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DOCUMENTING THE WIDENING TRANSATLANTIC GAP

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Executive Summary

Over the past 20 years, the gap in per capita income between the United States and the eurozone, which stood at around €10,000 in 2000, has not narrowed. It has widened since 2012. GDP per capita in the eurozone fell from 77% to 72% of US GDP per capita the 2000 and 2019, thus diverging from the level of wealth on the other side of the Atlantic.

This gradual decoupling of GDP per capita started before the pandemic. This Policy Brief therefore looks at this European lagging – the widening gap – over the twenty years before the pandemic and the energy crisis, from 2000 to 2019, and explores possible explanations for this decoupling.

Our results show that divergence between the eurozone and the United States is mainly due to lower hour productivity growth in the former. It also appears that capital, much more than differences in working hours, is a major factor in the divergence between the two zones. Productive efficiency diverges because of lower capital intensity in information and communication technology (ICT) equipment on the one hand, and in intangible assets on the other. The amount of ICT capital per job was five times higher in the United States in 2019; the amount of intangible capital per job was three times higher. These yawning gaps in 2019 were not as much as wide in 2000.

Of course, there are also big differences between the Member States of the eurozone, so we must be careful not to draw premature conclusions about the European aggregate and the inadequacy of Europe's policies. Indeed, Germany comes close to the US level (82% in 2019); France stands out for its sustained intangible investment, but without distinguishing itself in terms of GDP growth; and Italy lags behind, with very low level of productivity gains and intangible investment, while Spain is in a process of catching up.

Despite these intra-European differences, the capital factor seems to be the driving force behind the gap and divergence for all the countries observed. And by its very nature, the deficit in capital accumulation will also be the cause of divergence after 2019. If policy recommendations are to be defined, they must aim at increasing the investment in ICT and intangible assets to catch up with the level of capital available per job in the United States.

SciencesPo

The gap in growth rates between Europe and the United States has been confirmed in favour of the latter since the post-Covid recovery. While the United States has recorded growth rates of 2% or more since 2021, the energy shock has brought the recovery in the European Union (EU) to a halt (see *OFCE, Policy Brief* 125, International outlook). While the productivity slowdown remains a serious concern from a long-term perspective (Goldin *et al.*, 2024), there are signs of a recovery in the United States compared to the pre-Covid crisis period. All these factors suggest that the gap in per capita wealth between the United States and Europe will continue to widen. These divergences are not new. The gradual decoupling of GDP per capita began before the health crisis suggesting that Europe's weaker resilience is partly explained by structural factors. This *Policy Brief* therefore looks at Europe's decline over the twenty years prior to the pandemic and the energy crisis, from 2000 to 2019, and explores possible explanations for this decline. The most recent period from 2020 to 2023 is characterized by two major cyclical shocks and will be the subject of further analysis to be published shortly.

The gap in per capita income between the United States and the eurozone, which was around €10,000 in 2000, has not narrowed over the last twenty years. Since 2012, it has widened. Eurozone GDP per capita fell from 77% to 72% of US GDP per capita between 2000 and 2019, and is therefore falling behind the level of wealth on the other side of the Atlantic. The term "falling behind" refers precisely to the widening of this gap. This study examines the reasons for this decline in Europe's relative position. The 2009 crisis seems to have been a turning point, and it appears that the European production system was unable to digest the shock of the financial crisis and the sovereign debt crisis. Is it a question of *ex ante* fragility (institutional and/or economic) that is preventing a recovery, of an inability to fully embrace the digital economy that has driven growth over the last 10 years, or is it a question of greater vulnerability to emerging players, notably China, which is hampering the European export engine that was previously its strength? There is no doubt that this lag is not the result of a single cause.

Of course, focusing on GDP per capita means neglecting many other factors that determine Europeans' well-being and standard of living, as well as ignoring the distribution of income and its representativeness for all individuals in an economy. It is a synthetic indicator and therefore has its limitations. Nevertheless, it captures several factors that determine the productive capacity of economies.

Here we examine the factors of production, labour and capital, both tangible and intangible, to document the weaker performance of the European production system relative to the US, as revealed by the widening gap in GDP per capita between the US and Europe.

1. Why talk about a "Widening transatlantic Gap"?

When we talk about Europe's widening per capita income[1] gap with the United States, we mean the growing difference in per capita income with respect to the US. Per capita income is defined as the ratio of GDP to population and measures the average standard of living in a country, which can also hide significant economic and social inequalities. This first section shows the existence and extent of this gap over the period 2000-2019.

Table 1 shows GDP per capita at constant prices and purchasing power parity and its evolution for Europe and the United States between 2000 and 2019. First of all, there is a rather large difference in the level of GDP per capita over the whole period. In 2000, GDP per capita was €29,800 in the EU-27 and €33,500 in the eurozone (hereafter referred to as the EZ), while it was €43,700. In the US, twenty years later, per capita income in the US rose to over €54,800, compared with just €37,200 in the EU and €39,600 in the EZ. In the US, per capita income grew by an average of 1.2% per year over the period. In Europe, growth differs between the EU and the EZ. In the EU, as in the US, per capita income grew by 1.2% while in the EZ it grew by only 0.9%.

Table 1. **GDP per capita at constant purchasing power parity and its average annual growth rate (AAGR) in Europe and the United States between 2000 and 2019**

	GDP per capita (Euros, constant 2015 prices and PPP)		AAGR of GDP per capita 2000-2019	
	2000	2019	TCAM (%)	Difference in AAGR / USA (pp)
United States	43 742	54 863	1.2	/
EU 27	29 802	37 237	1.2	0.0
EZ 19	33 520	39 602	0.9	0.3
Germany	36 308	45 156	1.2	0.0
Spain	29 237	34 315	0.8	0.4
France	33 724	38 761	0.7	0.5
Italy	35 544	35 284	0.0	1.2

OCDE, Authors' calculations.

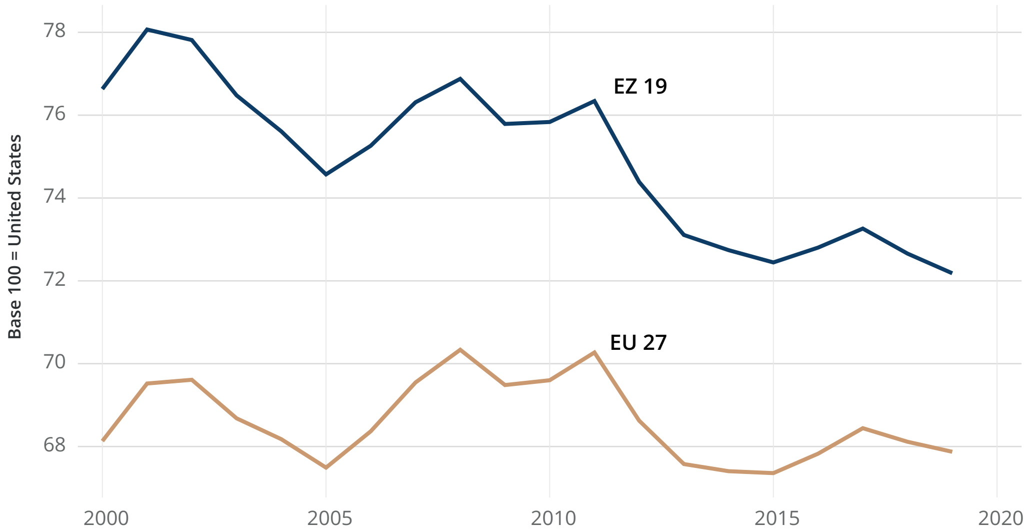
Note: The OECD provides data in constant 2015 dollars and PPPs. To convert these international dollars into international euros, we apply a fixed conversion rate of 0.9005 to the values, which corresponds to the dollar-euro exchange rate in 2015.

Figure 1 shows how GDP per capita in the EZ has fallen behind that of the United States over the last two decades. Per capita income in the EZ fell from 77% of the US level in 2000 to 72% in 2019. However, per capita income in the EU has remained stable at around 68% of the US level. The EZ's decline has been more pronounced since the sovereign debt crisis (2010-2012). However, it should be emphasized that this crisis is largely the result of the structural slowdown in economic growth since the 1970s and the 2008 crisis both of which contributed to the gradual deterioration of public finances in European countries.[2]

1. In the rest of this *Policy brief*, Europe is taken to mean the 27-member European Union, without distinguishing it from the 19-country euro zone. The distinction is made when results are specific to each perimeter. According to Eurostat data, the values for the population, GDP and R&D expenditure of the EZ are equal to 78%, 90% and 87% respectively of those for the EU 27.

