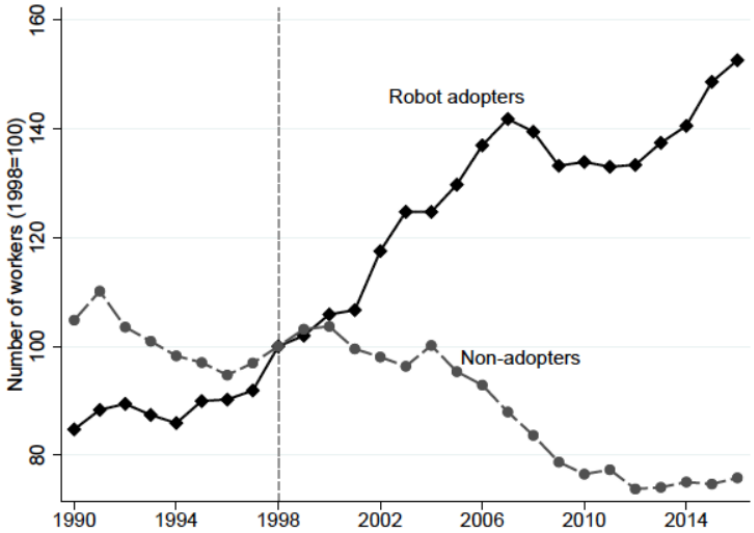

Exhibit 3: Evolution of employment for robot-adopters vs. non-adopters

Source: *VoxEU.org*

Assuming recruiting is a sign of a growing business and laying off staff a sign of the opposite, robot-adopting companies have done far better than non-adopters. In other words, despite adopting a technology that, at the face of it, destroys jobs, robot-adopting companies have been so successful that more jobs have been created than have been lost.

Which countries will be impacted the most by automation?

It goes without saying that automation will affect countries quite differently. In a country like China, where hundreds of millions have migrated from rural parts of the country to urban areas in search of a better life, there may simply be too many mouths to feed to fully automate anytime soon.

Likewise, in countries like the US or the UK where the workforce will continue to grow in the years to come (albeit only modestly), there is less of a need to automate than in countries like Japan or Germany where a shrinking workforce will make automation an absolute necessity, assuming you don't want to undermine your output capacity.

Obviously, that argument ignores issues to do with competitiveness. A country that has adopted the new technology may be able to produce the goods more cheaply, but such a rational argument is conveniently ignored by populists like Donald Trump when he promises the electorate to re-establish jobs in the rust belt of America.

In a study from late 2017 ("Jobs Lost, Jobs Gained: Workforce Transitions in a Time of Automation"), McKinsey identified three significant drivers of automation - demographics, national income levels and industry structure. McKinsey then went on to project the percentage of current work activities that will be displaced by automation between now and 2030. Not surprisingly, the oldest, most industrialised countries (Japan, Korea, Italy and Germany) will be affected the most (Exhibit 4).

