

The scope of job polarization in France

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Job polarization describes the structural deformation of the job market in which the share of jobs increases at the top and bottom of the skills ladder and decreases for middling jobs. In theory, job polarization is U shaped. Empirical data easily shows a decline in the share of jobs in the middle distribution (the bottom of the U), as well as an increase in the most skilled jobs (right side of the U). This J-shaped semi-polarization is symptomatic of an “upgrading” effect, i.e. the overall rise in the level of education and skills attainment. The left side of the U, in contrast, which represents the increase in the share of low-skilled jobs, is often less developed and sometimes non-existent. In France, job polarization is more or less apparent depending on the study. There are several explanations for job polarization. Technological progress seems to be the dominant explanation although other factors also come into play including globalisation and a series of institutional and structural factors, such as job market regulation, expansion of the service sector and an aging population.

It is not only the number of jobs that are created or destroyed that matters; the type of job is just as important. For this reason, job polarization has attracted greater attention over the past fifteen years. Job polarization describes the structural deformation of the job market in favour of jobs located at the bottom and top of the skills ladder and associated wage distribution, and to the disadvantage of middling jobs. Research has looked into the characteristics and causes of this trend. The subject is also of interest for the questions and underlying structural concerns it raises, notably in terms of rising wage inequality, the shrinking middle class and growing feelings of downward social mobility. Job polarization is not only an economic issue: it also raises a mix of social and political considerations.

It is not our intention to cover all of these aspects in this article. We will focus on assessing the scope of job polarization in France via a non-exhaustive review of the literature. Job polarization is a vast and complex subject and the phenomenon is not easily measured nor explained. We will begin with a few definitions. In the second part, we will focus on empirical observations and in part 3 we will examine the main explanatory factors. We will conclude with a few forward-looking thoughts about the impact of the current digital revolution on job polarization.

What is job polarization?

According to our research, the term “job polarization” was first coined by Goos and Manning (2003)¹. These authors describe the deformation of labour demand due to the impact of technology in general and computers in particular. Broadly speaking, technological change increases relative demand for skilled and unskilled labour and, at the same time, reduces demand for middling jobs. This deforms the structure of the job market by increasing the share of jobs at the two extremities of the skills ladder and associated wage distribution, and concomitantly reducing the share of middling jobs. Consequently, job

¹ Marteen Goos and Alan Manning, 2003, *Lousy and Lovely Jobs: The Rising Polarization of Work in Britain*, Center for Economic Performance Discussion Papers DP0604, December

polarization is U shaped, at least in theory. Job polarization occurs when we observe changes in all three parts of the U. If only one or two of these trends are observed, then strictly speaking, it is not job polarization.

The skills level of an occupation can be determined by diplomas², wages (average or median wage observed in various occupations at the beginning of the observation period³) or standard occupation classifications (see table 1 for a list of the main occupations based on ISCO, the International Standard Classification of Occupations). In France, the standard is the PCS classification of “professions and social-professional categories”, as well as “professional families”, which divide occupations into broader groups.

What empirical data says about job polarization

Job polarization has been rather well established in the US, where the phenomenon first appears in the 1980s, and the UK. Research by David Autor and his co-authors (2013)⁴ shows a clearly-defined U shape, which is characteristic of job polarization (see chart 1). Between 1980

² Degrees and diplomas are not used much as a criterion due to the variable relationship between education and employment depending on the country and profession. The diploma/skills/employment relationship is also disrupted by the increase in the share of unskilled jobs held by over-qualified graduates.

³ Jolly (2015) lists the drawbacks of using the wage criteria. It masks possibly wide wage dispersion within the same occupation. The wage levels that differentiate between low, medium and highly skilled jobs are arbitrary and highly sensitive. The same results are not attained when using a centile, decile, quintile or tercile-based breakdown. In France, the share of skilled and unskilled workers can vary considerably depending on whether the threshold used is the minimum wage or 1.5 times the minimum wage. Wage distribution by occupation can be used to make international comparisons, but it poorly reflects the job content and skills required for the job. Skills cannot be summarised by the level of wages, even though the two generally go together.

⁴ David H. Autor and David Dorn, 2013, *The Growth of Low-Skill Service Jobs and the Polarization of the US Labor Market*, American Economic Review, August



and 2005, the share of low-skill jobs on the one hand and skilled jobs on the other increased by comparable amounts, while a good portion of the middle of the distribution was marked by a relatively distinct trough. Yet even in the United States, job polarization has not been a uniform process over time and for all skill groups (Autor, 2014⁵). There is also some debate over the issue⁶.