2. See "La crise des dettes souveraines de la zone euro (2010-2012)", *L'éco en bref*, Banque de France, November 2023.

Figure 1. **Relative level of GDP per capita in the eurozone and the European Union compared to the United States**



OCDE, Authors' calculations.

Finding 1

In 2019, GDP per capita in the European Union and the eurozone was 68% and 72% of US GDP per capita respectively. The relative level of GDP per capita in the eurozone compared with the United States has deteriorated since the sovereign debt crisis of 2010-2012, falling from 77% of US GDP per capita in 2000 to 72%. That of the European Union has remained relatively stable over this period.[3]

Is the widening gap in European GDP per capita common to all Member States, or is it being driven by some? There is some heterogeneity within the EZ. Germany has maintained a growth rate comparable to that of the United States (1.2%) over the period. On the other hand, Spain, France, and Italy recorded lower growth rates of 0.8%, 0.7% and 0% respectively. Thus, GDP per capita in Germany increased much more than in the other countries over the period 2000-2019. Growth was much lower in Italy, and intermediate in France and Spain.

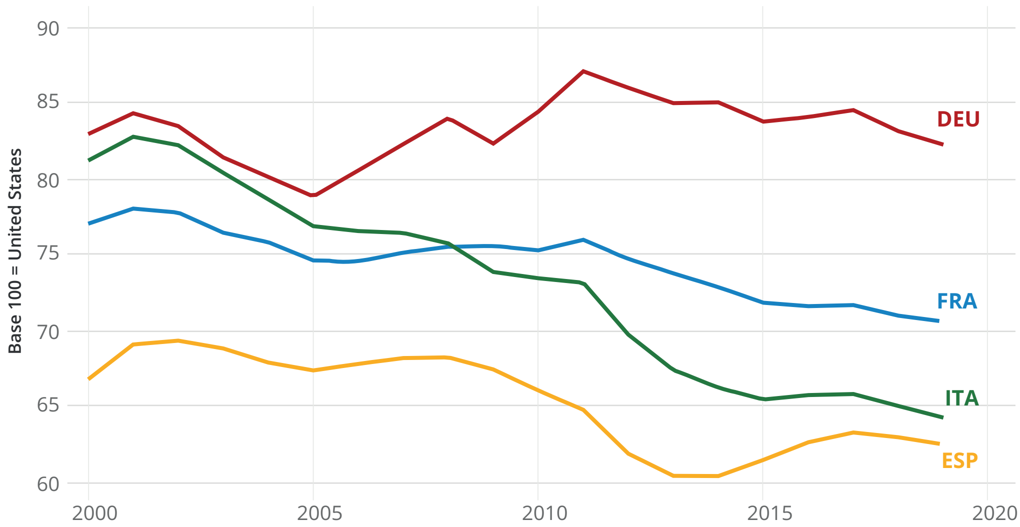
Figure 2 shows the evolution of the relative level of GDP per capita over the last two decades in four of the EU's major economies - Germany, France, Italy, and Spain - representing around 57% of the population and around 61% of the EU's GDP in 2023.

This graph highlights the heterogeneity among EZ countries, and specifically the sustained growth of Germany. The level of German GDP per capita relative to the US remained stable over the period at around 82%. Nonetheless, it increased between 2000 and 2011, before gradually declining along with the other countries since the sovereign debt crisis. France and Spain are intermediate cases. France's GDP per capita fell from 77% of the US level in 2000 to 72% in 2019, while Spain's fell from 67% to 63%. The Italian situation clearly stands out. The stagnation of its growth and its structural weaknesses explain why its GDP per capita has fallen behind that of the United States over the period.[4] Italian GDP per capita fell from 81% to 64% of US GDP per capita, a fall of 17 percentage points (pp).

3. China's GDP per capita increased fivefold over the period, reaching almost 40% of Europeans' per capita income in 2019.

4. Antonin, Guerini, Napoletano, Vona, 2019, "Italy: getting out of the double trap of high debt and low growth", *OFCE Policy brief*, no. 55, May.

Figure 2. **Relative level of GDP per capita in France, Germany, Italy and Spain compared with the United States**



OCDE, Authors' calculations.

Finding 2

Europe's falling behind the United States masks intra-EU heterogeneity. Germany's sustained growth in GDP per capita has enabled that country to maintain its average income gap with the United States. In contrast, growth in France, Spain and especially Italy was less dynamic, widening the gap by 6 pp, 4 pp and 17 pp respectively.

In what follows, we explore the potential sources of Europe's divergence by sequentially analysing the evolution from 2000 to 2019 of three elements that are at the heart of changes in economic performance: 1) labour; 2) tangible capital and, finally, 3) intangible capital.

2. The role of labour

Accounting decomposition of GDP per capita

To better understand the gap in income per capita (*Y/P*) between the United States and European countries, we decompose GDP per capita into two components: GDP (*Y*) per hour worked (*Y/H*), representing hourly productivity, and the number of hours worked (*H*) per capita (*H/P*), where *P* is the population. The accounting link between these variables is by definition:

$$\text{GDP per capita } (Y/P) = \text{Productivity per hour worked } (Y/H) \times \text{ Hours worked per capita } (H/P)$$

Thus, a higher level of GDP per capita can be achieved either by increasing productivity per hour or by increasing the number of hours worked per capita.

Hours worked per capita depend on the share of individuals in employment and on the intensity of work. It is then possible to extend the previous decomposition by defining hours worked per capita (*H/P)* as the product of the number of hours worked per employee (*H/E*, which represents the intensive margin of the number of hours worked per capita) and employment per capita (*E/P)*, which represents the extensive margin of the number of hours worked per capita):

Hours worked per capita (H/P) =
Average annual working hours per employment (H/E) x *Employment per capita (E/P)*

Not all people work. The proportion of people who work is a function of both demographics and the labour market. Part of the population does not participate in the labour market because they are too young or too old. Another part is unable or unwilling to work even though they are of working age (e.g. housewives and househusbands, people with disabilities, people who are discouraged from looking for work, for example). Finally, some of individuals of working age who would like to work are unemployed because of labour market conditions. The employment per capita can be broken down into four components:

Employment per capita (E/P) =
Share of working age population 15-64 (wap) x
Participation rate of 15-64 years old (par) x
Share of employed workers in the labour force of 15-64 years old (1 – u) x
Adjustment coefficient for 15-64 years old (corr)

The first element (*wap*) corresponds to the share of the population aged 15-64 said to be of working age in the total population. The second is the participation rate (*par),* defined as the share of the working-age population who are participating in the labour market (employed or unemployed). The share of employed workers in the labour force is equal to the proportion of the labour force that is employed. It is directly linked to the unemployment rate by the relationship (1 – *u*) where (*u)* is the unemployment rate. Finally, the adjustment coefficient for 15-64 years-old (*corr*) is equal to the ratio of total employment to employment of 15-64 years-old. This last coefficient measures the share of GDP per capita explained by employment of the over-64s but also captures the fact that data on total employment and on employment of the 15-64 age group come from different sources.[5]

5. The data used to break down changes in GDP per capita are based on two sources. Data on GDP at PPP, total hours worked, total population and total employment (salaried and non-salaried) are taken from the OECD's GDP Per Capita and Productivity Levels (PDB_LV) database, mainly from the OECD's Annual National Accounts. Data on the working-age population (15-64), the 15-64 labor force, employment of 15-64 year-olds and unemployment of 15-64 year-olds are taken from the OECD's Labor Market Data by Sex and Age (LFS_D), mainly from national surveys. Although total employment (15 years and over) is available in the LFS_D database, we have chosen to retain total employment from the PDB_LV database in order to maintain consistency with the national accounts on GDP per capita, hourly productivity, employment per capita and average working hours. It should be emphasized, however, that using the employment of those aged 15 and over from the LFS_D database instead of total employment from the PDB_LV database does not affect the study's conclusions. The results remain qualitatively and quantitatively similar in most cases.

Productive efficiency at the heart of the Europe's widening gap

How did the different components of per capita income contribute to the gap? Since the accounting decomposition of income per capita is multiplicative, its growth rate is approximately equal to the sum of the growth rates of each of its components. Table 2 breaks down the accounting relationship between the average annual growth rate of income per capita and the growth rates of hourly labour productivity and average hours worked per capita. The contribution of hours worked (*H/P)* to per capita income growth is itself decomposed into two elements that capture the contribution of changes in employment per capita (the extensive margin *E/P*) to changes in average hours worked (the intensive margin *H/E*).