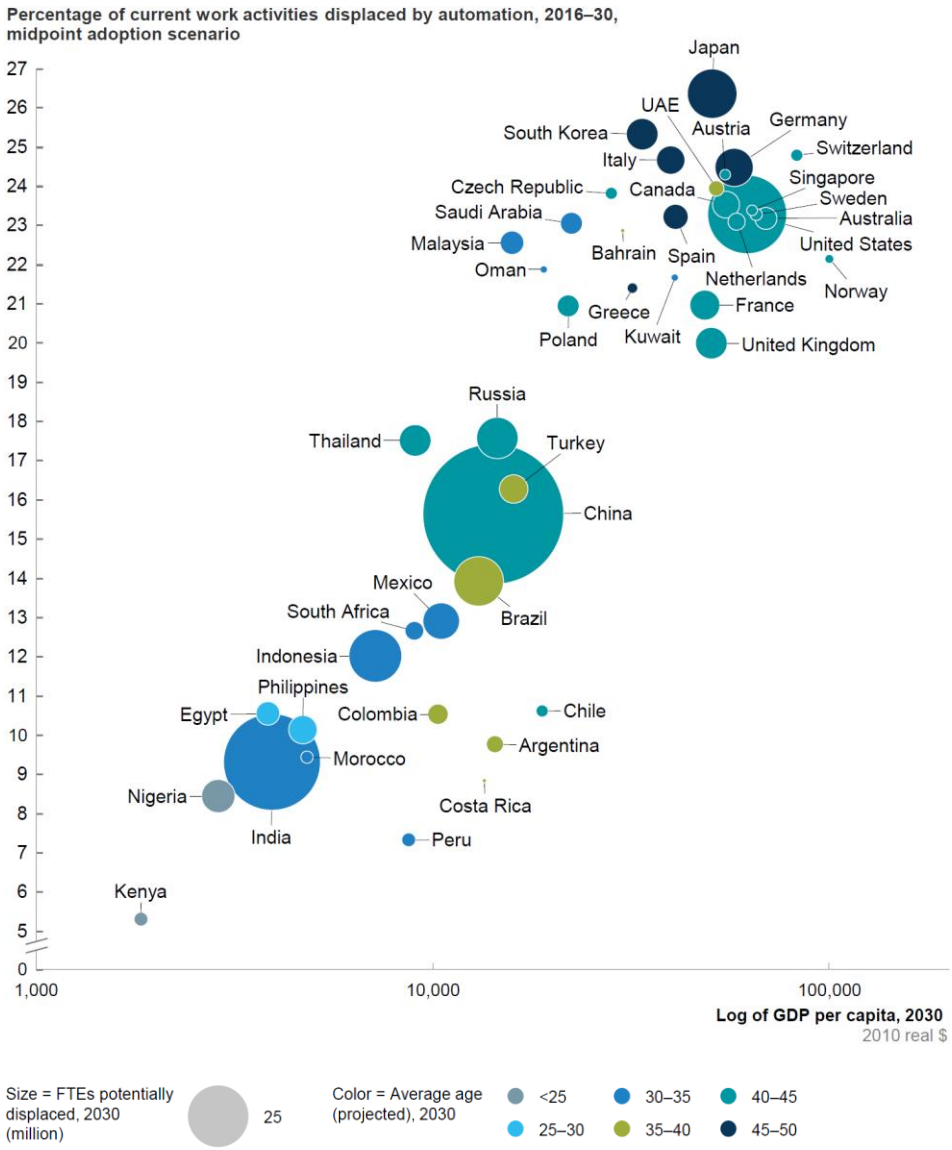

Exhibit 4: % of current work activities displaced by automation, 2016-2030

Source: *"Jobs Lost, Jobs Gained", McKinsey Global Institute*

Is automation good or bad for labour?

At first glance, the introduction of robots and other automation devices can only be bad for labour, one would assume, but there is more to the story than what first meets the eye. It all starts with how national income is divided. Allow me to take you back to school for a moment. In the national accounts, national income ends up in the pockets of either capital or labour. How it is shared is not identical from country to country, but what is the same all over the world is the little-known fact that, in the past, every time labour's share has deviated meaningfully from its mean value, it has mean-reverted. *Every single time!*

In the following, I will assume you understand the logic behind it all, i.e. why labour's share of national income is long-term stable or, at the very least, why it has been in the past. For those of you still not entirely comfortable, please read the appendix to this letter.

As mentioned in the appendix, labour's share of national income in the US has averaged 65% over the long term. Since the 1980s, labour's share has fallen continuously and is now fluctuating around 55%. According to the

Federal Reserve Bank of San Francisco, automation is at least partially to blame for that (Exhibit 5). In a recent paper, the researchers conclude that automation has improved businesses' bargaining power in wage negotiations, which has significantly restrained wages during a period of strong employment gains.

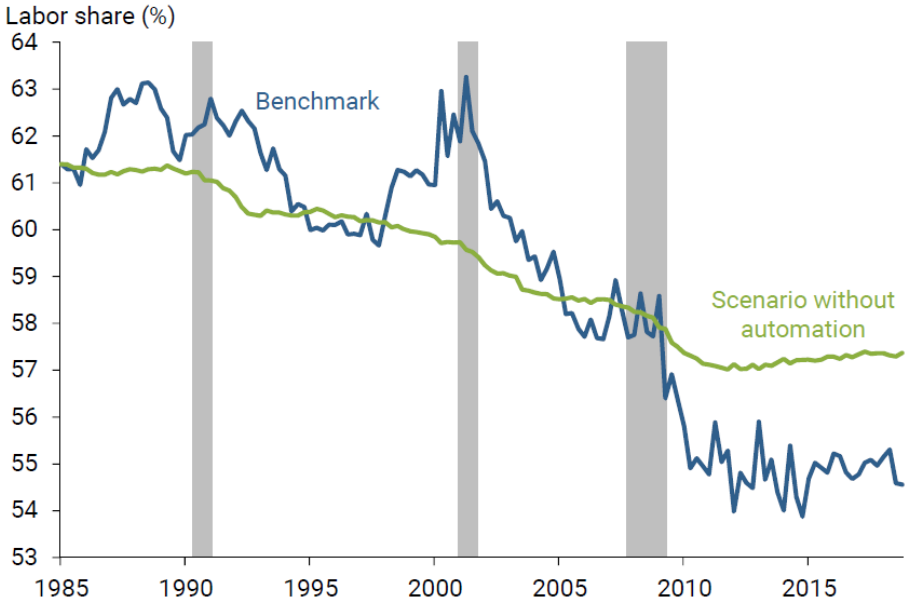

Exhibit 5: Labour's share of national income in the US – actual versus scenario without automation

Source: *Federal Reserve Bank of San Francisco*

I wonder whether economic theory should be re-written. After all, the digital revolution hadn't taken off when the theory covering this topic was first established. I do understand, and accept, that there is no rational reason why labour should always earn a certain percentage of national income, but I don't accept what some observers argue – that capital will continue to increase its share of national income as society automates more and more functionalities.

