

Berlin *aktuell*

Full Steam Ahead in the Digital Economy

September 2017



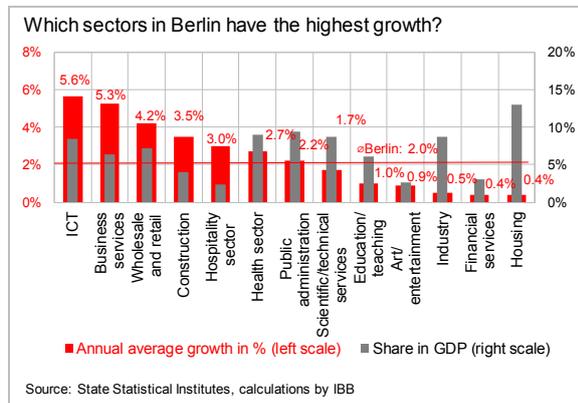
Leistung für Berlin.

Summary

- One fifth of all economic growth in Berlin is generated in the digital economy.
- One in eight new jobs is created in the digital economy.
- One in six new jobs in Germany's digital economy is created in Berlin.
- Since 2008, 36,000 new jobs in total have been created in Berlin's digital economy.
- In 2016, 77,000 people were already employed in Berlin's digital economy.
- There are now 9,318 companies up and running in Berlin's digital sector, an increase of 67.9% since 2008.
- These companies together generate EUR 9.4bn in sales, EUR 4.8bn of this with software and data services.
- The number of new digital companies being set up in Berlin is almost as high as in Hamburg and Munich combined. For the past four years, one new digital company has been set up every 20 hours.
- Berlin's start-up scene has substance. For every two new start-ups, only one company closes its doors. Female founders are making a particularly sustainable contribution to Berlin's start-up scene.
- Especially where software and data services are concerned, start-ups by women have much higher chances of survival than their male counterparts (difference: 11 percentage points).
- The high investment rate of 29% in terms of gross value added with software and data services shows that the start-up ecosystem in Berlin is now in a phase in which intrinsic strengthening effects are starting to take hold. Profits generated in the digital economy are being reinvested in this sector (compared to the 22% in Berlin's overall economy).
- Berlin's strong digital economy is paving the way for the digitalisation of other sectors. After Berlin profited in recent years from growth in ecommerce, many new companies are currently being established in the capital city's fintech sector.
- Berlin is the city with the highest number of fintech start-ups in Germany. These companies are soliciting more venture capital than all other locations in Germany combined.
- Over the next ten years, fintechs in Berlin could create up to 40,000 new jobs.

The digital economy is a growth engine

In recent years, the information and communication technology (ICT) sector has become one of the most important growth engines in the capital city. Economic output here rose faster than in any other area of the economy, in the post-crisis years from 2009 to 2016 by an average of 5.6% p.a. – that’s 3.6 percentage points higher than long-term average value added growth in Berlin (2.0%). The ICT share in Berlin’s overall value added now totals 8.5%. This means that the ICT share is now almost as high as that of Berlin’s entire industrial sector (8.7%) and twice as high as that of the construction industry (4.0%). In 2010, the ICT share was still just 7.2% while the industrial share was 10.5%.



Within the ICT sector of the economy, which also includes publishing, media and broadcasting services, companies in the digital economy are also in a particularly strong position. That's because it is precisely these companies who are introducing new technological and entrepreneurial innovations and hence have the greatest potential for growth. They have now reached an impressive annual growth rate of more than 10%. This is another reason why these sectors are very much in the focus of public discussion which is to be backed now by this study and the latest figures.

Classification of the Digital Economy

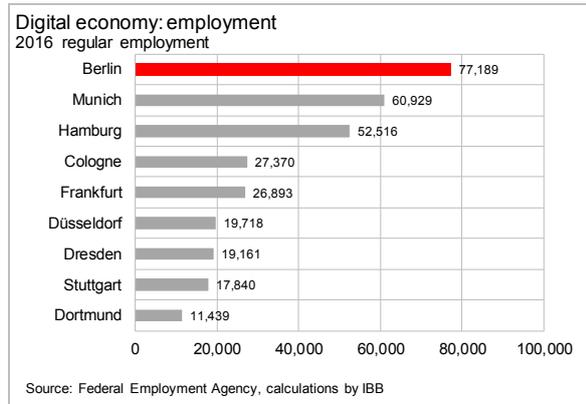
WZ-2008	Economic Branch	
26.1	Manufacture of electronic components	Basic ICT infrastructure
26.3	Manufacture of devices and installation of telecommunications systems	
61.1	Line-based telecommunications	
61.2	Wireless telecommunications	
61.3	Satellite telecommunications	
61.9	Other telecommunications	
58.2	Software publishing	Core area of the digital economy
62.01	Programming activities	
62.02	Consultancy services in the field of IT	
62.03	Operation of IT facilities for third parties	
62.09	Other IT services	
63.11	Data processing, hosting and related activities (database service, data storage services)	Bipolice infrastructure
63.12	Web portals	
26.2	Manufacture of IT equipment and peripheral de	Consumer electronics
26.4	Manufacture of consumer electronics	
26.8	Manufacture of magnetic and optical data carriers	
47.91	Internet and mail-order retail	

As in previous surveys¹ by IBB, the focus is on the core area of the digital economy with its particularly dynamic development. These are companies that produce software and provide Internet services. As digitalisation increases, the products offered by these companies are becoming more and more important for many sectors of the economy.

Furthermore, companies that supply hardware and infrastructure are also part of the digital economy. They provide the infrastructure needed to transmit (basic ICT infrastructure) and present (consumer electronics) the content and services generated in the core area of the digital economy. These are for the greater part telecom companies and manufacturers of terminal devices. E-commerce has now become an integral part of Berlin’s digital economy. With the expansion of the Internet, mail-order commerce changed dramatically, paving the way for new, young companies who are to a very large extent setting up shop in Germany’s capital city.

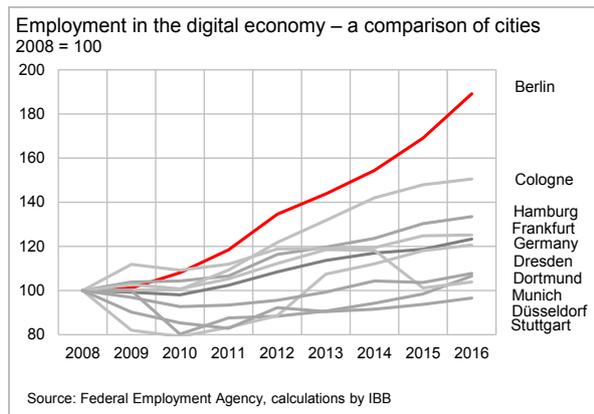
¹ Berlin aktuell: Digital Economy – Analysis by Comparing German Cities (July 2013); Berlin aktuell: Digital Economy in the Fast Lane (September 2014); Berlin aktuell: Strong Growth Thanks to Digital Transformation (September 2015); Berlin aktuell: Taking Stock of Fintechs in Berlin (August 2016)