Table 2. **Decomposition of the average annual growth rate of GDP per capita between 2000 and 2019**

	GDP per capita (*Y/P*)	Productivity per hour (*Y/H*)	Hours worked per capita (*H/P*)							
			Total	Average working hours (*H/E*)	Employment per capita (*E/P*)					
					Total	*wap*	*par*	(1 – *u*)	*corr*
	(a) = (b) + (c)	*(b)*	*(c) = (d) + (e)*	*(d)*	*(e) = (f) + (g) + (h) + (i)*	*(f)*	*(g)*	*(h)*	*(i)*
USA	1.2	1.5	-0.3	-0.2	-0.1	-0.1	-0.2	0.0	0.2
EU 27	1.2	1.1	0.1	-0.3	0.4	/	/	/	/
EZ	0.9	0.8	0.0	-0.3	0.3	-0.2	0.5	0.1	0.0
DEU	1.2	0.9	0.2	-0.3	0.6	-0.3	0.6	0.3	0.0
ESP	0.8	0.8	0.0	-0.2	0.2	-0.1	0.6	0.0	-0.2
FRA	0.7	0.9	-0.1	-0.1	0.0	-0.3	0.2	0.0	0.1
ITA	0.0	0.1	-0.1	-0.4	0.3	-0.3	0.5	0.0	0.1

OCDE, **Authors' calculations.**

Hourly productivity gains in Europe are lower than in the United States. In the US, they contributed for 1.5 pp to per capita income growth, while the contribution of hours worked per capita was negative for -0.2 pp. In Europe, hourly productivity is also the main contributor to per capita income growth, accounting for 1.1 pp in the EU and 0.8 pp in the EZ. The difference in the AAGR for hourly productivity compared to the United States is therefore 0.4 pp for the EU and 0.7 pp for the EZ. In contrast to the US, hours worked per capita (*H/P)* made a slight contribution of 0.1 pp to growth in the EU. Its contribution was positive but almost nil for the EZ.

The result for Europe hides heterogeneous situations. In Germany and France, productivity per hour growth contributed 0.9 pp to GDP per capita growth. In Spain, the contribution was 0.8 pp. In Italy, the contribution of productivity gains was close to zero. The contribution of working time was negative in France (-0.1 pp) and Italy (-0.1 pp), but positive in Germany (0.2 pp) and almost zero in Spain. It should be stressed that this diagnosis does not consider the indirect effect of variations in hours worked on productivity gains since the returns to labour are decreasing.

The distinction between the intensive margin (average hours worked) and the extensive margin (employment per capita) of working time reveals divergences between the United States and Europe. Firstly, the contribution of average hours worked was negative in both the US and Europe. It contributed -0.2 pp in the US, compared with -0.3 pp for the EU and the EZ. This decline reflects the secular trend towards shorter working hours, driven by productivity gains. Indeed, productivity (or wage) growth reduces the labour supply by cutting the number of hours worked (Cette *et al.*, 2023). Employment per capita fell in the United States over the period, making a negative contribution to per capita income (-0.1 pp). On the other hand, this increased in Europe. Its contribution was 0.4 pp for the EU and 0.3 pp for the EZ. Nevertheless, there are some notable differences within the EZ. In Germany, the contribution of employment per capita was particularly high (0.6 pp). In Spain and Italy, it was close to that of the EZ, at 0.2 pp and 0.3 pp respectively. In France, the contribution was practically zero, underlining the small gains in jobs per capita over the period.

The deterioration in employment per capita in the United States relative to Europe was mainly due to a declining participation in the US labour market. The participation rate fell by 0.2 pp in the US, while it rose significantly in the EU and EZ, by 0.5 pp and 0.6 pp, respectively. This increase in labour market participation can be seen in Germany (0.6 pp), Spain (0.6 pp) and Italy (0.5 pp), and to a lesser extent in France (0.2 pp). The decline in the population of working age (15-64) was evident in both the USA and the EZ. This trend reflects the combined effect of low fertility and longer life expectancy in both areas. However, this process is slightly more pronounced in Europe. The share of the working-age population in the total population fell by 0.1% in the United States, compared with a 0.2% decline in the EZ. The unemployment rate did not play a major role in the dynamics of GDP per capita over the period. Its reduction contributed less than 1 pp to the change in GDP per capita in the US and 1 pp in the EZ. In contrast, the fall in the German unemployment rate contributed 0.3 pp to the increase in its GDP per capita. The adjustment coefficient for 15-64 years-old made a positive contribution of 0.2 pp to per capita GDP growth in the US, while its contribution was almost nil in the euro zone. It was negative in Spain (-0.2 pp), but this effect reflects more of a statistical artefact than an actual increase in the ratio of employment of 15-64 years-old over total employment (see note 5).

Finding 3

The widening gap between Europe and US income per capita is mainly due to greater gains in labour productivity in the United States than in Europe. The underlying causes of Europe's widening productivity gap are not fundamentally arising from a decline in average working hours or in employment per capita.

3. The role of tangible capital

Tangible investment refers to the acquisition of capital goods by firms to increase their production capacity or improve their efficiency by replacing existing equipment. In so doing, physical investment plays a crucial role in the ability of economies to renew themselves and respond to contemporary challenges. By increasing production capacity, companies can meet growing demand, thereby fostering economic growth. Capital accumulation is one of the determinants of output growth and an important route to productivity gains. Investment increases production capacity and modernises production processes, thereby reducing unit production costs, and improving the quality of goods and services, thereby increasing profitability and competitiveness.[6] The European Union's EU-KLEMS database provides several measures of investment, ranging from tangible investment to intangible investment (see Section 4). It also provides a breakdown of the aggregate into more detailed investment items.

6. We deliberately omit multiplier effects such as those on employment and national income. Although essential, these macroeconomic effects do not directly concern the competitiveness of the production systems studied.

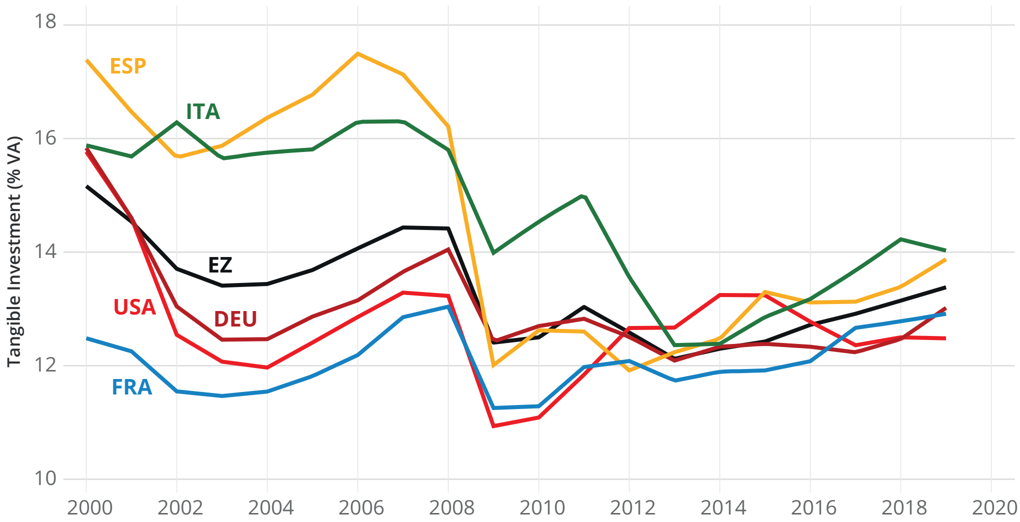
Rates of tangible investment are similar in the United States and the eurozone. The structure of investment in the United States reveals a high degree of specialisation in ICT

Let’s look first at the dynamics of the investment rate (excluding residential), defined as the ratio of tangible investment to value added (Figure 3). We can see that the dynamics of the EZ and the US are very similar, both in terms of level and growth rate. In both cases, the investment rate stands at just over 15%, falling sharply following the bursting of the internet bubble (in 2001) and then the financial crisis (in 2009), before finally stabilising at around 13% of value added. It should also be noted that investment in the United States is more volatile than in the EZ. In 2019, US tangible investment was 30% higher than investment in the EZ: €1.3 trillion in the US, and €1 trillion for the EZ.[7]

7. We have used the 2015 average exchange rate of 1 euro for 1.11 dollar (ECB).

At the intra-European level, we observe a high degree of heterogeneity in investment rates at the beginning of the period, and greater homogeneity at the end, which can no doubt be attributed to specific initial productive specialisations. Take, for example, the case of Spain, which was hit hard by the 2008 financial crisis because of the role played by real estate in its growth at the time, with a 4 pp reduction in just a few months. In Germany, but especially in France, the investment rate held up well during the financial crisis. As shown by Kremp and Sevestre (2013) in France, the credit crunch did not affect the supply of financing from banks, and private investment remained vigorous during the financial crisis. Across the Rhine, the decline in the investment rate predates the 2008 crisis, and the investment rate in 2019 is the same as the one in 2000.