In addition to the theoretical reason mentioned in the appendix, there is a simple and sound economic reason why capital's share of national income *cannot* increase forever. Labour earning less and less of national income and real wage growth being as miserable as it has been in recent years is effectively two sides of the same story and, if that trend were to continue forever, you would effectively destroy the economy. Consumer spending amongst ordinary people is such a vital part of the economic jigsaw.

When capital owners choose to pocket their profits, as has increasingly been the case in recent years, only a small fraction is allocated to consumer spending. Most of it is instead invested in risk assets, driving up the value of those risk assets but undermining GDP growth, which is precisely what has happened more recently.

In that context, it is worth pointing out that not everyone agrees with the Federal Reserve Bank of San Francisco that the fall in labour's share is driven by automation. Take Bruegel, a Brussels-based independent think tank, which has come to a fundamentally different conclusion. In a research paper from April 2017, Bruegel found that most (of the bigger) countries around the world have experienced the same – labour losing out to capital – but that two countries stand out. In those two countries,

labour's share of national income has actually increased meaningfully over the last 20 years, and that is particularly the case as far as the industrial sector is concerned. Those two countries are Italy and France (Exhibit 6).

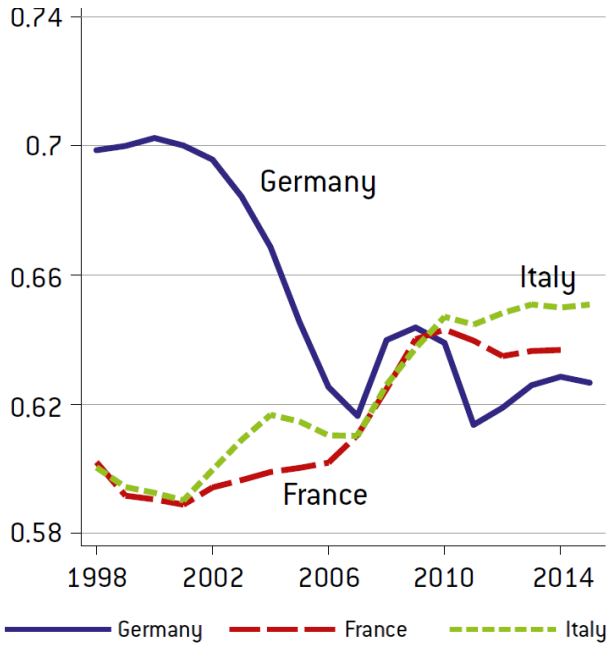

Exhibit 6: Labour's share of national income in the industrial sector (selected countries)

Source: Bruegel.org

What makes Italy and France so different from everybody else? One issue stands out. The capital-to-labour ratio has risen much more dramatically in Italy and France over the past 20 years than it has in most other countries, e.g. Germany (Exhibit 7).

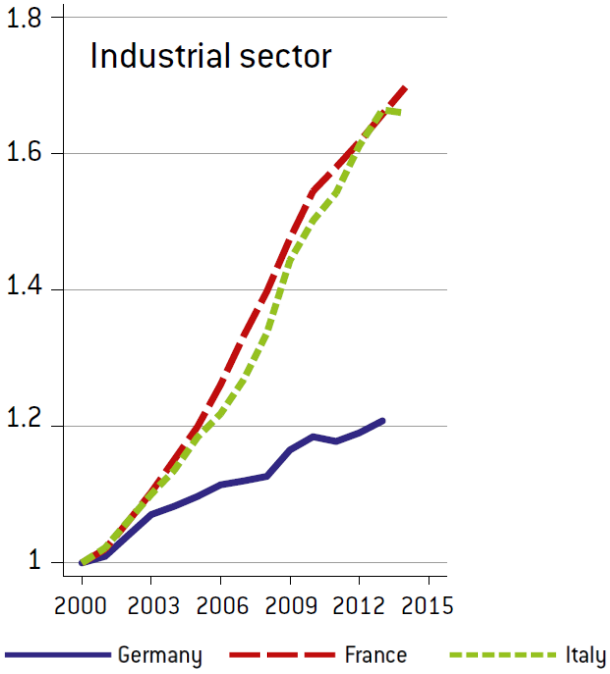

Exhibit 7: Capital-to-Labour ratio (selected countries)

Source: Bruegel.org

In other words, in those two countries, industrialists have made substantial investments unlike countries like Germany where the opposite is the case. My conclusion? Increased automation does not necessarily lead to labour

being squeezed by capital owners as some observers have concluded. If the capital is invested wisely, labour may actually benefit.

What is holding productivity growth back?