Every 8th new job is created in the digital economy



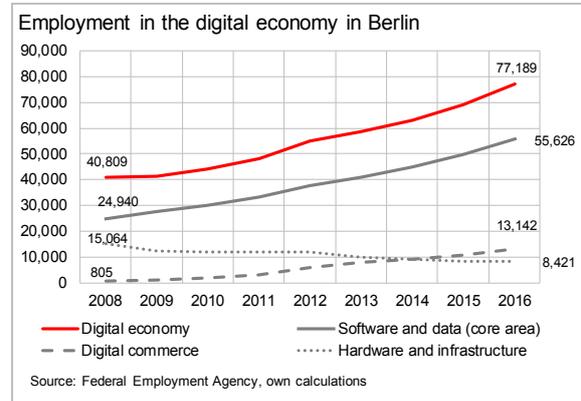
In 2016, a total of 77,189 people were employed in Berlin's digital economy – more than in any other major German city. Far fewer people were employed in the digital economy in Munich (60,926), Hamburg (52,516), Cologne (27,370), Frankfurt (26,893), Düsseldorf (19,718), Dresden (19,161), Stuttgart (17,840) and Dortmund (11,439).

Between 2008 and 2016, 36,380 new jobs were created in Berlin's digital economy (an increase of 89.1%, compared to the 22.7% increase for Berlin's economy as a whole). This means that more than every 8th new job in Berlin since 2008 was created by a company in the digital economy (13.0% of all new jobs).



Compared to other major cities in Germany, the increase in employment in Berlin's digital economy recorded between 2008 and 2016 was also much higher at 89.1%. Over the

same period, job growth was lower in Cologne (+50.5%), Hamburg (+33.5%), Frankfurt (+25.2%), Dresden (+20.6%) Dortmund (+7.8%), Munich (+6.5%) and Düsseldorf (+3.8%). In Stuttgart, employment in the core area of the digital economy actually fell (-3.5%).



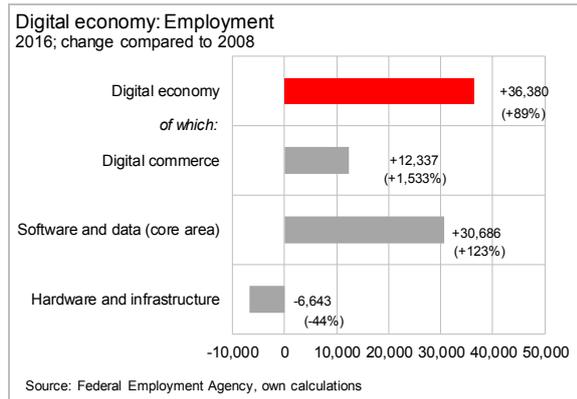
The capital city's economy proved itself to be very flexible during this period. Although the number of people working in the hardware and infrastructure sector in the capital has fallen by 6,643 since 2008, 12,337 new jobs were created in digital commerce during the same period. More than 13,142 people now work in this sector in Berlin, corresponding to 10.8% of all those employed in digital commerce in Germany. On the whole, fifteen times more people are now employed in e-commerce in Berlin than in 2008. The German average for employment in digital commerce, however, has merely doubled.

Since 2008, 4.4% of all jobs in Berlin were created in e-commerce. 13,142 people now work in e-commerce in Berlin, that's more than in any other major German city.

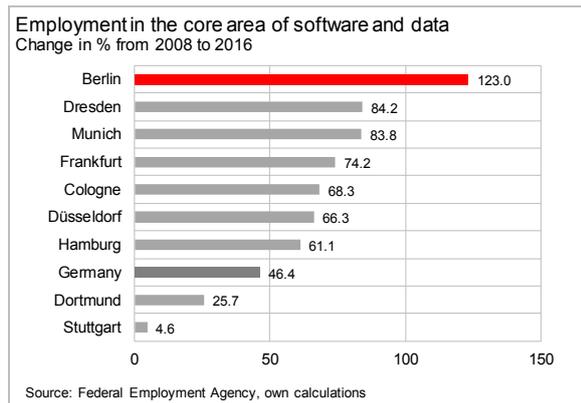


In Dresden and Munich, digital commerce accounts for only 3.4% or 2.5%, respectively, of growth in employment. In Dortmund, Cologne, Hamburg and Stuttgart, this figure was 1% or less. In Düsseldorf (-1.0%) and Frankfurt (-2.7%), digital commerce even slowed down employment growth.

Highest rise in software and data providers in Berlin



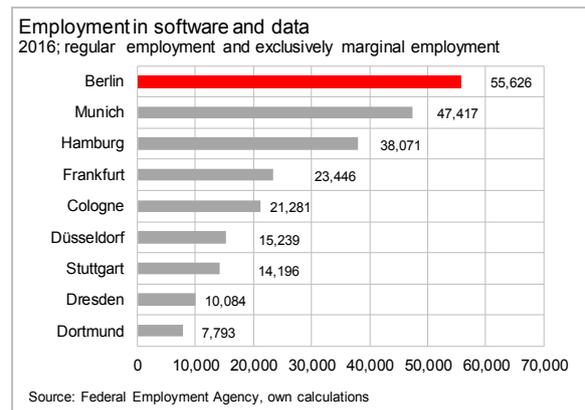
In addition to the 12,337 new jobs in digital commerce, 30,686 new jobs have been created in software and data services, the so-called core area of the digital economy, since 2008. Compared to other major German cities, the core area of the digital economy in Berlin fared extremely well, recording an increase of 123% against 2008.



Neither Dresden (+84.2%), Munich (+83.8%) nor Frankfurt (+74.2%) were able to achieve such good growth in employment. That being said, Cologne (+68.3%), Düsseldorf (+66.3%) and Hamburg (+61.1%) did manage to achieve above-average employment growth in the core area of the digital econo-

my when compared to the national average of +46.4%. Job growth in Dortmund (+25.7%) and Stuttgart (+4.6%), on the other hand, was below average.

A comparison of software and data

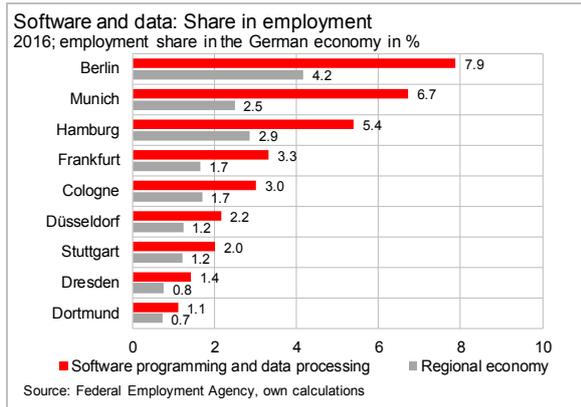


In 2016, 705,570 people in Germany were employed as software developers and service providers in the core area of the digital economy.

Compared to other major cities in Germany, most of those working in software and data services are employed in Berlin (55,626). This is followed by Munich (47,417) and Hamburg (38,071). Far fewer people are employed in this sector in Frankfurt (23,446), Cologne (21,281), Düsseldorf (15,239), Stuttgart (14,196), Dresden (10,084) and Dortmund (7,793).

