

The three largest economies in the world are the United States, the European Union and China. They are roughly based on three different philosophies: companies-first, people-first and government-first.

Europe should be the humans-first continent

By KOEN DE BOSSCHERE

The three strongest economic blocks are home to three different political systems: capitalism and freedom for the United States, social democracy in Europe and a government-controlled regime in China. Another way to characterize them is companies-first, people-first and government-first. The United States and China are competing for global dominance economically, politically, militarily, scientifically, in cyberspace, ... What is the role of Europe in this epic battle?

The United States actively promoted its values after the Second World War, and took a role of global leadership during the Cold War. Neither Europe nor China were at that time promoting their own values on a global scale. China was, for a long time, a closed society with its own internal issues. It was only when globalization started in the 1990s that it became the factory of the world and experienced unprecedented economic growth. Now that it has joined the top three world economies, it wants to play a more prominent role in various ways: economically, politically, militarily, scientifically, in cyber space, ... It is rapidly expanding its influence in each of these domains. China is building political relationships with many countries in the southern hemisphere, and is building a global transportation system (the belt and road initiative). China is currently working diligently on a new world order, in which it plans to play a prominent role.

After having been centre stage of two world wars, Europe needed time to let the wounds of war heal, and it had to deal with the effects of decolonization, the Cold War in its backyard, the fall of the iron curtain and, finally, the reunification of the continent. Now that the healing process has come to an end in large parts of Europe, the time has come for it to speak for itself, to promote its values and to claim leadership in areas where it is strong. If it fails to do so, it might eventually become crushed between two superpowers, or it might become an appendix of the Eurasian continent, and just one of the world's many cultural holiday destinations.

Since its creation in 1993, the European Union has steadily been working on its integration: development of the internal single market, European Union law, a common visa policy in the Schengen area, a common currency in the Eurozone. All these accomplishments required time,

Key insights

- The integration efforts of the European Union have created one of the three largest economies in the world, enabling EU leaders to play an important role in international decisions.
- The European Green Deal is not only a growth strategy for the European economy, but also for the European computing industry. Sustainability requires a lot of monitoring and optimization to save resources, and this will always require some form of computing.
- Europe has the potential to create and maintain the best trained workforce in the world.

Key recommendations

- Europe should continue to invest in education and training and stay competitive with the rest of the world.
- Europe should create a solid digital ethics framework to assess the introduction of new technologies in Europe.

and delicate political agreements. Only the older generation still remembers how divided Europe was when it came out of the Second World War: one currency per country, no single market, the iron curtain and the threat of the Cold War, compulsory military service for young men, several European countries run by dictators. A lot has changed for the better.

In the last decade the European Union has developed a common Foreign and Security Policy, and attempts to speak with one voice to hold more weight in matters of external relations and defence. It now has diplomatic missions all over the world, and at the United Nations, the G7 and G20. Important decisions are however not made by a president, or by a parliament, but by 27 member states, and require lengthy negotiations. Europe is today an economic union, but not yet a political one. The lack of political union became clear during the debt crisis in parts of the Eurozone, in the

migration crisis at the southern borders of Europe, and in the discussions about the COVID-19 relief fund. Due to its large diversity (religion, language, culture, living standards, ...), political debate in the EU is not going to disappear anytime soon. Fortunately, there is a lot of diplomatic talent in Europe, and integration moves forward continuously, albeit slowly at times.

The European Union was unanimously awarded the Nobel Peace Prize in 2012 “for over six decades having contributed to the advancement of peace and reconciliation, democracy and human rights in Europe”. This is an important accomplishment after around fifty wars of varying size in Europe since 1800. Europe is today one of the best places to live in the world, and it remains an attractive place for new EU candidate countries, and for over a million people a year who seek to enter Europa and to start a new life here.

At the same time, there are also many Eurosceptics living in the union. They mostly complain about the loss of sovereignty and control and about the fact that integration moves too fast. The UK became the first major country to leave the European Union. The negotiations leading to the withdrawal agreement made clear how strong the economic integration is in practice, and how difficult and costly it is to

leave the Union (even without being part of the Eurozone or the Schengen Area). European politicians will learn a lot from this experience, and will hopefully be better prepared for the other major challenges like immigration, growing inequality, ageing population and climate change.

Notwithstanding all the political difficulties, Europe is gradually gaining global influence, and it tries to retain a seat at the table on international decisions. Well-known are the antitrust cases against large international corporations like Microsoft (2004-2008: €2 billion), Intel (2009: €1 billion) and Google (2017: €2.4 billion) [1].