Back to the question I raised early on in this paper – how on Earth is it possible that productivity growth is so pedestrian despite society being 'bombarded' with new digital technologies all the time?

Apart from the fact that capital owners in most countries have chosen not to reinvest a reasonable percentage of corporate profits and that governments cannot afford to invest, there is a whole host of other so-called negative productivity agents in play. See the extensive work conducted by J.P. Morgan Asset & Wealth Management here.

Although JP Morgan's work is US-centric, I should point out that the US economy is far from the only one suffering from these sorts of problems. It just happens that few countries provide as reliable statistics on these sorts of things that the Americans do.

Take obesity, gun violence and smoking which cost American tax payers a fortune every year (Exhibit 8). All that money could (and should) be spent on productivity-enhancing investments such as better technology, education and/or infrastructure, but the US government, and *many* other governments all over the world, spend an obscene amount of money on such issues every year.

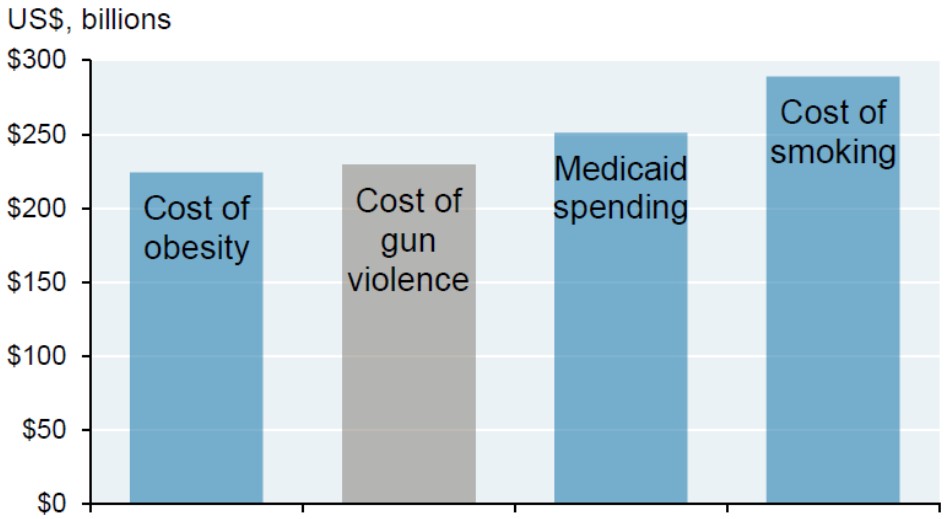

Exhibit 8: Estimated annual cost to US tax payers from various behavioural patterns (2015 data)

Source: JP Morgan Asset & Wealth Management

I would strongly recommend you click on the JP Morgan link above for a more complete review of this topic. In my opinion, there can be no doubt that automation actually boosts productivity, but that that a (mounting) mix of negative productivity agents is holding productivity growth back.

Which measure of productivity should you focus on?

You may recall from prior Absolute Return Letters that I often claim that GDP growth equals the sum of workforce growth and productivity growth. Whilst mathematically correct, it is overly simplistic. In reality, there are three important drivers of economic growth:

- Labour inputs (either a growing workforce or longer working hours)
- Accumulation of capital stock

- Technological improvements

As I said earlier, there are two measures of productivity. The equation $\Delta GDP = \Delta Workforce + \Delta Productivity$ is based on labour productivity whereas the statement above – that there are in reality three important drivers of GDP growth – is based on total factor productivity (TFP).

In an increasingly digitised economy, the use of TFP will most likely gain traction whereas the use of labour productivity will gradually be phased out (I think). Think of it the following way: If company ABC invests in a robot and in return makes half the workforce redundant, assuming output remains unchanged, labour productivity will double, as half the normal staff can now deliver the same output. Having said that, just because labour productivity has doubled, economic efficiency (TFP) may not be any better. That depends on the capital cost of the robot and the advantages the robot can bring (e.g. no human errors).

This makes TFP a superior measure of productivity during times of technological advances. By separating the key drivers of economic growth (labour, capital and technology), one can get a much better picture as to what *really* drives economic growth and, in that context, the answer today is unambiguous – technology does! Allow me to refer you to an April 2015 paper from the Federal Reserve Bank of St. Louis that looked into this. Their conclusion couldn't be any clearer:

"Technological progress is the main driver of long-run growth. The explanation is actually quite straightforward. Holding other input factors constant, the additional output obtained when adding one extra unit of capital or labour will eventually decline, according to the law of diminishing returns. As a result, a country cannot maintain its long-run growth by simply accumulating more capital or labour. Therefore, the driver of long-run growth has to be technological progress."

Don't take anything for granted

As we have just learned, technology is key to growth in TFP and to economic growth in general, and empirical evidence very much supports that view. The 2015 paper from the Federal Reserve Bank of St. Louis looked at all three input factors (technology, capital and labour) and found that, whilst past growth of both capital and labour correlates negatively with future growth of GDP (Exhibits 8a and 8b), past growth of technology correlates very positively with future growth of GDP (Exhibit 8c).