Figure 3. **Tangible investment as a percentage of value added, by country, 2000 to 2019**



EU-KLEMS, national and capital accounts, 2023 edition. Authors' calculations.

Notes: Total private sector. Tangible investment is defined as the sum of nominal investment in machinery and equipment, transport equipment and ICT, but excludes residential investment and arable land. Calculations are based on value data.

The composition of investment by type of asset is also instructive (Table 3). The most striking feature is the difference between the American and European shares of investment in information and communication technologies (ICT; IT and communication equipment). In fact, this share reaches 15% in the United States compared with 6.6% in the EZ, and this difference is found in every country in the EZ. It is also worth noting the high proportion of non-residential investment in construction in France and Spain, which suffer from negative financial externalities relating to property and construction prices. This is to the detriment of the share devoted to other productive investments, such as machinery and equipment and ICT. Finally, Italy stands out for its high share of investment in machinery and equipment (48%), reflecting its relative specialisation in the manufacturing sector.

Table 3. **Structure by type of tangible investment, 2019**

	EZ	USA	DEU	ESP	FRA	ITA
IT equipment	3.3	8.0	2.9	3.6	3.5	4.5
Communication equipment	3.3	7.1	3.8	2.1	2.5	2.9
Non-residential investment	33.6	27.6	28.9	38.2	37.8	29.9
Machinery and equipment	37.5	38.2	40.2	34.0	35.0	47.9
Transport equipment	22.4	19.0	24.3	22.2	21.2	14.9
Total (in %)	100.0	100.0	100.0	100.0	100.0	100.0
Total (billions of current euros)	999.8	1316.9	287.9	108.7	182.8	156.1
As a % of market VA	13.4	12.5	13.0	13.9	12.9	14.0

EU-KLEMS, **national and capital accounts, 2023 edition. Authors' calculations.**

Notes: Total private sector. Tangible investment is defined as the sum of investment in machinery and equipment, transport equipment and ICT, but excludes residential investment and arable land. Data missing for the European Union.

Finding 4

The dynamics of investment, common to all the countries, conceal differences in the types of investment made in the various economies. The US economy, relative to the eurozone and its member countries, is concentrating twice as much effort on ICT.

Relative to the number of jobs, European investment represents 70% of US investment, confirming its lagging position in ICT

Relating investment to value added has the advantage of eliminating the question of prices and exchange rates, but it does not allow us to grasp the differences between countries in terms of investment volume. A high investment rate may be the expression of a genuinely high volume of investment, but it may also be the result of a low level of value added. To better appreciate the differences between countries, we relate investment (in euros and constant 2015 prices) to the number of jobs. Figure 4 shows the evolution of material investment per job by type of asset. Investment is measured at constant 2015 prices.

Relative to the number of jobs, the dynamics of tangible investment differ greatly between the USA and the EZ after 2008, in line with observations on labour productivity. Before the financial crisis, investment per job was almost €9,000 in the US and almost €8,000 in the EZ, with the two series showing a form of cointegration due to the stability of their gap, despite expansionary or recessionary economic phases. After 2008, the difference between the two geographical zones increases significantly. In 2019, investment per job in the United States was €11,500, compared with €8,000 per job in the European Economic Area. From €1,200 in 2008, this gap has thus tripled in a decade, to €3,500 in 2019. It should be noted that in the United States, tangible investment returned to its 2008 level in 2011, while in the EZ it only returned to this level in 2019.

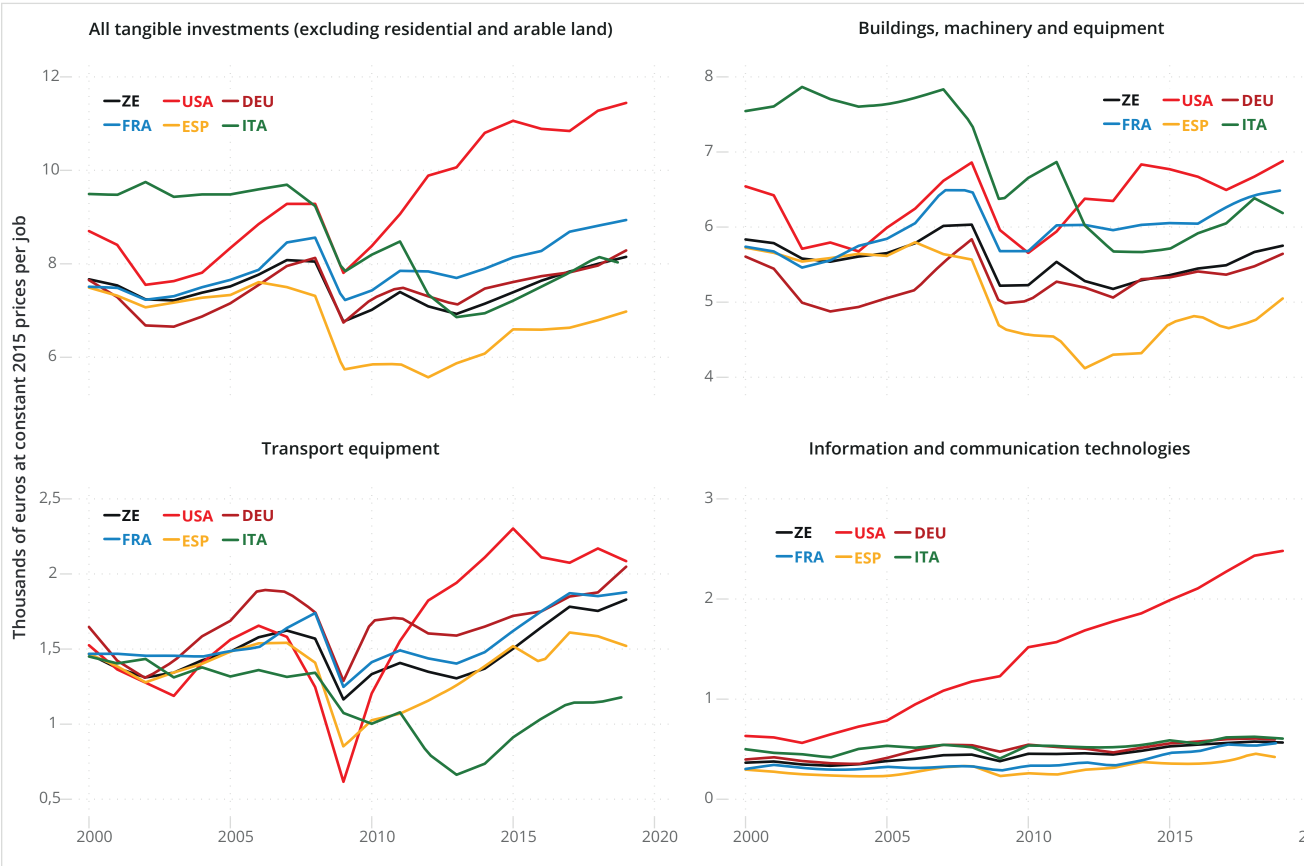
Where does this American vigour come from, and, by contrast, how can we explain this European apathy? Part of the answer can be found in the other quadrants of Figure 4. Firstly, the vigour of US investment can be seen everywhere, with the US systematically investing more per employee from 2012 onwards, for every type of investment considered. Secondly, and spectacularly, note the strength of US investment in ICT. Initially close to European levels, this investment is growing steadily in the United States, whereas it remains absolutely constant in Europe. The comparison is eloquent here, since investment per job in Europe remains at between €500 and €700 per year per employee over the entire period, while it rises to €2,500 per job in the US.[8]

8. As investment is measured here at constant prices, can the choice of the ICT asset deflator explain this discrepancy? There is still room for improvement when it comes to measuring ICT prices. Statisticians agree that ICT prices are probably overestimated, due to an underestimation of qualitative improvements. Would the bias be different in Europe and the United States? We'll assume that statisticians' skills are identical and that the price overestimation bias is the same. If we assume that the faster increase in quality in the US is not captured by price statistics, this would mean that the ICT deflator used for US values is too high. In either case, the result of five times higher ICT investment per job in the USA is not tainted by any hint of statistical overstatement.