This means that one third of all software developers and data service providers work in Germany's nine major cities (each with a population of more than 500,000). Berlin alone already accounts for 7.9% of all people in Germany working in software and data services, so that this industry's share in Berlin is 3.7 percentage points above the city's share in overall employment in Germany (4.2%). Contrary to this, the core area of Munich's digital economy accounts for just 6.7% of overall employment in Germany.

Full Steam Ahead in the Digital Economy



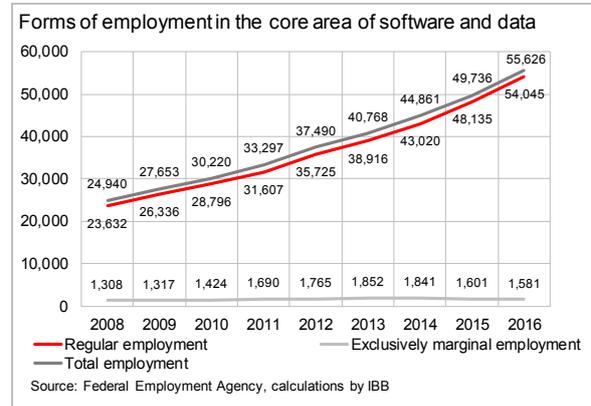
However, the difference of 4.2 percentage points in Munich's very low share in overall employment in Germany (2.5%) and the share of its digital economy (6.7%) is slightly higher than in Berlin. Compared to Berlin, Hamburg (5.4%), Frankfurt (3.3%), Cologne (3.0%), Düsseldorf (2.2%), Stuttgart (2.0%), Dresden (1.4%) and Dortmund (1.1%) have much smaller shares in overall employment in Germany. Compared to the capital city, the difference between the share in overall employment in Germany and the share held by the digital economy is once again much lower in Hamburg (2.5 percentage points), Frankfurt (1.7), Cologne (1.3), Düsseldorf (0.9), Stuttgart (0.8), Dresden (0.7) and Dortmund (0.4).

The digital economy needs a skilled workforce

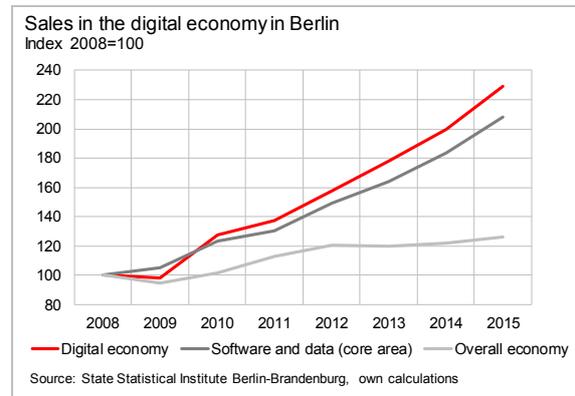
It is mostly regular jobs that are being created in software and data services. On the whole, 97.2% (54,045) of all people employed in software and data services hold regular jobs. Regular employment here has risen by 30,413 (+129%) since 2008. This increase was also much higher than the increase in marginal employment (+273; +21%).

Due to strong growth in this sector, companies are continuously on the lookout for programmers, database specialists and web designers. Even though Berlin has been a popular international destination for young people starting out in their careers, there are simply not enough people arriving in the city and companies are now hiring staff as a pre-

cautionary measure. Potential applicants are being offered good working conditions and high starting salaries. Compared to other sectors of Berlin's economy, gross salaries in this sector are now much higher totalling around EUR 4,300 (average for Berlin: EUR 3,610).

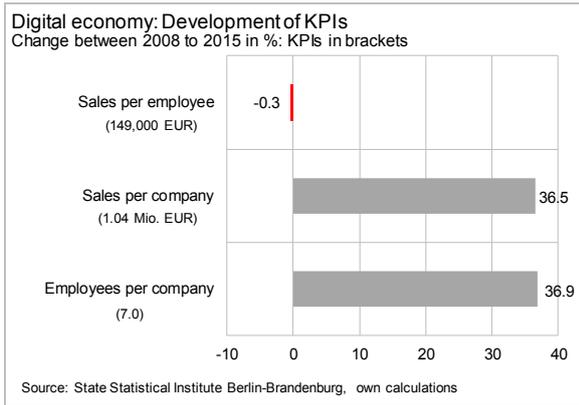


Internet companies are growing faster than companies in the rest of the economy



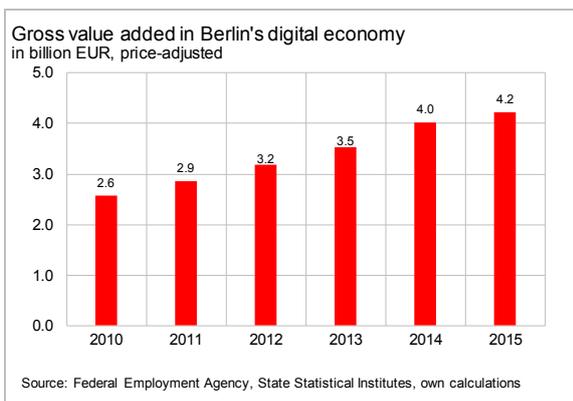
Sales generated by Berlin-based companies between 2008 and 2015 (most recent figures available from the business register) have risen by a total of 27.2%. The 7,319 companies currently working in Berlin's core area of the digital economy (software and data services) increased their sales since 2008 by 108% to EUR 4.8bn. This positive development, however, is even surpassed by the development of sales for the digital economy as a whole. Between 2008 and 2015, sales recorded by companies in Berlin's digital economy rose by a total of EUR 5.3bn (+129%) to EUR 9.5bn.

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These companies are growing at record speed. Since 2008, the number of jobs has risen by 36.9%, an average of 7 employees per company. From an entrepreneurial perspective, these jobs are needed because sales per company (EUR 1.04m) have also risen by 36.5%. However, sales productivity for digital companies, a figure that is measured in terms of sales per employee, is down slightly by 0.3% to around EUR 149,000. These companies are securing future sales growth by hiring additional staff today. The lack of skilled personnel is hence what is truly slowing down growth.