The Federal Reserve Bank of St. Louis chose to let TFP represent technology contributions based on the fact that (i) the correlation between past labour contributions and future GDP growth was -0.68 over the period tested (Exhibit 9a), (ii) the correlation between past capital contributions and future GDP growth was -0.30 (Exhibit 9b), and (iii) that the correlation between past TFP contributions and future GDP growth was +0.68 (Exhibit 9c).

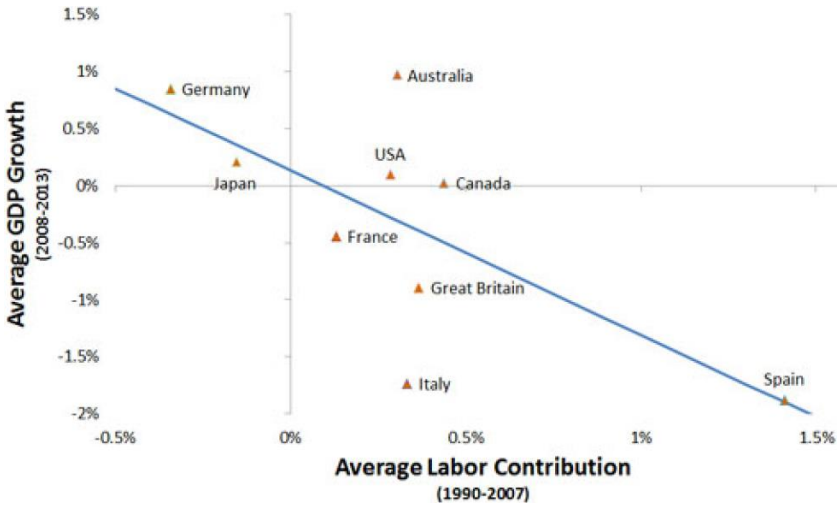

Exhibit 9a: Labour's contribution to economic growth
Source: Federal Reserve Bank of St. Louis

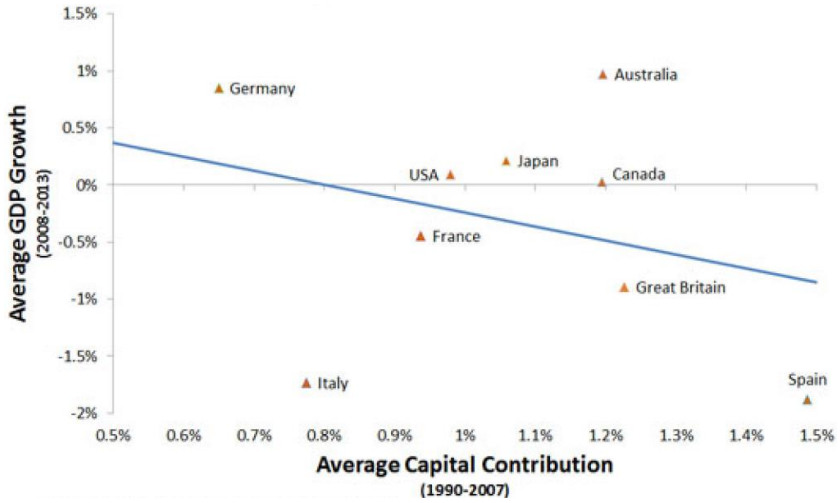

Exhibit 9b: Capital's contribution to economic growth
Source: Federal Reserve Bank of St. Louis

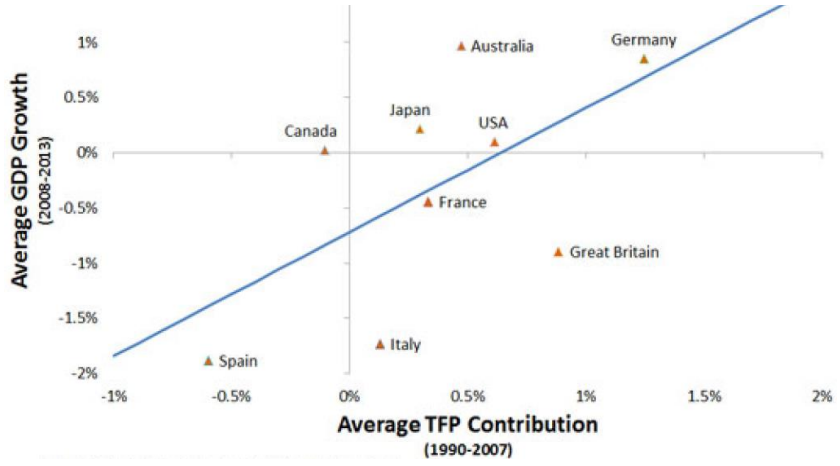

Exhibit 9c: TFP's contribution to economic growth
Source: Federal Reserve Bank of St. Louis

The fact that an increase in both capital and labour contributions led to slowing economic growth, but that that the inclusion of technology advances reversed the outcome can only mean that past investments in technology are *highly* positively correlated with future GDP growth.