Finding 5

Since 2012, tangible investment per job in the EZ has been systematically lower than in the United States. ICT investment stands out for its constantly widening gap, with a ratio of 1 to 5 by 2019: in Europe, investment per job remains at between €500 and €700 per year per employee over the whole period, while it reaches €2,500 in the United States.

Figure 4. **Tangible investment per job between 2000-2019, by type of asset and by country**



EU-KLEMS, national and capital accounts, 2023 edition. Authors' calculations.

Note: Tangible investment is defined as the sum of investment in buildings, machinery and equipment, transport equipment and ICT, but excludes residential investment and investment in arable land. Data missing for the European Union.

Since US investment has been more vigorous than European investment, the capital stock should also reflect these differences in level. According to EU KLEMS data, in 2019, US capital intensity was over €122,000 per job, compared with €93,000 in the EZ. At around €60,000 per job, France has a surprisingly low capital intensity. One might be tempted to read this as an expression of deindustrialisation since the manufacturing sector has a higher capital intensity than the tertiary sector. However, both the United States and France have a manufacturing sector share of around 10% of GDP, even though the US capital intensity is twice that of France. What's more, this weakness remains constant over the period observed, while the share of the manufacturing sector in GDP fell from 16% to 10% between 2000 and 2019.[9]

We also observe that since 2012, the decline in capital intensity has affected all countries in the EZ, and all categories of capital. In particular, ICT capital per European job is 20% of ICT capital per job in the US. This lag in the volume of ICT capital is not without consequences for the absorption of digital technologies, which are expected to generate future productivity gains. The low level of investment in equipment and ICT relative to employment, while the investment effort per unit of value added is comparable, suggests one explanation for Europe's lag relative to the United States, but above all this bodes ill for the catch-up process.

The most worrying element in our view is the accumulated backwardness of European capital when it comes to ICT. At a time when all the observers and experts see future economic growth being based on the increased use of digital technologies, particularly through the development of artificial intelligence and quantum computing, we have to ask ourselves whether Europe's lag is not reaching levels that will seriously handicap future growth. There are two polar explanations for the American lead over Europe, with different consequences. The first explanation would see in the European lag the absence of a European leader. In this view the American digital giants – the GAFAMs – would account for this investment gap. The development of ICT leads to the subsequent purchase of storage and computing centres, which alone can explain the observed gap. In this first case, the concentration of ICT investment would be very high, since the US dynamism would be due to a very small number of players. The second explanation, on the other hand, suggests that the gap observed is the result of dynamic US ICT investment spread evenly across the country's companies. If this is the case, then there is something more worrying to be seen in this gap, which can be summed up simply as follows: on average, an American job uses five computers, while a European job uses just one.[10]

To adjudicate between these two interpretations, we need to look at the granularity of investment, i.e. the companies that drive private investment.[11] In the absence of company data, it is difficult to provide an answer. However, if we calculate an indicator of the sectoral concentration of ICT investment (Herfindahl-Hirschman), we find that ICT investment is twice as sectorally concentrated in the USA as in the EZ, albeit at a fairly low level (0.2).

Finding 6

In the private sector, there is a capital stock differential of almost €30,000 between a US job and a job in the EZ. This gap breaks down as follows: €16,000 in buildings, machinery and equipment, €5,000 in transport equipment, and finally €8,000 in ICT. Of the three types of tangible assets, the low level of ICT capital per European job seems to us to be the most worrying, since it represents barely 20% of the ICT capital of a US job. This average value hides a higher sectoral concentration in the United States, but this remains low and does not contradict the idea that American jobs are generally better endowed with ICT.

9.
See DRIC, 2024, "The shortfall in European investment", *OFCE le blog*, 31 May.

10.
... or a computer 5 times more powerful. This observation needs to be qualified by the fact that part of this ICT investment also serves European jobs, since American companies provide digital services in Europe. However, it is likely that this nuance remains marginal and does not exhaust the differential observed between the two geographic zones. What's more, while American subsidiaries operating in Europe make extensive use of their American intangible capital, they are also obliged to invest in tangible capacities in Europe.

11.
The granularity of an aggregate therefore lies in the microeconomic origins of a macroeconomic indicator. When few companies contribute a great deal to an aggregate, it is said to be granular. This notion was originally put forward by Gabaix (2013).

4. The role of intangible capital

Intangible investments are playing an increasingly important role in capital accumulation and are at the heart of contemporary growth (Haskel and Westlake, 2019). They are necessary for the accumulation of knowledge, which drives innovation, technical progress and its appropriation, and therefore productivity gains (Griliches, 1998; Brynjolfsson, 2023). Investments in basic research, for example, have in common that they generate high returns beyond the year of the expenditure (in excess of 20%; see Press, 2013).

Some of these investments are recorded in the national accounts. These include research and development (R&D), software, databases and other intellectual property rights, including mineral exploration rights and artistic works. But other elements of spending by economic agents can be considered as intangible investments and make a major contribution to value creation and productivity gains. In the quest to explain the Solow residual, it became necessary to take into account additional intangible assets. The work of Corrado, Hulten and Sichel (hereafter CHS, 2005) has led to the addition of professional training, financial and design innovations, as well as advertising, marketing and organisational innovations (created or purchased) to the assets recorded by the national accounts. In what follows, we will refer to intangible assets as defined by CHS. According to these authors, intangible capital contributes between 1/5 and 1/3 of labour productivity growth. The INTAN-invest database, made available by Corrado *et al.* (2016),[12] has tracked the accumulation of these assets from 1995 to 2020.

The dynamics of accumulation of intangible assets is greater in the United States than in the EZ

In 2019, the EZ's intangible capital in the national accounts record (resp. in the CHS sense) represented 35% of the USA's intangible capital (resp. 36%). As we saw earlier, the EZ's tangible capital was 53% of that of the US, and the gap in intangible capital is even greater.[13] These differences clearly suggest that the nature of capital differs between the USA and Europe, even though their productive specialisations are not so far apart.

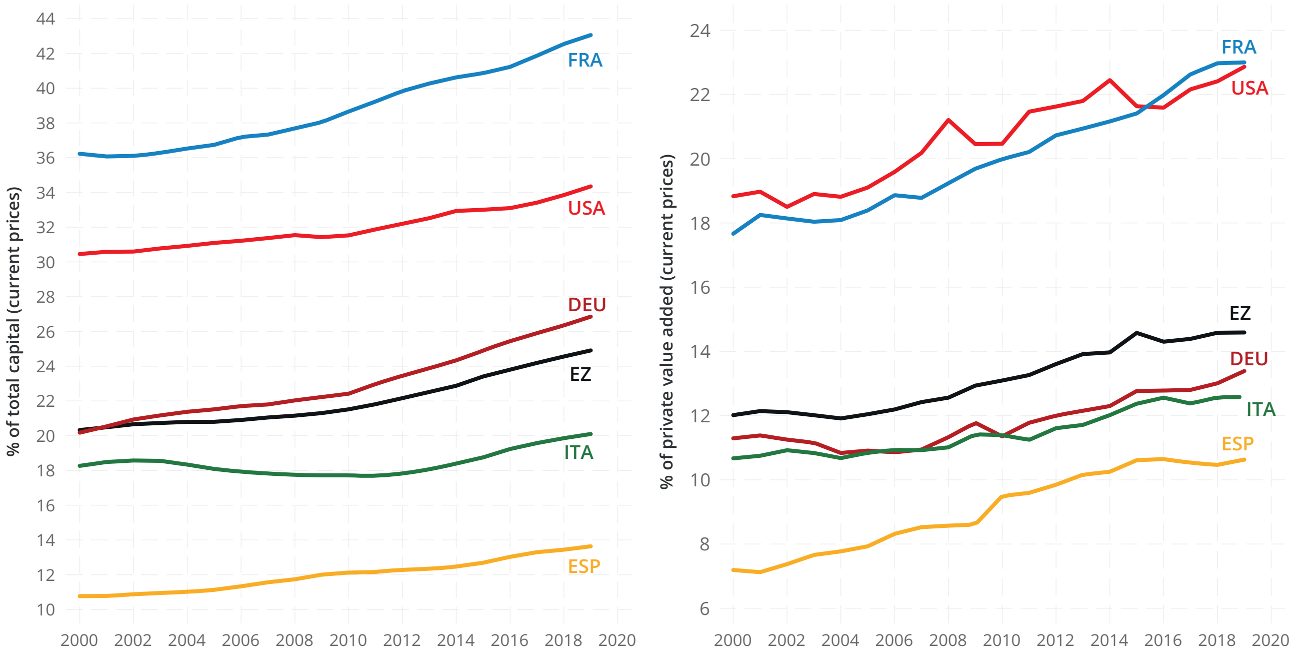
It is also striking to note that France stands out for the high intangibility of its capital, and that its rate of investment in intangible assets relative to value added is of the same order of magnitude as that of the United States, at around 22% in 2019 (Figure 5). The effort is less intense in Germany and Italy, which are close to the EZ average of 14%. It should be noted that the rate of investment in intangible assets has risen in all countries.