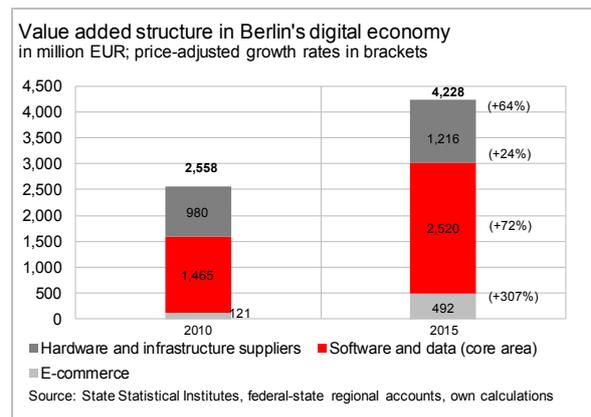
The digital economy accounts for one fifth of economic growth in Berlin



Since 2010, gross value added in Berlin's digital economy has risen by more than half to around EUR 4.2bn (+64%; most recent figures available: 2015). Value added is growing at an above-average rate in the core area of software and data services. While software and data services accounted for just EUR 1.5bn in Berlin's value added in 2010 (share in the digital economy: 57.1%),

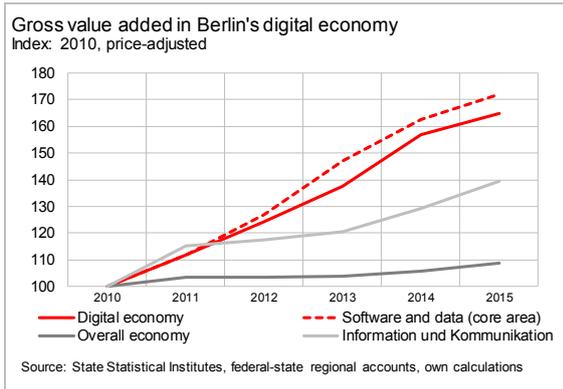
this figure recently already reached EUR 2.5bn (share: 59.6%).

One should be careful not to underestimate the importance of the digital economy for Berlin's economy as a whole. That's because in 2015, the value added generated by the digital economy accounted for only 4% of Berlin's total value added. However, if we look at the period from 2010 to 2015, the digital economy accounted for close to 20% of overall economic growth in Berlin. The reason for this is that in 2010 price-adjusted gross value added generated by Berlin's digital economy grew by EUR 1.7bn (+64%) to EUR 4.2bn. By comparison, the price-adjusted increase in Berlin's economy as a whole totalled EUR 8.8bn (+8.7%) over the same period.



Software and data services, up by 63.1%, were one again a growth engine. That being said, however, an even stronger increase was seen in ecommerce where value added has risen by 250% since 2010. Generating value added in the order of EUR 423m, e-commerce now accounts for 10.5% of Berlin's entire digital economy output. The hardware and infrastructure sector has also managed to grow by 24.6% since 2010 to EUR 1.2bn, even though this sector is becoming less important in the digital economy due to much more rapid growth in other sectors of the digital economy.

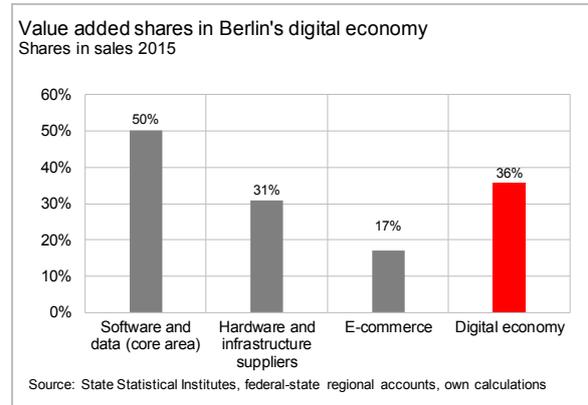
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omy totals around 36% of sales generated. There are, however, enormous differences in the individual sectors of Berlin's digital economy when it comes to their shares in value added. Providers of software and data services reach 50% and are almost on par with the value added share of Berlin's overall economy (55%). However, hardware and infrastructure suppliers (31%) along with e-commerce (17%) have only below-average value added shares because these sectors require a particularly high level of input from other regions.

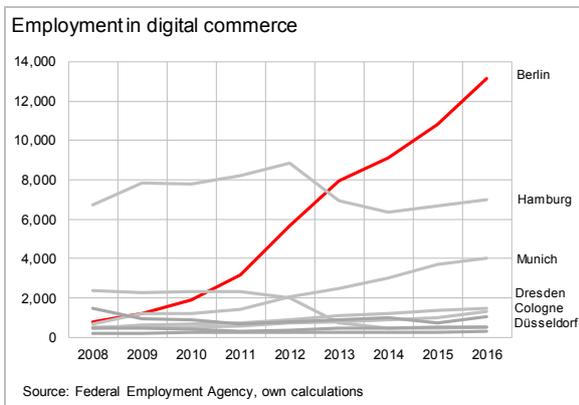
Transformation of the digital economy

In recent years, Berlin has become the most important centre for ecommerce in Germany. The capital city has hence demonstrated that it is not just a successful location for providers of software and data services as well as hardware and infrastructure suppliers, but that it is also a centre of digital transformation for other areas of the economy. In Berlin today, 13,142 people are employed in ecommerce, a sector in Berlin that employed just only 803 people when it kicked off in 2008.



Despite the considerable increases in employment and value added in ecommerce, it makes sense to take a look at how much value added was actually generated in Berlin. The share of value added in sales is particularly interesting from the perspective of employees, entrepreneurs and investors.

In recent years, the structure of the digital economy has changed considerably. Certain sectors are subject to what are at times opposing trends. This becomes clear when we look at employment figures and value added per employee in the individual sectors. A strong growth trend can be seen for Berlin's digital economy both for gross value added per employee (2010-2015: +5% to EUR 61,000) and for employment (+57%).

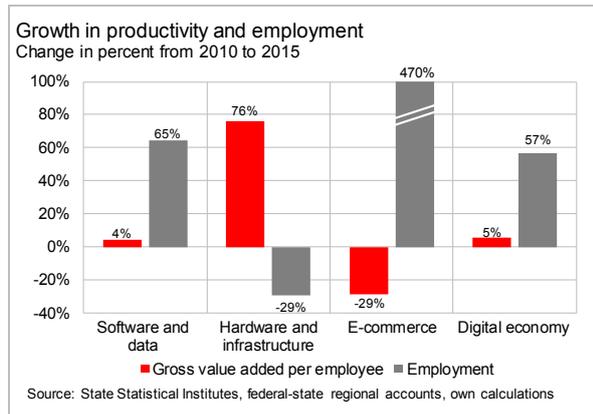


Particularly strong growth can be seen with software and data service providers who are rightly referred to as the core area of the digital economy. Between 2010 and 2015, for instance, there was significant increase in labour productivity (gross value added per employee: +4% to EUR 51,000) as well as in the number of jobs (+65%).

Value added is, after all, what fuels wages, salaries, profit distributions and dividends. In Berlin, gross value added in the digital econ-

In ecommerce, however, strong growth (now totalling 13,142 jobs and an increase of +470%) is coinciding with a significant decline in gross value added per employee (-29%). Although employment in ecommerce is rising steeply, the lower value added share

(-5 percentage points since 2010) means that labour productivity has declined by 29% to EUR 45,000 in sales per employee. The rapid spread of ecommerce to international markets initially requires a considerable amount of manpower which requires successful scaling in order to achieve higher productivity.