The dark side of the story

Now to the dark side of the story. Moore's law (named after the co-founder of Intel, Gordon Moore) is effectively breaking down. According to Andrew Lees at MacroStrategy Partnership LLP, computer clock speed hasn't improved at all since 2004, and hardware components have now reached atomic dimensions, meaning that the smallest transistor that can ever be created has already been built.

The implication of this is that future technology advances have to come from software. The hardware party is effectively over, says Andy, and I find it hard to come up with a convincing counterargument. In that context, I should mention that I recently met with Hitesh Thakrar – one of the most knowledgeable technology investors I have ever met – and he agreed with this assessment.

If you are still not convinced, I would suggest you take 18 minutes out of your busy day and listen to what John Hennessy, Chairman of Google, has to say about this subject. In a presentation earlier this year called The End of Moore's Law and the Rise of AI, he made it very clear that hardware improvements have arrived at the end of the road, and that the future is AI.

Software suffers from utility limits too

It is not as simple as that, though. Two issues: Firstly, software is of no value without the hardware on which it runs. In other words, it is indeed possible that it is not only hardware that has arrived at the end of its S-curve. The same could be the case for software. Secondly, research is becoming prohibitively expensive. According to the Allen Institute for Artificial Intelligence (and I quote):

"The computations required for deep learning research have been doubling every few months, resulting in an estimated 300,000x increase from 2012 to 2018. These computations have a surprisingly large carbon footprint. Ironically, deep learning was inspired by the human brain, which is remarkably energy efficient. Moreover, the financial cost of the computations can make it difficult for academics, students, and researchers, in particular those from emerging economies, to engage in deep learning research."

Going forward, we could quite easily end up in situation where only corporate giants like Microsoft and Google have the balance sheet to support further R&D, and that wouldn't be good. Not only would competition suffer, but society may never harvest all the fruits of the digital revolution as too many smaller companies, and perhaps even the government, cannot afford to take advantage of new technologies.

Even worse, it may not only be in the computer hardware industry that we face an insurmountable problem – let me give you a couple of examples. In the pharmaceutical industry, the return on investments in pharma R&D is already below the cost of capital and will probably turn negative within 2 years (Exhibit 10). This will most likely limit future investments in the industry.

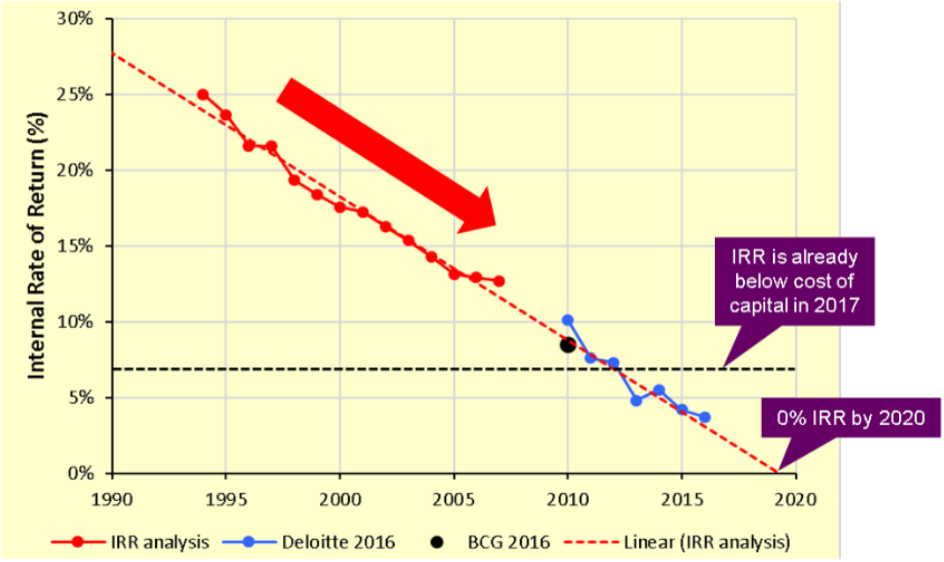

Exhibit 10: Return on investment (IRR) in pharma R&D
Source: *EvaluatePharma*

Secondly, there is pretty compelling evidence to suggest that research in general is not as effective as it used to be. As you can see on Exhibit 11 below, in the US, the absolute number of researchers across all sectors has grown faster and faster over the past century, yet TFP has slowed (modestly) over the same period. One could therefore argue that the marginal contribution to economic growth from research is much more modest these days.

Back to *the* question

Equipped with all the information I have just acquired, I will now try and answer the question I opened this letter with:

In the digital age, does it really matter that the workforce will shrink? Won't robots just replace humans in the work process?