The structure of intangible investment in 2019 is presented in Table 4 for the United States, the EZ, Germany, France, Italy and Spain. The Intellectual property assets include assets relating to intellectual property rights recorded in the national accounts, plus design, brands, advertising and financial innovations (CHS assets). The structure of intangible assets is relatively similar between the European Economic Area (EEA) and the United States, although efforts on training relative to organisation are more balanced in Europe (ratio of 1/2 to 1/5) than in the United States (ratio of 1/8). There are other differences between European countries. France's distribution of assets is fairly similar to that of the United States, even in terms of the ratio of tangible to intangible assets.

12. Data published on intaninvest.net. Intangible investment is defined as the sum of investment in R&D, databases and software, design, advertising, brands, intellectual property, training and organisation. Expenditure on organisation is measured by the economy's expenditure on management and organisational consultancy (obtained via the value added of these sectors), to which is added the companies' own component based on the wage bill for executive functions.

13. We have used the 2019 average exchange rate of 1 euro for 1.12 dollar (ECB).

Figure 5. **Share of intangible capital in total capital (left) and rate of intangible investment (right)**



INTAN-INVEST, 2023 edition. **Authors' calculations.**

The table also confirms that, due to a higher rate of investment in intangible assets, the United States has a more intangible capital structure than the EZ. Between 2000 and 2019, the growth rate of investment in intangible assets at constant prices was 70% in the EZ, compared with 98% in the US. At an equivalent level of depreciation, intangible capital doubled in the United States, whereas it increased by around 2/3 in the EZ.

Table 4. **Structure by type of intangible investment, in 2019, as a % of total intangible investment (as defined by CHS)**

	EZ	USA	DEU	ESP	FRA	ITA
Research & Development	18.1	18.4	29.0	13.6	15.0	18.3
Software and databases	17.6	14.8	8.9	24.3	23.5	17.7
Intellectual property	32.6	28.0	34.0	40.4	25.5	38.5
Organisation	23.1	34.4	18.1	13.3	29.1	16.8
Training	8.5	4.4	10.0	8.5	6.9	8.6
Total (in %)	100	100	100	100	100	100
Total (in billions of euros)	1085.4	2952.1	296.1	83.3	325.6	140.0
K tangible / K intangible	3.5	2.1	3.3	7.3	1.6	4.4

INTAN-INVEST, 2023 edition. **Authors' calculations.**

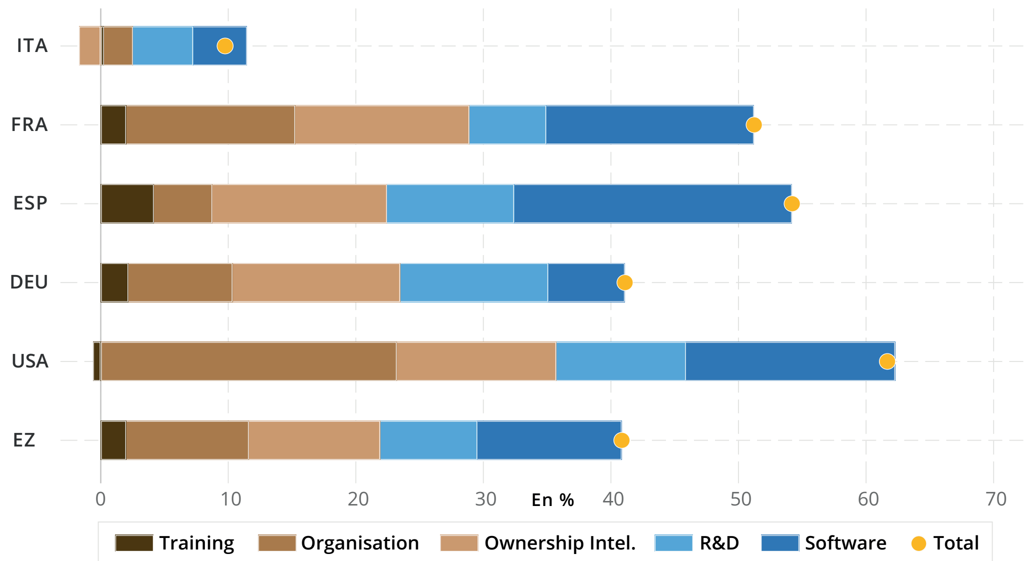
Note: Total for the private sector.

Figure 6 shows that the average annual growth rate of intangible investment from 2000 to 2019 was higher in the United States than in the EZ. However, high growth rates can be driven by catch-up effects, as is indeed the case for Spain. Among the EZ countries surveyed, Germany and Italy had the lowest growth rates, while Spain had the highest.

While the rate of investment was increasing in all regions and countries, the respective contributions of the different types of intangible assets to this growth vary. Organisation had a greater weight in the United States, while R&D and intellectual property contributed relatively less, and training was declining. France saw less growth in its R&D than the US: although it experienced the same deindustrialisation, the digital services sectors did not take over as much of the growth in this asset. In France, on the other hand, spending on organisation and software was driving growth in intangible capital. The EZ was growing almost half as fast as the US, but the different types of assets made a more balanced contribution to this growth. Italy is clearly still a poor performer, which explains the EZ's underperformance.

We can see that it is the United States that increased its volume of intangible investment the most, due in particular to strong growth in organisational assets. Germany is the country with the highest contribution from R&D to growth in intangible investment. Italy increased its volume of intangible investment by only 10%, the smallest increase of the four European countries studied.

Figure 6. **Decomposition of 2000-2019 growth in intangible investment per asset, by zone/country**



INTAN-INVEST, 2023 edition. Authors' calculations.

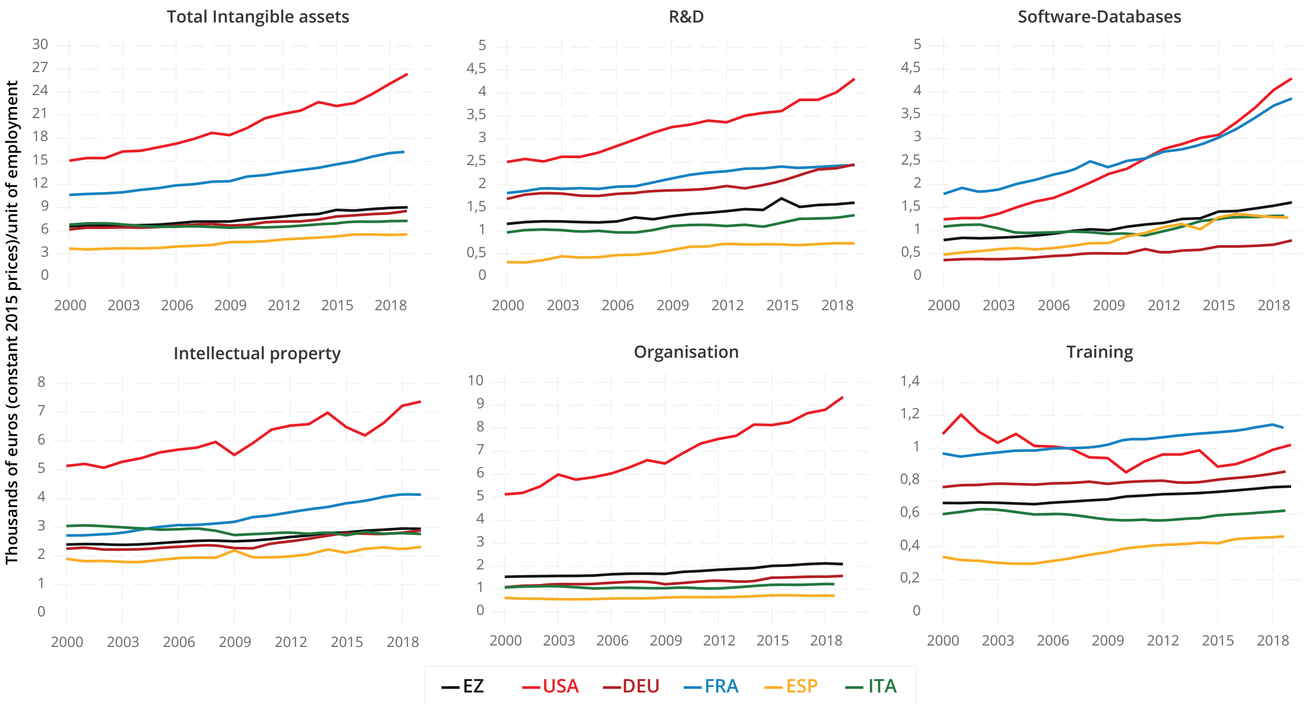
Note: The average annual growth rate in intangible investment was 41% in the eurozone and 62% in the United States. France increased its intangible investment by 51%, including 15% in software and databases.