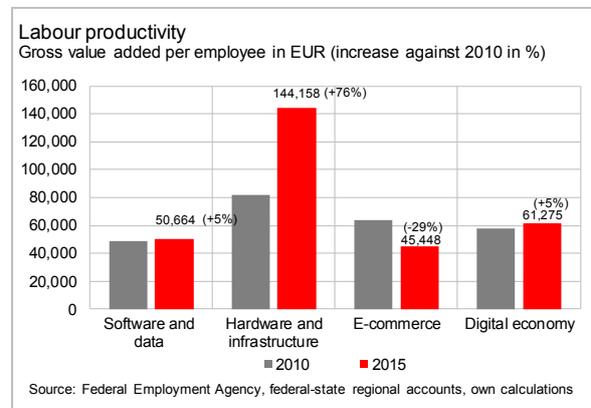
In the case of hardware and infrastructure suppliers, on the other hand, the employment rate is down (-28%) while productivity is up (+76%). Berlin's hardware and infrastructure suppliers have downsized in recent years. This effect is closely linked to globalisation. The traditional labour-intensive production of consumer electronics and products for the basic ICT infrastructure has shifted from Europe to Asia for cost reasons. However, those companies that remain in Berlin have been able to maintain their value added share since 2010 and their labour productivity has risen by 76% to EUR 144,000 per employee. Despite the low number of jobs, gross value added increased by 24.6% to today's EUR 1.2bn. These companies are to a large extent export-oriented companies.

Good prospects for the digital transformation

The three areas of the digital economy, i.e. software and data, hardware and infrastructure as well as ecommerce, are good examples of the opportunities and risks which the digital transformation poses for Berlin's economy as a whole.

In the field of hardware and infrastructure, it becomes apparent that the decline in jobs, resulting from digitalisation and automation, does not necessarily have negative consequences for a region. Thanks to higher productivity and a greater value added share, hardware and infrastructure suppliers can still contribute significantly to regional economic growth. Rising gross value added is passed on to consumers and investors in the form of wages and profits. Higher demand for goods and labour indirectly creates new jobs in the region.

If ecommerce in Berlin is to make a permanently strong contribution towards prosperity and employment in the region, the value added share and productivity will have to be increased. For this to happen, Berlin will not only have to become an important logistics hub for ecommerce in the region itself and for all of Germany, but will also have to permanently establish itself as a management and administrative centre for trans-regional and international markets.



The shift from traditional mail order business to online mail order has been largely completed in Germany. That being said, this sector will undergo significant change in the future. Technical innovation will continue to reduce personnel requirements in logistics operations. One current challenge facing the

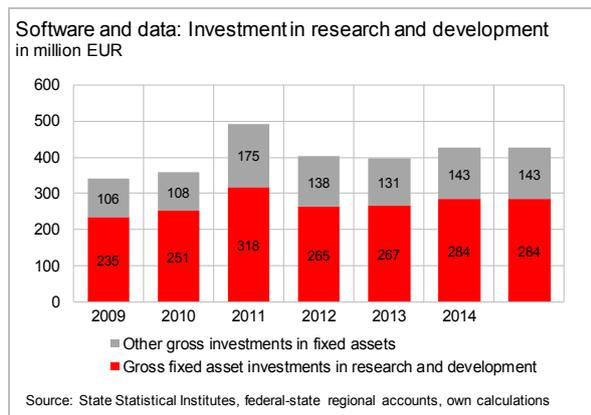
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industry is the high rate of returns² which rose again in 2016 for the first time since 2002. On the other hand, the growing linking of e-commerce with stationary commerce together with much shorter delivery times thanks to new storage space in the inner city will lead to new opportunities for the sector and job prospects in the region.

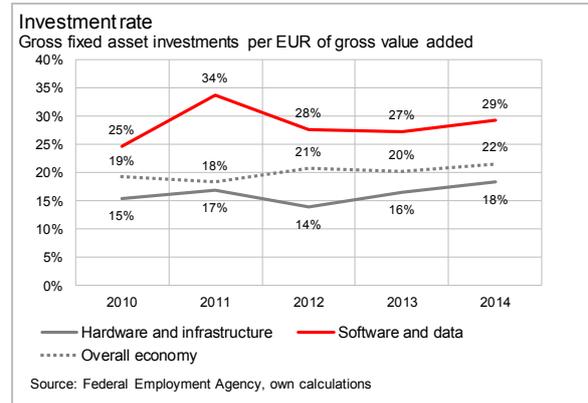
The software and data sector is not just the backbone of Berlin's digital economy, it has also become extremely important for many other sectors in Berlin. This is where the technological know-how of the much-publicised digital transformation can be found, a transformation that is moving ahead at a fast pace in many areas of the economy. In recent years, both employment and labour productivity have risen steeply in the software and data sector. Productivity will reach a much higher level in the future. Since this sector is extremely knowledge-based, it can be assumed that the value added share will continue to be above-average.

High investment rate thanks to R&D

Investments in knowledge-based sectors of the economy are driven more by research and development expenditure (R&D) than in other sectors. Since the major revision of national accounts in 2014, expenditure on research and development is now classified as an investment.



Of the EUR 427m recently invested by companies in the software and data sector, EUR 248m was spent on research and development (67%). Investments by software and data service providers in Berlin have risen by 21% compared to 2010. On the whole, investments in the software and data sector have in fact increased by 35%.



The investment rate indicates which part of the gross value added generated by companies flows back into the company in the form of investments in buildings, equipment or R&D services, contributing hence to future company growth. In Berlin, the investment rate for the economy as a whole totalled around 22% in 2014 (most recent figure available).

The companies working in the core area, i.e. software and data service providers, recorded for Berlin an above-average investment rate of 29%. Although the 18% investment rate recorded by Berlin's hardware and infrastructure suppliers is below average for Berlin, this figure has in fact increased by four percentage points since 2012. This shows that savings in the hardware and infrastructure sector are paying off. A fact that becomes even clearer when we look at investment per employee: In 2014, investment totalled EUR 19,000 per employee while in 2010, this figure was only EUR 13,000.

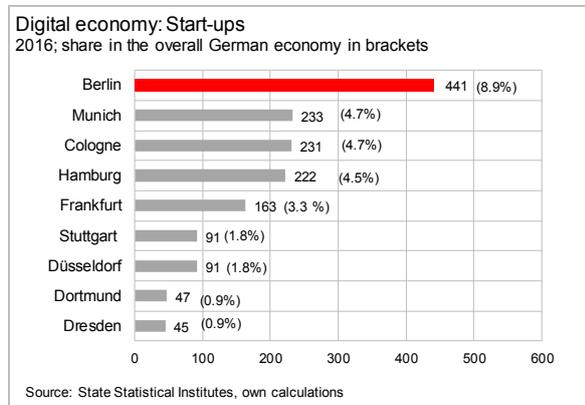
² German E-Commerce and Distance Selling Trade Association (bev) 2016

Focus on start-ups

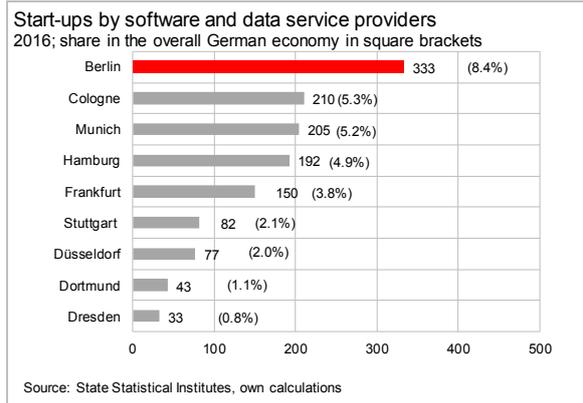
For four years now, one new digital company has been set up every 20 hours

In 2016, 441 new companies in total were founded in Berlin's digital economy. On average, one new digital company is set up every 20 hours. These companies are so-called business start-ups, corporations, such as limited liability companies, stock corporations or limited partnerships that are registered in the commercial, association or cooperative register. Companies like these can be assumed to be of greater economic importance as soon as they are set up due to the high costs involved in their registration.