Another illustration of EU influence is the introduction of the General Data Protection Regulation (GDPR) which put control over personal data back where it belongs, namely in the hands of the citizen. The GDPR turned out to be rather powerful because it did not just have an impact in Europe: it forced everybody who wants to do business in Europe to comply. Thanks to the GDPR, we can now opt-out of unsolicited mails with a single click. Of course, individual European countries would never have been in a position to impose such a legal framework, but the European Union could. But there are more domains in which Europe could take a leading role. Why not try to protect Europeans from disinforma-

tion, fake news and hate messages on the internet?

Towards a 100% sustainable Europe

For many years, sustainability was only relevant if it did not conflict with profitability. Engineering schools taught that the products made from raw materials were of a better quality than products made of recycled materials. Business schools taught that it was better for the economy to replace a consumer product than to repair it. After the publication of the United Nations Sustainable Development Goals, an increasing number of people started to realize that sustainability is no longer a “nice to have” but a necessity for maintaining our living standards, and those of the generations to come. The brilliance of the SDGs lies in the fact that they span 17 domains, and most people will find at least a couple of domains that they care about (climate, poverty, biodiversity, gender equality, justice, ...). The SDGs have created a framework, which is, for the first time, taken seriously by politicians, universities, and businesses. It is no longer acceptable to ignore sustainability.

Economists have investigated how to create business models for a sustainable economy and discovered that e.g. decarbonizing the economy is a once-in-a-lifetime investment opportunity because renew-



able energy is getting cheaper by the day, while fossil fuels are getting more expensive (harder to exploit, more investments needed to protect the environment, ...). Furthermore, fossil fuel reserves are finite, and will eventually have to be replaced by renewable energy sources. That process will require a lot of innovation, technology and investment. Holding off on making the transition will only serve to give a head start to other countries developing the technology before us, and to help them become global leaders in sustainable technology.

Therefore, Europe did the right thing by resolutely promoting the European Green Deal. There is no time to lose if we want to stay relevant in the future. By working on the European Green Deal, we will be able not only to reduce Europe’s ecological footprint but also to develop sustainable technologies that we can sell across the world. Rather than hurting the economy, implementation of the Green Deal will help it to transition to a more sustainable model. Europe and the EU member states will have to help businesses to make this transition.

The European Green Deal is an opportunity for the European computing industry. Sustainable processes are optimized processes (less energy consumption, less waste, ...) and such optimizations are only possible with the help of lots of computing, CPS, IoT, Hence, the European Green Deal is a growth strategy not only for the economy as a whole but also for the computing industry specifically, and we should therefore embrace it.

Towards excellent education for all

Europe has an excellent education system. Higher education is more affordable than in the United States and, in the top one hundred best universities worldwide in the 2020 Times “Higher Education Ranking”, Europe has 37 institutions (North America has 45, and Asia 18) [2]. Unfortunately, since 2016, Europe has lost five universities in the top one hundred. Two places went to the United States and three went to Asia; European universities are experiencing competition from the rest of the world. Another noteworthy observation is that the majority of the 37 Euro-

pean universities are located in countries which have historically been predominantly protestant.

Country	#100	#50
United Kingdom	11	7
Germany	8	3
The Netherlands	7	0
Switzerland	4	2
France	3	1
Sweden	1	1
Belgium	1	1
Finland	1	0
Denmark	1	0
Total	37	15

In terms of absolute numbers of tertiary graduates, Europe and the United States are stagnating, while China has grown from two million per year to 15 million per year over a period of just 15 years [3]. In terms of relative numbers, China now has more tertiary graduates per 1,000 of the population than Europe (Figures 1, 2). It is clear that China is preparing its future as a scientific powerhouse and this workforce will fuel and accelerate its innovation potential in the coming years. Europe should invest more in tertiary education because it will need the innovation potential of these people in order to stay competitive on the world stage.