US job polarization: Change in the employment share of occupations according to their skills (1980-2005)

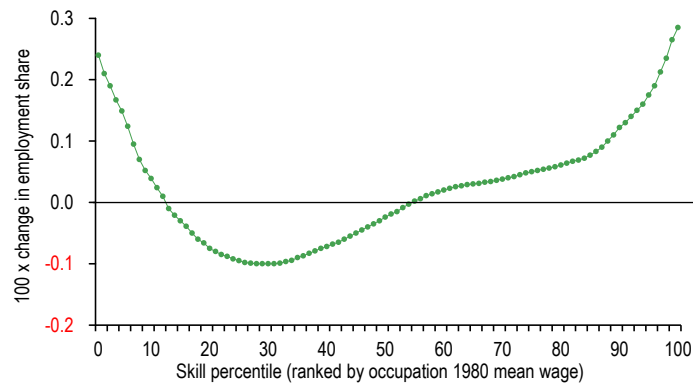


Chart 1 Source: Autor and Dorn (2013), BNP Paribas
Note: on the x axis, the first centile corresponds to the 1% of the least skilled jobs, etc. and the skill level is measured using the average wage in 1980.

Job polarization first reached Europe in the 1990s, as shown in research by Marteen Goos and his co-authors. The observed trend is not as evident as in the United States, especially in France. The U shape is more or less distinct. This depends in part on the way we look at the skills structure: in terms of individual qualifications (diplomas, experience), job content (required skills) or the position held (via wages). The results also seem to be sensitive to the observation period and the level of data aggregation.

On the whole, data easily demonstrate the bottom of the U (the decline in the share of middling jobs) as well as the right arm of the U (the increase in the share of jobs at the top of the distribution). This J-shaped semi-polarization is symptomatic of an “upgrading” effect, i.e. the overall rise in the level of education and skills. The left side of the U, in contrast, which represents the increase in the share of low-skilled jobs, is often less developed and sometimes non-existent. Below we have organised the results of the research we reviewed by order of increasing “clarity” of job polarization in France, and provided a representative chart whenever possible.

⁵ David H. Autor, 2014, *Polanyi’s Paradox and the Shape of Employment Growth*, NBER Working Paper n°20485, September

⁶ See for example Jennifer Hunt and Ryan Nunn, 2019, *Is Employment Polarization Informative about Wage Inequality and Is Employment Really Polarizing?*, NBER Working Paper n°26064, July

International Standard Classification of Occupations (ISCO-88)

HIGH SKILLED	Major group 1: legislators, senior officials and managers	
	11	Legislators and senior officials
	12	Corporate managers
	13	Managers of small enterprises
	Major group 2: professionals	
	21	Physical, mathematical and engineering science professionals
	22	Life science and health professionals
	23	Teaching professionals
	24	Other professionals
	Major group 3: technicians and associate professionals	
	31	Physical, mathematical and engineering science associate professionals
	32	Life science and health associate professionals
	33	Teaching associate professionals
34	Other associate professionals	
SKILLED NON-MANUAL	Major group 4: clerks	
	41	Office clerks
	42	Customer service clerks
	Major group 5: service workers and shop and market sales workers	
51	Personal and protective services workers	
52	Models, salespersons and demonstrators	
SKILLED MANUAL	Major group 6: skilled agricultural and fishery workers	
	61	Skilled agricultural and fishery workers
	Major group 7: craft and related trade workers	
	71	Extraction and building trades workers
	72	Metal, machinery and related trades workers
	73	Precision, handicraft, craft printing and related trades workers
	74	Other craft and related trades workers
	Major group 8: plant and machine operators and assemblers	
81	Stationary plant and related operators	
82	Machine operators and assemblers	
83	Drivers and mobile plant operators	
ELEMENTARY	Major group 9: elementary occupations	
	91	Sales and services elementary occupations
	92	Agricultural, fishery and related labourers
93	Labourers in mining, construction, manufacturing and transport	
Major group 0: armed forces		

Table 1

Source: BNP Paribas

J-shaped semi-polarization?

We begin our review of the literature with the Ast study (2015)⁷ which is notable for its long, 30-year observation period, from 1982 to 2012. According to the author, the French labour market does not show all the signs of job polarization. Although virtually all of the high-skilled occupations have effectively shown strong job growth, trends have been more mixed in the low-skilled segment, with a decline in certain low-

⁷ Dorothee Ast, 2015, *“In 30 years, there was strong growth in employment in the skilled professions and in certain of the unskilled professions of the services sector”*, *Dares Analyses* n°028, April. The author studies changes in employment by professional categories, and the skills level is determined by the average hourly wage in 1990-1992.



skilled jobs in industry and agriculture, and an increase in certain low-skilled service sector jobs. In agriculture, industry, construction and public works, jobs have tended to increase in an almost linear manner with the level of skills. A form of job polarization can be seen in the tertiary sector, and is especially clear in the 1990s. Jolly (2015)⁸ also concludes that job polarization in France was not very strong, and that it was J shaped during the observation period of 1993-2010.