Most start-ups were registered by software and data service providers (333). However, new companies have also been set up in e-commerce (57) and in the hardware and infrastructure sector (51). The new companies being set up in Berlin's digital economy are largely headquarters, just 17% of these are branches.



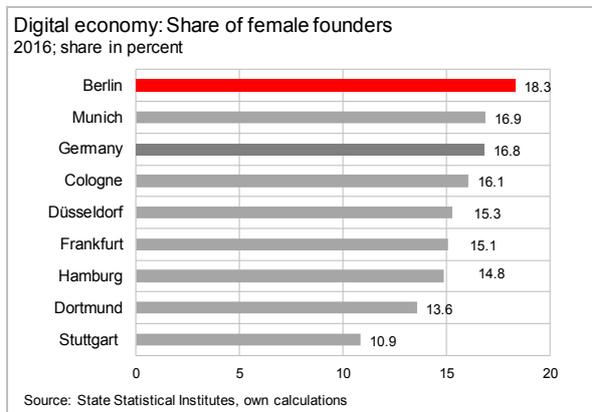
In the comparison of cities across Germany, Berlin stands out in 2016. Every 11th German start-up in the digital economy went into business in Berlin (8.9%). The number of new digital start-ups is much lower in Munich (233 start-ups; share: 4.7%), Cologne (231; 4.7%) and Hamburg (178; 4.5%). The number of new companies in Berlin's digital economy is almost as high as the number for Munich and Hamburg combined.



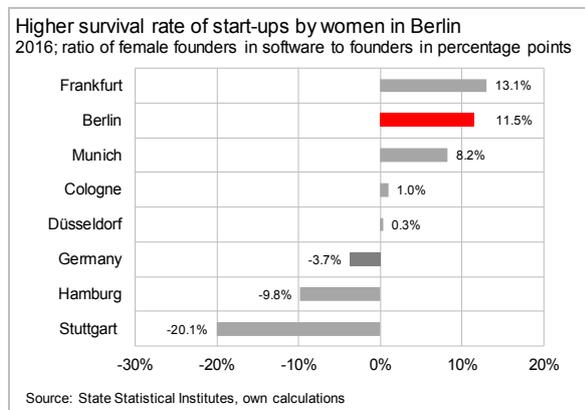
Accounting for a total of 7.4% (333 start-ups) of start-ups in Germany, Berlin is also the leading city in the technologically innovative core area of software and data services, far ahead of Cologne (210 start-ups), Munich (205) and Hamburg (192). Far fewer software and data service providers opened shop in Stuttgart (82), Düsseldorf (77) and Dresden (33).

Every 5th digital start-up in Berlin is set up by a woman

Female founders have a remarkable role to play in Berlin's digital economy. The share of female founders in Berlin totals 18.3% and is above average compared to other German cities. The share of female founders in the digital sector is much lower in Munich (share of female founders: 16.9%), Cologne (16.1%), Düsseldorf (15.3%), Frankfurt (15.1%), Hamburg (14.8%) or Dortmund (13.6%).



The establishment of Outfittery in 2012 definitely showed the general public the importance of female founders for Berlin's start-up scene. That being said, however, female founders in Berlin are also under-represented in Berlin's digital economy and, with a share of just 18.3%, they still lag far behind the share of female founders in the rest of the economy (27%). But there is very good reason to increase the share of women in start-ups because these start-ups have much better chances of survival than their male counterparts, especially in Frankfurt, Berlin and Munich. This is particularly the case with start-ups by software and data service providers. In Berlin, the number of male founders of digital companies in 2016 was 26.5% higher than the number of men who closed shop in this sector. This ratio is the so-called survival rate for start-ups by men. When it comes to women, on the other hand, the survival rate of their companies is as high as 38%. This means that the survival rate of start-ups by women is 11.5 percentage points higher than that of their male counterparts.



The higher survival rate of start-ups by women in the core area of Berlin's digital economy is higher than in all other cities with the exception of Frankfurt where a gap of 13.1% was in fact reached. Women's lead in terms of the survival rate of their start-ups is much lower in Munich (8%), Cologne (1%) or Düsseldorf (0.3%). In Hamburg (-9.8%), Stuttgart (-20.1%) and Dortmund (-30.1%), the survival rate of start-ups by women in the core area of the digital economy is much lower than that of men.

Berlin is benefiting from the digital transformation

Berlin is a winner when it comes to economic transformation as a result of digitalisation. Jobs in Berlin's ecommerce sector have risen steeply, while traditional mail-order business in other regions has failed to adapt to customer requirements. Over the next 15 years, Berlin's strong digital economy will promote the digital transformation process in related areas of the economy. Berlin's technology-orientated key sectors, such as transport, mobility and logistics, as well as energy and the health sector are likely to benefit from this development.

The boost in productivity brought about by the digital transformation along with the growing digital proximity to other international business centres will fundamentally change the face of work in many sectors. Since these changes in the working world will come about much faster than in the past, life-long learning will have to be promoted both within and outside of companies.

The digital transformation will lead to a loss of jobs in Berlin too. This will be felt particularly in sectors where the automation of simple tasks will lead to greater efficiency and cost savings. But even if simple jobs are lost, new, high-quality jobs will be created to steer digitalised processes. What's more, a growing number of jobs will be created in the digital economy. If the higher company profits that result from cost savings remain in Berlin in the form of investment expenditure, this will improve Berlin's economic situation as a business centre. Ultimately, this will benefit private consumers and the government's coffers, and public investment and public services will be stepped up, once again creating new jobs, especially in the services sector.

In a future scenario for Berlin, the economic dividend of the digital transformation will be divided among the future industries, i.e. energy, health, transport, ICT and the creative industries. These industries alone will record economic growth of up to 5.2% p.a. if automation and digitalisation effects are fully im-

plemented and take effect. However, other sectors of the economy, especially those related to business services, offer potential for additional growth. All in all, the model scenario shows that by the end of the next decade, Berlin's gross value added is likely to rise by an average of 2.5% p.a.

If the digital transformation is implemented with determination, IBB's economic experts calculated in 2015 that Berlin will be among the leading cities with a global digital economy. By 2030, this could lead to around 270,000 new jobs in Berlin's future industries. Due to the rapid rate at which jobs have been created over the past two years in these industries, it is likely that the target will be reached much sooner, by 2025 according to the latest calculations. At the beginning, the digital transformation of mail-order business made Berlin one of the most important places in Germany for ecommerce (B2C). When it comes to the digitalisation of production too, Berlin simply cannot be ignored. A trend towards B2B is now emerging. Setting up and operating B2B online solutions as well as services to digitalise business processes are in demand in the finance sector. At present, strong growth is currently being seen in the field of fintechs; their productivity-boosting impacts are spreading to banks throughout Germany even though this is likely to lead to positive employment effects, especially in the capital city.