European universities produce on average more PhDs per 1,000 of the population than the United States or China, even in science

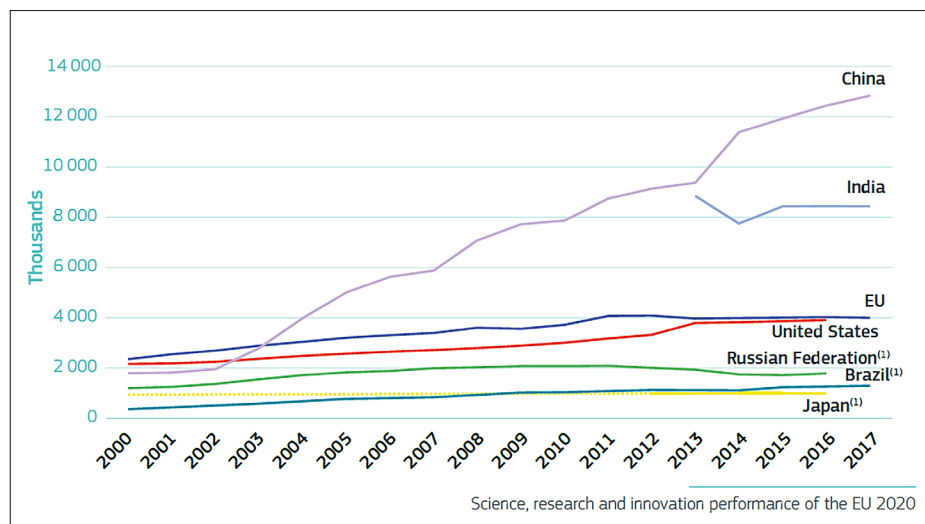


Figure 1: Total number of tertiary graduates, 2000-2017

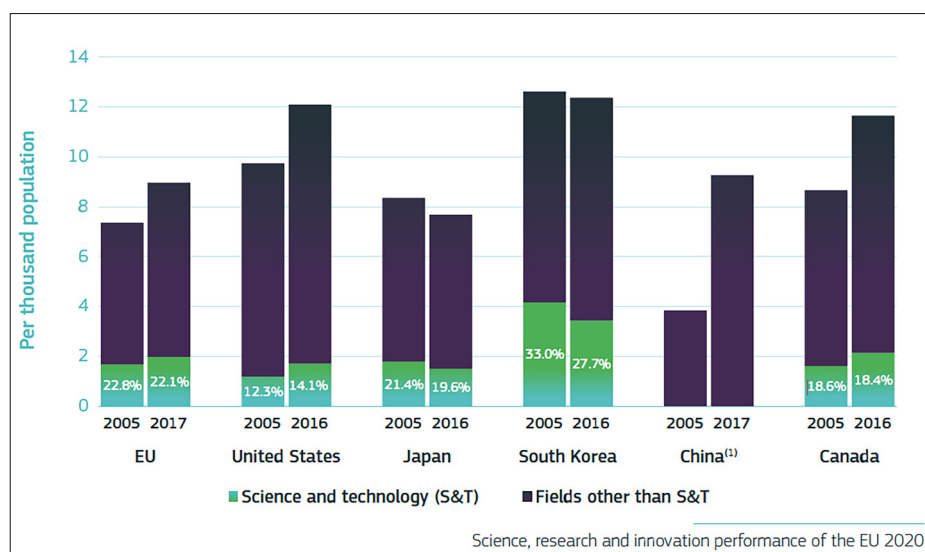


Figure 2: Tertiary graduates per thousand population broken down by science and technology and other fields, 2005 and 2017

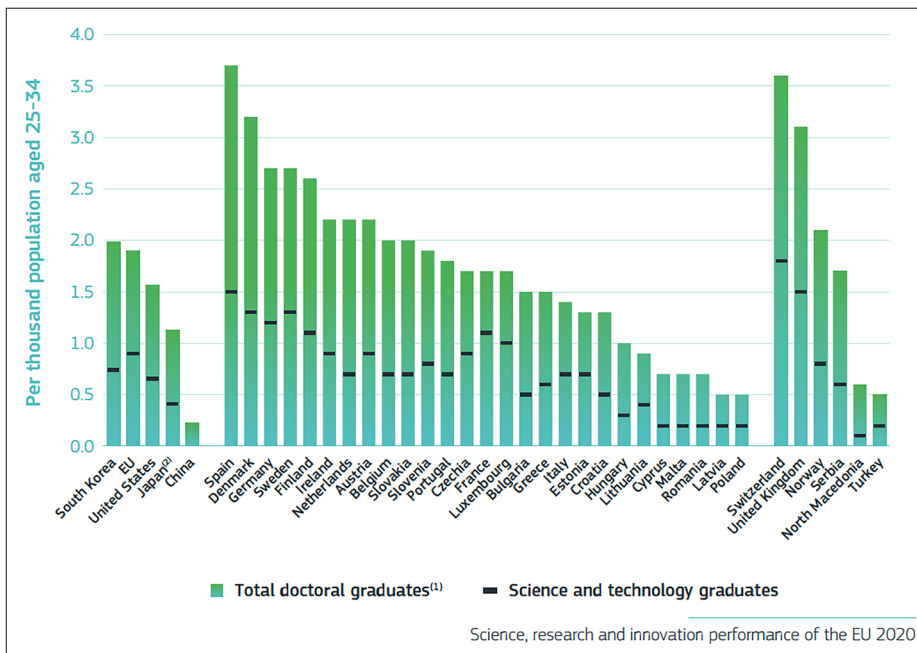


Figure 3: New doctoral graduates per thousand population aged 25-34, 2017

and technology. Many individual European countries do better than the United States. This is therefore a clear strength (Figure 3).