Finding 7

In contrast to the case with the rate of investment in tangible assets, the EZ, except for France, has a slower rate of accumulation of intangible assets, with an investment rate of 15% compared with 23% in the USA. As a result, the ratio of tangible capital to intangible capital is much higher in the EZ (equal to 3.5) than in the US (2). France stands out for the high degree of immateriality of its capital, the result of a very high rate of investment in intangible capital (23%), even though it is not driven by R&D investment.

Figure 7 shows that, apart from training, investment in intangible assets relative to employment clearly accelerated in the United States after the financial crisis and after 2012. The provision of intangible capital for each job has been increasing in the United States. This is probably not a homogeneous phenomenon, and the following section looks at the granularity of R&D investment. Looking at the results for tangible investment, there is a clear complementarity between intangible and ICT investment.

Figure 7. **Intangible investment per job, by type of asset and by country**



INTAN-INVEST, 2023 edition. Authors' calculations.

The ratio of intangible investment to employment increased in all countries except Italy. Growth was the strongest in the United States. The ratio hit €27,000 of intangible investment per job in the United States, compared with €9,000 in the EZ. All the countries surveyed showed positive growth in R&D, software and databases, organisational assets and, with the exception of Italy, intellectual property assets. Italy's underperformance can be seen in all intangible assets, with a decline in intellectual property assets and training. When it comes to training assets, it is striking that the United States stands out for a decline, unlike the EZ. The latter, despite Italy's underperformance, is growing, thanks in particular to the Spanish and French engines.

The dynamics of the growth rate of intangible investment per job suggest significant differences in intangible capital intensity. In 2019, an American job came with €79,000 of intangible capital, while a job in the EZ with €28,000..

Finding 8

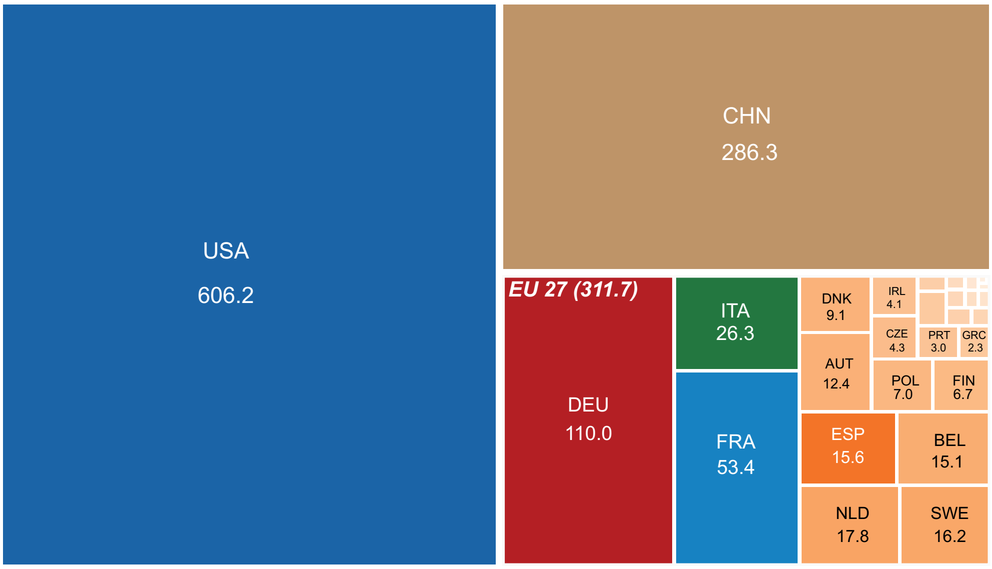
The provision of intangible capital for each job has been growing faster in the USA than in the EZ for all assets except training. The highest rate of growth was seen in software and databases for all countries. This rate was twice as high in the USA as in the EZ for R&D, organisational and intellectual property assets. Finally, on average, the intangible capital available to an American job was around 3.5 times greater than in the EZ. France stands out in terms of its level (higher) and Italy in terms of its growth rate (lower, even negative).

There is no comparison between the United States, the EU and China in terms of the ways in which knowledge is accumulated

This sub-section focuses on R&D, with China emerging as the next threat to Europe's technological downgrading.

In 2019, the EU invested €311.7 billion in R&D (public and private funding), including €270.7 billion in the EZ, with the difference mainly explained by the contributions of Sweden and Denmark. At €606.2 billion, the United States invests as much in R&D as the EU and China combined, as shown in Figure 8. Among EU countries, France invests twice as much as Italy, but half as much as Germany (€110 billion). Germany's R&D effort (as a percentage of GDP) is worth 3.2%, well ahead of France's 2.2%. Sweden leads the European countries in terms of R&D effort (3.4%), but remains a small country of 10 million inhabitants, investing only €16.2 billion in 2019.

Figure 8. **R&D investment (billions of current euros), 2019**



Eurostat, **OFCE calculations**.
Note: These are public and private R&D expenditures. For the EU, R&D includes direct aid (including European funds).

In the public sector, R&D efforts by sector of performance have evolved in a similar way accross the three areas.[14]

By contrast, total private sector investment has grown more in the United States than in China, and more in China than in the EU. There is no significant difference when looking only at the EZ.[15] Between 2015 and 2019, US private investment increased from 1.95% to 2.38%, bringing the total effort above the 3% threshold. China's private R&D effort increased relatively more at the beginning of the period than at the end. With reference to the objectives set by the Lisbon European Council in 2000, we can draw the following conclusions.

Part of the gap with the United States can be explained by the colossal size of R&D spending by US companies in the ICT sector; we have highlighted the importance of tangible investment by this sector (see Findings 5 and 6). Take Alphabet, for example, which will top the list of GAFAM R&D spenders in 2022:[16] with €25.5 billion, this group will have invested as much in R&D that year as all the private companies

14. Private R&D effort excludes the private non-profit sector. Public R&D effort includes research and higher education organizations and institutions. For EU countries, current GDP data and deflators come from Eurostat EU. These variables for the USA and China come from the World Bank. We have performed several imputations of the private and public R&D series for the three regions, in certain years, to ensure that there are no gaps in the curves.

15. The similarity in private research effort between the EU-27 and the eurozone stems from similar rates of decline for R&D and GDP. In 2019, for example, R&D and GDP in the eurozone were respectively 13.1% and 14.5% lower.

16. R&D Scoreboard data begins in 2003. As the year 2022 is available, we have gone up to this year in order to have a 20-year period, as in the other charts in the Policy Brief. The "F" refers to Facebook, renamed Meta in 2021.

established in France. There is a trend towards concentration of R&D in this sector (Figure 9), whereas 10 years ago R&D was concentrated in the automotive (Toyota, Volkswagen) and pharmaceutical (Pfizer, Roche) industries.

Throughout the period 2003-2022, the level of R&D concentration in Europe is similar to that in the other two regions, where concentration levels are closer and slightly lower. The graph on the right shows the level of concentration of ICT R&D relative to the level of concentration in the other sectors. ICT R&D is increasingly concentrated in the US, with the relative level of concentration increasing by almost 50% over the period. The EU, on the other hand, is characterised by a higher relative level of concentration of ICT R&D over the whole period, but without any increase.