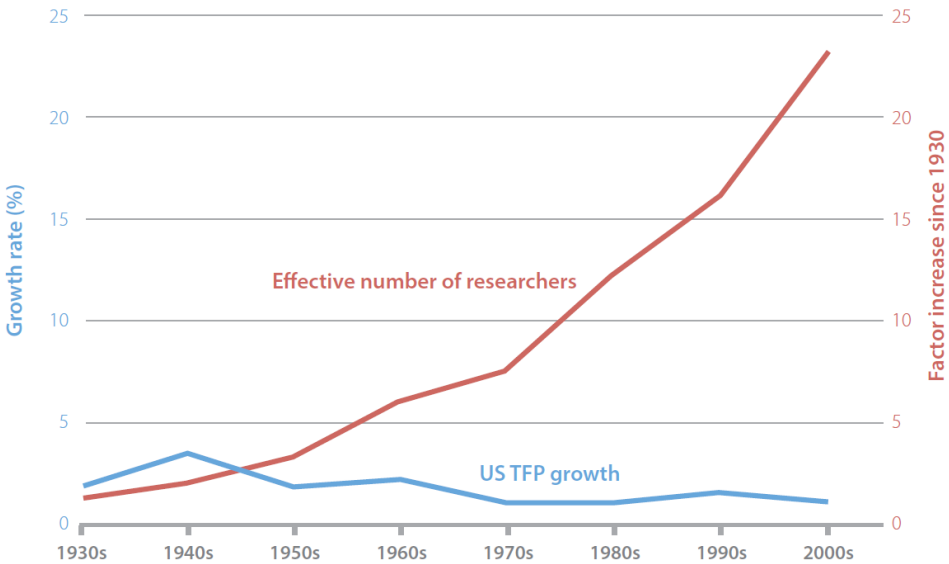

Exhibit 11: Number of US researchers vs. growth in US TFP
Source: *"The Productivity Paradox", Oxford Martin School*

According to McKinsey, as many as 375 million workers worldwide could be displaced by robots and other automated systems between now and 2030. In the countries to be most affected, that is about one-quarter of the

workforce (see Exhibit 4 again). That is a hair-raising number and has forced me to do some serious thinking.

If you go back in history, on a net basis, no new technology has *ever* caused job losses, and the early indications are that robots might not do that either (see Exhibit 3 again). Having said that, no new technology has ever caused as many job losses as robots will, so it is hard to say. Regardless of that, I have reached the following conclusions:

1. The introduction of robots will most likely cause problems initially, so the rate of unemployment could rise in the short term.
2. Many new job opportunities will present themselves over the medium to long term, meaning that the problem will gradually fade away again. Some of the new job opportunities would include:
    - technology-related opportunities in an increasingly automated society (and there will be many of those);
    - caring for the elderly in an ageing society;
    - producing goods and services for the expanding middle classes of EM countries;
    - modernising an outdated infrastructure in the developed world; and
    - establishing a first-world infrastructure throughout the developing world.
3. As you have probably already deduced when looking at that list of job opportunities, the introduction of robots is not the only megatrend that will affect our livelihoods in the years to come. Between all these changes, I spot plenty of opportunities.
4. At least in the short term, some countries are better equipped to deal with the displacement problem than others and, ironically, those with the most adverse demographic outlook may have the smallest mountain to climb.
5. As the use of robots spreads across society, current disinflationary trends could possibly even turn deflationary. One consequence of increased automation is therefore for interest rates to stay low for a long time to come.
6. As already mentioned, TFP will gradually replace labour productivity as the de facto measure of productivity in society.
7. Assuming automation is rolled out across society, GDP growth shouldn't be dramatically affected by a shrinking workforce, but there are many other reasons why GDP growth will be low in the years to come. See my comments earlier re JP Morgan's negative productivity agents.

Final remarks

I cannot close this letter without adding a bit more colour to my conclusion no. 4. As I alluded to above, the countries to be most affected by adverse demographics may see robots as a blessing in disguise.

Take for example Germany. According to the UN, the are 49.8 million working-age Germans (those between 20 and 64) today. The 20-64 age group will drop by 4.2 million over the next ten years and by another 2.7 million between 2030 and 2040.

If you assume that McKinsey's estimate is correct (that 24% of the German workforce will be displaced by robots over the next 10 years), almost 12 million Germans could be displaced, but 'only' 7.7 million will require re-training, as 4.2 million workers will retire anyway.

Compare that to the US, where the working age population will grow from 194 million today to 197 million by 2030. Again, assuming McKinsey is spot on, 23% of the US workforce will be displaced. In other words, between those to be displaced by robots and new job market entrants, 48.6 million Americans will require training or re-training over the next ten years.

As far as the US is concerned, that equates to more than 25% of the workforce, where the corresponding number in Germany is only about 15% despite a higher proportion of the German workforce being displaced by robots. There can be no doubt that the German government has a much more manageable problem on its hands than is the case in the US.