Therefore, it is important for Europe to keep investing in education. Before the industrial revolution, the landmass of a country was an indicator for its economic production (because agriculture requires land); after the industrial revolution, it was the size of the population that determined the scale of industrial production, and the size of the army that could be mobilized. Nowadays, it is the number of well-trained knowledge-based workers that have the biggest impact on the economy: innovators, scientists, entrepreneurs, ... Europe will never be able to beat China in terms of the absolute number of graduates, but it could do better than the United States because it has a larger population. A better trained workforce is good not only for the economy: people with higher levels of education have a better income (all higher education degrees lead to a higher than median income in the United States, and lower than median unemployment rate; the situation in Europe is similar) [4]. They also have better health and longer life expectancy, care more about sustainability, are politically more engaged, and participate more in cultural events. Investment in raising the education level of a population pays for itself even in the short term. However, Europe should be aware of the

“brain drain”: highly educated people often move to the United States for better working conditions and salaries, and they are highly appreciated because of their good education, especially in the domain of AI.

Create a solid digital ethics framework

Computing has become such a powerful commodity that we should start thinking about whether everything that can be done should be done. Decades ago, similar questions led to the establishment of disciplines like medical ethics, bio-ethics, business ethics, military ethics and so forth. It is now time to invest in digital ethics as a discipline, and to make sure that all professionals in computing receive basic training in it. The creation of cyber armies in many countries might also call for some form of regulation.

Digital ethics is not a new concept; in fact, it was first touched upon in the mid-1940s by Norbert Wiener, who coined the term cybernetics in his book “Cybernetics: or control and communication in the animal and the machine” (1948). At the time, it was not taken very seriously by the scientific community. The last decade has, however, witnessed a sharp increase in interest in digital ethics.

The key problem is that, whereas in the past computers did the calculations and

humans made the decisions based on the calculations, this is not longer entirely the case. Decision makers are assumed to have an ethical framework to guide them in the decision-making process. With artificial intelligence, computers not only do the calculations, but also make the decisions, indirectly guided by humans during the building of the learning database in the case of deep learning, the most common implementation of AI. At the moment, these are small decisions but the expectation is that they might also be asked to make important, even life-changing decisions in the near future, as in the example of a self-driving car. This means that the people who make the decision-making algorithms have to follow an ethical framework to guide the decision-making process. Not all computer scientists have developed an ethical framework comparable to that of people involved in building public policy, for example. In some cases, they are not even to be blamed, as the bias comes from the data that was used to train the system (also compiled by humans), and not from their code.

Some universities have established centres for digital ethics (for example, the Digital Ethics Lab of the Oxford Internet Institute [7] founded in 2017, and Center for Digital Ethics and Policy of The Loyola University of Chicago [8]). As mentioned in “Rethinking Education”, modules on digital ethics are being introduced into several computer science courses in order to ensure that graduates have a basic understanding of the ethical aspects of their profession.

There seems to be more interest in digital ethics in Europe than in the United States or in China, so this is an opportunity to lead. A solid ethical framework, based on the most recent scientific insights should be developed and used as a touchstone when introducing new technologies in Europe, irrespective of whether the technology was developed in Europe or not. Europe can lead in this area, like it is leading in the protection of the privacy of its citizens with the GDPR.

European Commission priorities

The European Commission has set forward six priorities for 2019-2024 [6].