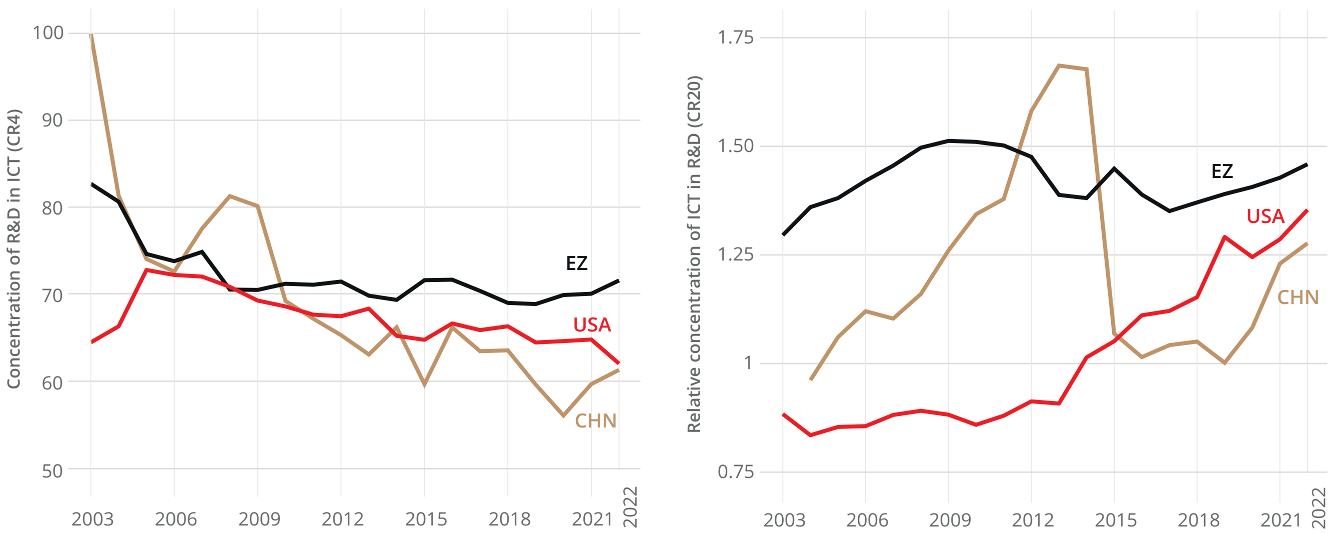
The EU KLEMS data used earlier show that the ICT sector (C26 and J) accounts for 36% of R&D spending, and that this sector's leading role in R&D spending increased most strongly in the US over the period 2000-2019 (see DRIC blog post, 2024).[17]

17. *Op. cit.* note 9.

Finding 9

In 2019, the United States will have invested as much in R&D as the EU and China combined: for every €1 invested in the EU, the United States invests €1.9 and China invests 90 cents. Over the period 2000-2019, the public R&D effort (0.8% of GDP) was slightly higher in Europe than in other regions. The 1% target set by the Lisbon strategy has still not been reached, nor has the 2% target for private R&D. Between €90 and €100 billion a year of R&D is still needed to reach these targets. Part of the gap with the United States can be explained by a greater concentration of R&D in the US ICT sector.

Figure 9. **Concentration of ICT R&D, 2003-2022**



R&D Investment Scoreboard, OFCE calculations.

Note: R&D expenditures are those financed by companies using their own funds, including subcontracting (see Nindl, Confraria *et al.*, 2023, for the detailed scope of the survey). In the graph on the left, we calculate for each region the share of R&D spending by the top four companies in the different branches of the ICT sector. ICT is then defined as the unweighted arithmetic mean of these shares. The ICT sectors (NACE Rev. 2 codes) are: 26 (Computer, electrical and optical products), 58-60 (Publishing, audio and broadcasting), 61 (Telecoms), and 62-63 (Computer activities and information services). The graph on the right calculates the share of the top 20 companies' R&D expenditure in ICT (without distinguishing between ICT sectors), which is then compared with the share of the top 20 companies' R&D expenditure in the rest of the economy.

For patents, we obtained counts from the World Intellectual Property Organization.[18] This is an exhaustive count of patents granted through the PCT (Patent Cooperation Treaty) to the offices of each of the three areas. The number of patents granted (all technologies combined) is increasing at a steadily slowing rate in Europe and the United States but doubled by 2020 in China, where this number is growing exponentially (327, 8252 and 58,814 patents in 2000, 2010 and 2020, respectively). The increase in China is concomitant with better protection of intellectual property (see Park, 2008). The situation is even more dramatic in the semiconductor sector, an important component of the ICT sector, where Europe and the United States are falling behind China.

18. Patent data are available from the WIPO Intellectual Property Statistical Data Center: https://www3.wipo.int/ipstats/key-search/indicator.

It would therefore appear that certain sectors play a decisive role in the changes in productivity and in the gap in GDP per capita between Europe and the United States. This raises the question of whether the European economy has shifted its productive capacity towards sectors with low productivity gains, which would automatically lead to low labour productivity growth. The decomposition of aggregate productivity gains into intra-sectoral effects, inter-sectoral effects and cross-sectoral effects shows that the European (i.e. EZ) lag is not due to a sectoral positioning that is not conducive to productivity gains. Rather, it is the result of weak intra-sectoral effects.

5. Conclusion and discussion

This Policy Brief documents the widening transatlantic GDP per capita gap. In 2019, the GDP per capita in the EZ was 72% of the US level, down from 77% in 2000. Analysis of working time and productivity per hour shows that the GDP per capita gap between the EZ and the US is mainly due to lower gains in productivity per hour.

Exploring the dynamics of tangible and intangible capital accumulation shows that the differences in productive efficiency are linked to the much more dynamic growth in US investment, particularly in ICT and intangible assets. Investment in ICT came to €223 billion in 2019 in the United States, compared with €65 billion in the EZ. Per job, ICT investment is five times higher in the US than in the EZ. In addition, intangible investments are themselves three times higher.

Considering intangible investments, the United States invest massively in R&D, and account for as much as Europe and China combined. The ICT sectors are a key driver of R&D investment, just as they are for investment in ICT equipment.

Looking beyond the overall analysis, we see that France and Germany are not lagging as far behind in terms of productive efficiency. In fact, Germany has experienced higher growth rates over the last two decades, which has narrowed its gap with average American wealth. France stands out for the greater immateriality of its capital, due to the strength of its investments in software and databases, but also to the weakness of its rate of accumulation of tangible capital. Italy is struggling to match the growth ratios for investment in intangible assets and ICT hardware, and its production system is far less efficient. Spain stands out for growth rates typical of a catch-up dynamic, starting from lower levels of accumulated capital.

The EZ's stall became more pronounced during the sovereign debt crisis, very probably indicating the vulnerability of its productive apparatus to the financial crisis that preceded it, and a lack of resilience to economic crises. The inability of European economies to recover quickly to their pre-crisis levels reveals a lack of capacity to bounce back, to adjust to new post-crisis conditions and to the high impact of financial constraints on investment. Because of the lessons learned from 2012, public policy has responded very differently to the 2020 crisis. However, the energy shock once again put public support efforts to the test, while at the same time the US economy redoubled its investment efforts, fuelled in particular by proactive industrial policies to strengthen its autonomy in semiconductors and green technologies. The exposure of the divergence in the dynamics of capital accumulation required for the digital economy over the next twenty years raises questions about the EZ's resilience and its rebound capacity as well as its ability to meet its environmental ambitions.

The most recent data show that in 2022, the United States had exceeded its 2019 level, with GDP per capita rising by 4%. The EZ has fallen to 70.6% of the US, 2 pp below its 2019 level, and only Italy is approaching its 2019 level of GDP per capita. The Covid and energy shocks have deepened the stall, which is part of a structural trend that needs to be reversed.

The low level of tangible investment – particularly in ICT – and intangible investment in the EZ compared with the United States should be seen in the context of a more sustained productivity dynamic on the other side of the Atlantic. Intra-sector productivity gains are the result of innovation, whether driven by new or existing companies. Innovation is the result of considerable past investment, often over several years, both intangible when we are talking about the invention process *stricto sensu*, and tangible when it comes to translating inventions into tangible innovation.

These results only serve to confirm the failure of the Lisbon strategy of 2000 and oblige the European Union to rethink its means of stepping up R&D efforts and investment in intangible capital. For the absence of an ICT sector of comparable size to that of the United States cannot alone explain the gap in capital intensity with the rest of the economy.

If the EZ is to become a major player in the digital and environmental transitions, additional efforts need to be made in terms of financing. More specifically, this could be achieved completing the unification of the the European capital markets, which is imperative for financing riskier investments in intangible assets, or more directly through public orders for large-scale, long-term industrial projects. To be effective, these resources will need to prioritize sectors or technologies that meet the needs of the greatest number of Member States.

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