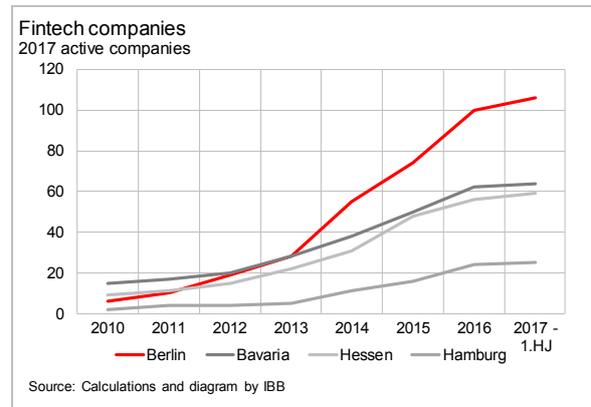
A focus on fintechs

The world of finance goes digital

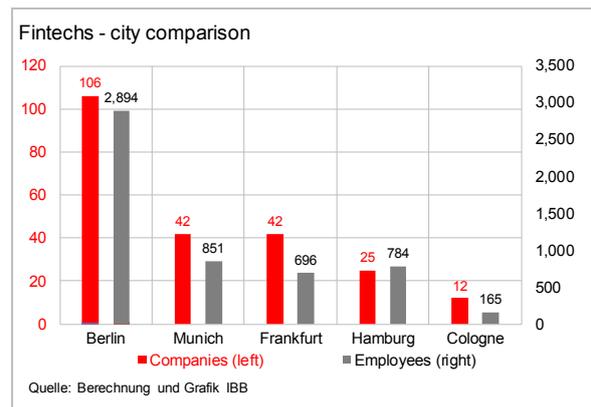
The digitalisation of the finance sector, generally referred to as 'fintech', poses huge challenges for the entire world of finance, but it also brings with it opportunities, especially for major cities like Berlin that are open to digitalisation. The 'traditional' finance sector, with its banks, insurance companies and other wealth service providers, is hard to distinguish from the many new financial technology (fintech) companies. These include companies that work, for instance, with

crowd funding, social trading, robo advice as well as digital payment transactions.

Since these fintechs are new, they are not clearly defined in official statistics. Based on our own data compiled from public online sources and commercial register data, it is possible to estimate the number of active fintech companies in Berlin and Germany. A database with 377 companies established in Germany was set up for this. Of these 377 companies, 324 were active at the time of the survey.



Berlin is the city in Germany with the highest number of active fintech companies, i.e. 106, followed by Munich (42), Frankfurt (42), Hamburg (25) and Cologne (12).

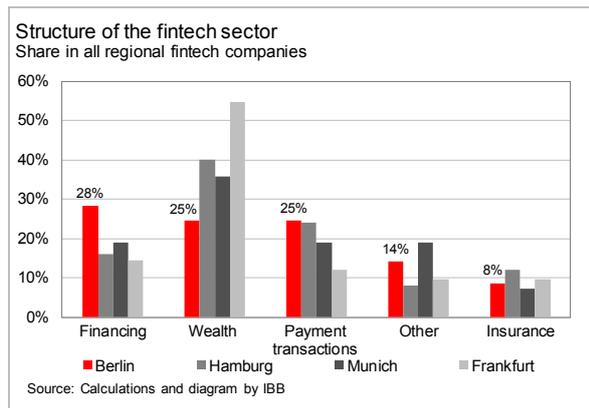


When it comes to jobs, Berlin once again has a considerable lead over other major cities in Germany. There are currently 3,000 people working at fintech companies in Berlin. The number of people working at fintech companies is much lower in Munich (850),

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Frankfurt (700), Hamburg (780) and Cologne (170).

Even when compared with Germany's other federal states, Berlin's fintech sector still looks good. Although Berlin with close to 3,000 jobs in the fintech sector lags behind the federal state of Bavaria (4,900 jobs), it is still ahead of Hesse (1,540), North-Rhine Westphalia, Lower Saxony (790) and all other federal states.

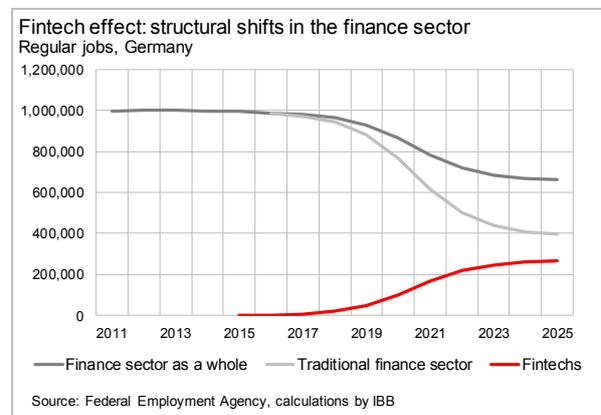


Most of Berlin's fintech companies (around 28%) work in financing. These include companies that supply online loans, crowd funding and crowd lending as well as factoring services. Around 25% of Berlin-based fintech companies focus on wealth and investments for their customers. These companies are active in trading (social trading/robo trading) or banking, they operate financial management platforms or help their customers to make money through crowd investing. Another 25% of fintech companies in Berlin develop new technologies for payment transactions. In addition to developing and using crypto-currencies based on block chain technology, such as bitcoin, these companies focus on payment transactions, be it payments for online retailers or cashless transfers at restaurants and supermarket cash desks. Another 8% of Berlin's fintech companies work in insurance. Around 14% of fintech companies in Berlin develop tools that cannot be directly assigned to any of the other areas. These include special comparison portals, identification platforms or account management systems.

In terms of its structure, Berlin's fintech sector differs at times very much from that of other regions. While companies in Berlin are relatively evenly represented in all five fintech sub-sectors, this is not the case in other regions. In Frankfurt, for instance, there is a strong focus on wealth and investments (55% of all fintech companies in Frankfurt).

Fintechs are causing upheaval

In order to be able to assess the potential for jobs in the finance sector, the following assessment uses the Potential for Automation of Occupations in the Finance Sector that was compiled by the Research Institute of the Federal Employment Agency. Around one third of the close to one million jobs in the finance sector in 2016 in Germany has the potential for automation. In the long run, these jobs will probably be lost. It can therefore be assumed that only around 666,000 of the jobs that currently exist in the finance sector will continue to be carried out by humans.