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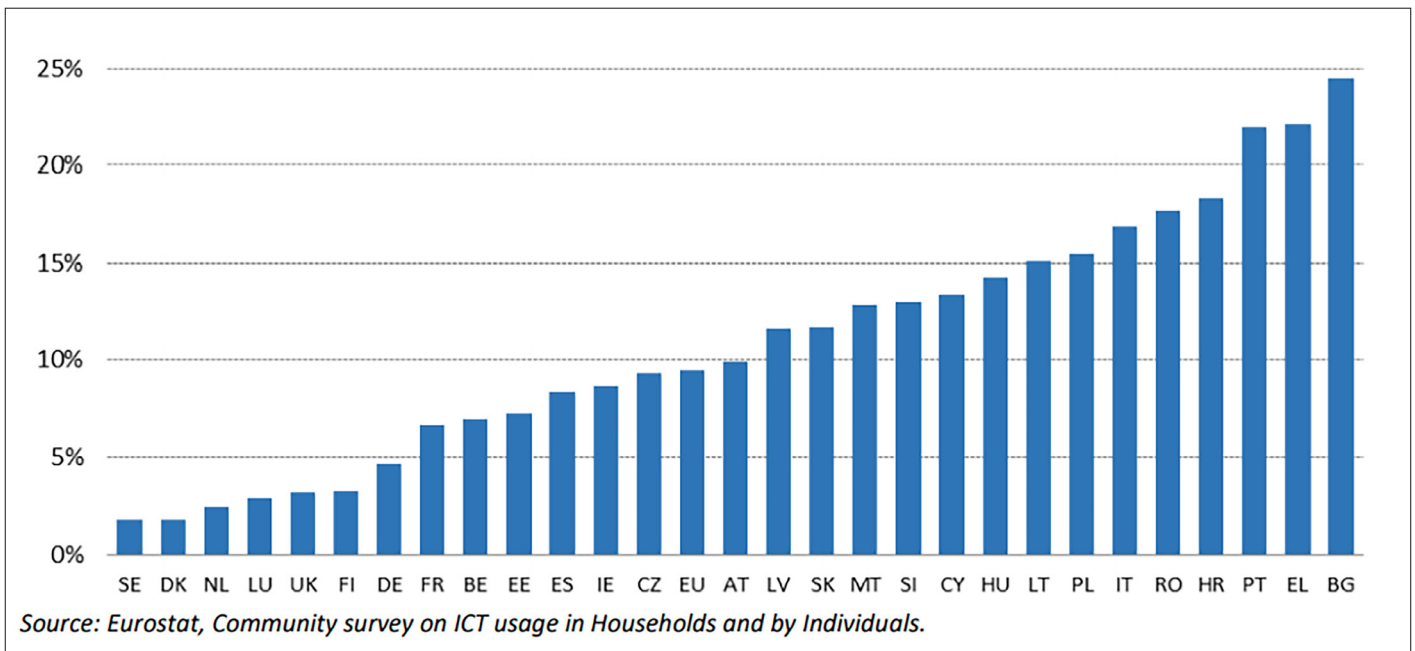


Figure 4: People who never used the internet (% of individuals), 2019

A European Green Deal: Europe aims to be the first climate-neutral continent by becoming a modern, resource-efficient economy. At the same time, it also wants the Deal to become the growth strategy of the European economy, and the source of millions of jobs in the sustainable economy.

A Europe fit for the digital age: The EU's digital strategy will empower people with a new generation of technologies. COVID-19 has shown how critical the digital infrastructure is, and how important it is for digital participation to be inclusive. Affordable broadband internet access for all is essential. Without access to the internet, citizens can no longer fully participate in society [5]. In some countries there is still a long way to go (Figure 4).

An economy that works for people: The EU must create a more attractive investment environment, and growth that creates quality jobs, especially for young people and small businesses. To create more and better jobs all over Europe, we need more startup companies and SMEs. Europe should not promote international companies with zero hour contracts but insist that all the jobs created in Europe are decent jobs. There should be no working poor.

A stronger Europe in the world: The EU will strengthen its voice in the world by championing multilateralism and a rules-based global order as advocated in this contribution.

Promoting our European way of life: Europe must protect the rule of law if it is to stand up for justice and the EU's core values as advocated in this contribution.

A new push for European democracy: We need to give Europeans a bigger say and protect our democracy from external interference such as disinformation and online hate messages. Democracy is best protected by investing in solid education for young people, by offering them a decent job, and by fighting disinformation and fake news on the internet.

Several of these priorities boil down to caring for everybody, and especially for those with the least resources at their disposal. It is important that nobody is left behind, that inequality does not lead to a polarized society, and that people are protected from the adverse effects of technology.

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This document is part of the HiPEAC Vision available at hipeac.net/vision.

This is release v.1, January 2021.

Cite as: K. De Bosschere. Europe should be the humans first continent. In M. Duranton et al., editors, HiPEAC Vision 2021, pages 156-161, Jan 2021.

DOI: 10.5281/zenodo.4719676

The HiPEAC project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement number 871174.

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