From an investment point-of-view, the implications of this megatrend are so profound that a fundamental change to portfolio construction shall be required. No longer should you apply a very conventional approach, i.e. you shouldn't allocate x% to the US, y% to Europe, etc.

Investing in a world that is rapidly automating is instead about identifying the disruptors and the disrupted. If you invest more broadly, as most passive investors do, you'll end up owning both the disruptors and the disrupted, and that is not a winning strategy.

I suspect that a sizeable proportion of my readership invests mostly in passive instruments these days. If you are one of them, you may assume that following my advice may be difficult to implement for those sticking to ETFs and other passive investment strategies, but nothing could be further from the truth. There are indeed some very interesting ETFs on offer that target investment opportunities in this area.

One final note – and I may upset a few readers with this comment, but I cannot help it. I need to get it out!

One of the painful implications of stagnant, or even falling, real wages over the last many years is the rise of populism. Ruthless politicians all over the world take advantage of the fact that workers are increasingly prepared to 'riot' against what they (rightfully) perceive to be deteriorating conditions. In an attempt to win them over, the populists make empty promises and, when they get caught in one of their frequent lies, they swiftly move on to the next lie. And to all those of you who think I am referring to Donald Trump now, I can tell you I am not. We have ended up with one in this country who appears to be even more cynical!

Niels C. Jensen
1 November 2019

Appendix

Why is labour's share of national income long-term stable?

The share of national income between labour and capital is a close cousin to the ratio of wealth-to-GDP - it is essentially two sides of the same story. Both are so-called Cobb-Douglas production functions, i.e. both are long term stable and will (over time) mean revert if they deviate meaningfully from the long-term mean. In the following, I will focus on wealth-to-GDP, and that is simply because I am better equipped to zoom in on that. Having said that, if wealth-to-GDP is out of whack, so is labour's share of national income.

In the world's biggest economy, the US, the mean value of wealth-to-GDP is 3.8x and the mean value of labour's share of national income is about 65%. Those numbers are based on Federal Reserve Bank data going back to 1950, but more superficial data going back to the 1860s suggests the same. The former is now a tad over 5x and the latter about 55%. Mean reversion is long overdue!

Even if wealth-to-GDP is virtually constant over the very long term, wealth can grow a lot faster (or slower) than GDP over shorter periods of time (Exhibit A1). The chart only goes to 2006 as it was produced in early 2008 by Woody Brock of Strategic Economic Decisions (SED).

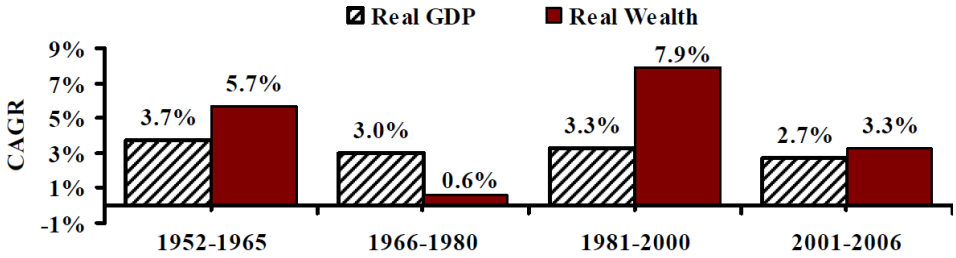

Exhibit A1: Cycles of wealth and GDP growth
Source: Strategic Economic Decisions (2008)

The logic behind Exhibit A1 is quite simple. Financial markets enjoy regimes of optimism and regimes of pessimism and have always done so. In the equity market, you can measure which regime we are in by tracking the trend in aggregate P/E values. When they are on the rise, we are in a regime of optimism. Such a regime is also known as a secular bull market. Likewise, when P/E values are under pressure, we are in a regime of pessimism – a so-called secular bear market.

If you have a copy of my book – ***The End of Indexing*** – I suggest you take a look at Exhibit 2.3 on page 23. As you can see, these regimes vary a great deal in length, but most of them have lasted 10-20 years.

It is important to understand that regime changes are driven less by economic fundamentals than by shifts in societal belief structures. When the Chicago School of Economics (in 1952) started to develop an economic theory based on rational expectations and efficient markets (led by Harry Markowitz), there was no room for such thinking. Optimism and pessimism *cannot* exist, the scholars said.

Time has told us differently, and the thinking around regimes and secular bull and bear markets is now widely accepted. When I expect equity returns

to be modest in the years to come, it is not only because I expect GDP growth to disappoint but also because I expect a regime change from optimism to pessimism.

What precisely will cause that regime change, nobody knows, but my overall favourite to alter current beliefs, which are overwhelmingly optimistic, is a collapse of the DB pension system which is ridiculously underfunded in many OECD countries and smacks of an accident waiting to happen.

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