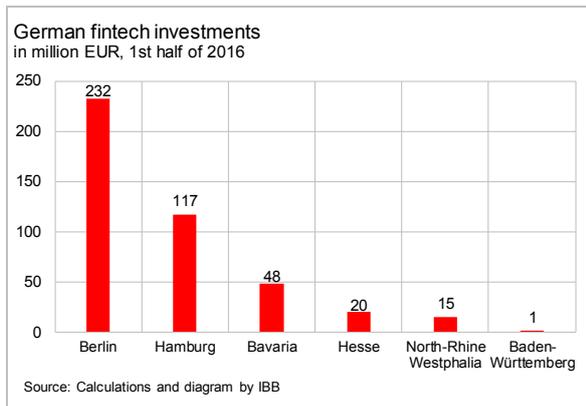


These new jobs will not necessarily have to be created in newly established fintech companies – but not all of the companies that exist today will successfully master digitalisation. If we look at the finance companies that today already consider digitalisation to be at the core of their company strategy, these companies will provide only around 400,000 jobs (40%) in 2025. The remaining 260,000 jobs will be created at fintech companies that

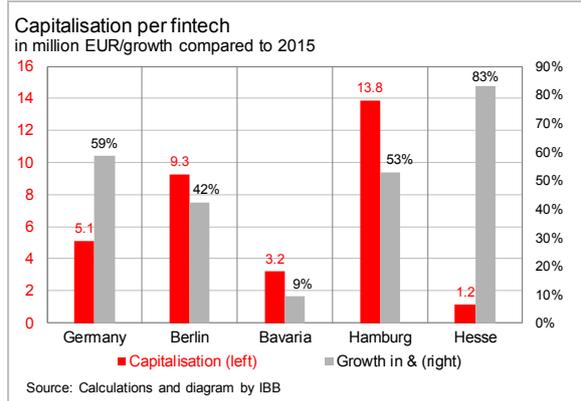
are currently being set up or will be set up in the future.

Regional shift due to fintechs

Berlin has particularly good prospects as a hub for fintechs. According to a current analysis, a total of EUR 232m in venture capital went to fintechs in Berlin in the first half of 2017. This is followed by Hamburg with EUR 117m, then Bavaria (EUR 48m), Hesse (EUR 20m) and North-Rhine Westphalia (EUR 15m). And the trend for Berlin looks promising: Compared to the first half of the previous year (EUR 151m), financing in Berlin increased once again by 54%. This means that for 2017 as a whole, VC investments in Berlin-based fintech companies can be expected to total around EUR 400m.



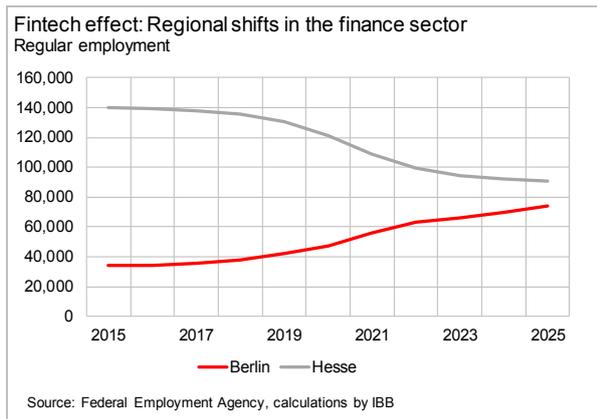
As VC funds increase each year, this also improves the capitalisation of fintechs in Berlin. In 2015, average company capitalisation in Berlin totalled EUR 6.5m. This figure has now reached EUR 9.3m per company, i.e. by mid-2017 it had risen once again by another 42%. The capitalisation of Berlin's fintechs is hence much higher than the German average of EUR 5.1m. The average capital per company was much lower in Bavaria (EUR 3.2m) and Hesse (EUR 1.2m). Hamburg is the only city where more capital per company was raised.



The fact that more than half of all German fintech capital is injected into Berlin is also being felt on the labour market. A look at online job exchanges shows that almost every second new job advertised by German fintechs is in Berlin. If we assume that merely every fourth job created in the future will be in Berlin, this means that new fintech companies in the capital city could create around 67,000 new jobs. At the same time, around 27,000 jobs in finance are likely to be lost in Berlin due to the digitalisation of existing companies, so that only around 7,000 of the 34,000 people working in finance today will continue to work at their original workplace. All in all, the number of people working in finance in Berlin could rise to around 74,000 by 2025. Digitalisation in the finance sector hence offers potential for around 40,000 additional jobs in Berlin.

While good starting conditions ensure that Berlin is among the winners in the digital economy, developments in other regions are not as rosy. In Germany's biggest financial centre, Frankfurt am Main (the figures refer to the federal state of Hesse), the capitalisation of fintechs in the first half of 2017 was only EUR 20m. This corresponds to less than 5% of the entire venture capital invested in German fintechs. Frankfurt am Main today already accounts for just around 13% of fintech jobs advertised. At the same time, it can be expected that again merely 40% of jobs in traditional finance companies will continue to exist. This could mean that by 2025 the number of jobs in the entire finance sector in Frankfurt am Main could fall from today's 139,000 to 90,000.

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Whether or not the scenario outlined above will in fact materialise is subject to a number of uncertainties. It is, for instance, difficult to assess if and when digitalisation will fully come to fruition in the finance sector. Furthermore, it is difficult to forecast the strategic decisions to be made by international banks. Decisions regarding location, especially in the aftermath of Brexit, could play a key role in determining which city will take the lead in the competition for the title of most-important European fintech centre. Less stringent labour market regulations in the UK are a factor that will make it difficult from a company perspective to shift jobs from London to other locations. In their search for locations, banks also have to comply with the regulatory requirements of the European Banking Authority.

Conclusion

Berlin is and will continue to be Germany's most important centre of the digital economy. The city has gained this position thanks to its unique start-up ecosystem that is also drawing VC investors and the innovation departments of major corporations to this major city on the banks of the river Spree. The importance of Berlin as a scientific hub forms the basis for this start-up scene. That's because more than half of all founders set up shop close to their former university.

The digital economy in Germany's capital city now provides jobs for 77,000 people. The core area of software and data will continue to form the heart of the digital economy. But based on this know-how, many new companies will be established in other sectors. Up to now, Berlin has benefited considerably from growth in ecommerce. And other sectors have already embarked into the world of digitalisation.

All in all, Berlin is in a good position to assume a leading role as a location for the digital transformation of the economy in the years and decades to come.

- In the capital city, the digital economy is more important than anywhere else in Germany and is now regarded by international investors as a major start-up hub.
- Besides the digital economy and creative industries, Berlin's future industries, i.e. energy, transport and health, are in an excellent position. But in the years and decades to come, the companies in these industries will also have to find solutions to some of the most urgent social challenges, such as the shortage of finite resources, environmentally friendly mobility and an ageing society.
- Berlin is an important scientific hub with a multitude of universities and research institutes, which are home

to clever minds and know-how for the future.

- Berlin is also an attractive city, not just for tourists. The city is also popular among job seekers and this makes it easier for companies in Berlin to recruit skilled personnel than for companies at less attractive locations.
- As a major centre for services, both customer and business services, Berlin is already prepared for the transformation of the economy from a product to a service society because Berlin was quick to understand the structural change taking place in traditional industry.

One current focal area of economic development is the transformation of the finance sector. In 2016, more than half of all German venture capital for fintechs went to Berlin. This is an indication of the capital city's prominent position in this field. Looking ahead, fintechs could create up to 40,000 jobs in Berlin. This is due to the potential for automation in the finance sector, as well as the considerable pool of skilled personnel, especially in Berlin's digital economy.

Published by:
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Publishing date: August 2017

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