France: Change in the employment structure by detailed socio-professional categories (observation period 1988-2014)

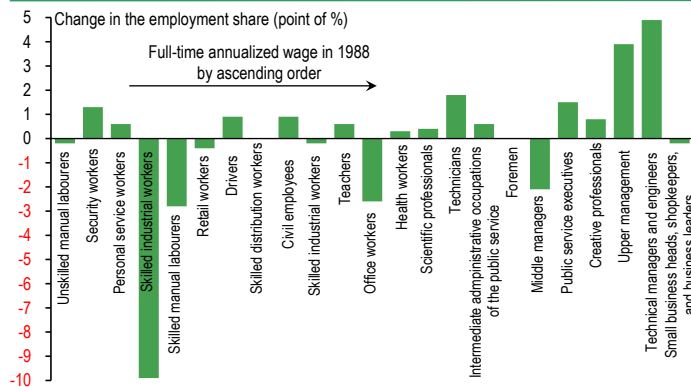


Chart 2 Source: Berger and Pora (2017), BNP Paribas

Research by Berger and Pora (2017)⁹, based on PCS socio-professional categories, also fails to find clear signs of job polarization in France during the observation period 1988-2014 (see chart 2). According to their calculations, the share of worker groups in the medium wage range actually declined less than for their lower paid counterparts. The drawback of this study is that it does not include personal service workers due to the lack of comparable data over the period. This omission probably contributes to limit the perceived polarization since these unskilled jobs were among the ones that increased most during the period.

The occupation-based approach used by Eurofound (2017)¹⁰ offers a greater level of data aggregation (employment is divided into five equal groups based on the average hourly wage, with each group representing 20% of the jobs at the beginning of the period). It also provides a more limited historical perspective, but uses more recent data (the observation period doesn't begin until 2008, but runs through 2016). The breakdown by periods is also of interest. It draws similar conclusions to those in the above-mentioned studies: job polarization is not very clear cut in France, except during the sub-period 2008 to 2010, when it was distinctly U shaped (see chart 3).

⁸ Cécile Jolly, 2015, *La polarisation des emplois : une réalité américaine plus qu'européenne ?* working document n°2015-04, France Stratégie, August

⁹ Emmanuel Berger and Pierre Pora, 2017, *Y a-t-il eu polarisation de l'emploi salarié en France entre 1988 et 2014 ? Une analyse selon les catégories socioprofessionnelles et le contenu de l'emploi en tâches*, in *France*, 2017 edition, Insee Références

¹⁰ European Foundation for the improvement in living and working conditions. *Occupational change and wage inequality: European Jobs Monitor 2017*, Research Report.

France: Employment shifts by wage quintile and sub-periods

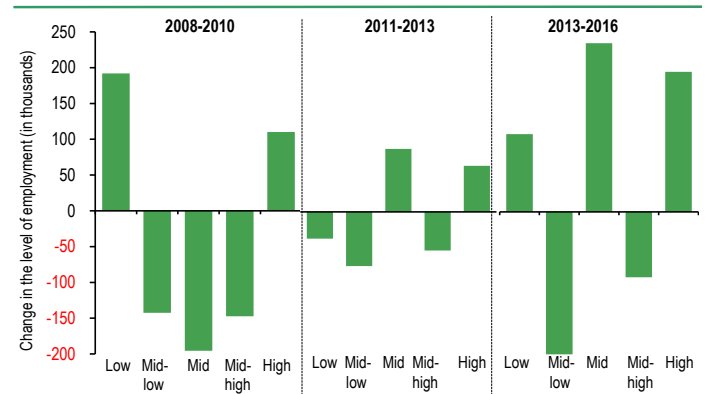


Chart 3 Source: Eurofound (2017), BNP Paribas

EU: Employment shifts by wage quintile and sub-periods

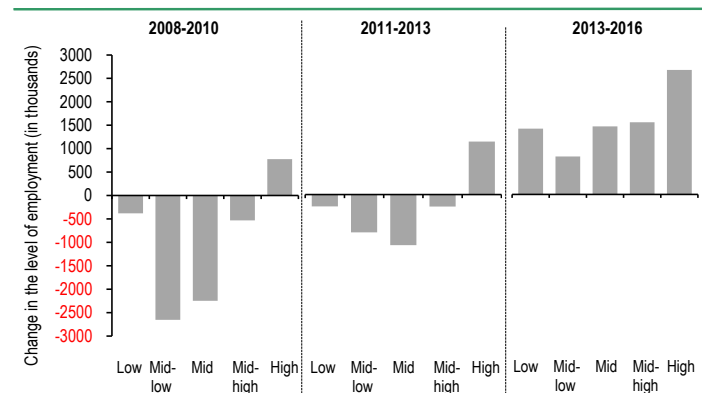


Chart 4 Source: Eurofound (2017), BNP Paribas

In the other two sub-periods (2011-2013 and 2013-2016), trends contrasted rather sharply between one occupation group and another. As a result, over the entire observation period (2008-2016), job polarization was neither J nor U shaped, but rather W shaped (see chart 5). In comparison, job polarization in Europe was J shaped over the period as a whole (see chart 5). In the most recent sub-period (2013-16), all of the job categories reported growth, even though it was strongest in the fifth quintile (see chart 4). This widespread growth is similar to the one observed prior to the great recession, between 1998 and 2007.

Or real U-shaped polarization?

Among the studies finding evidence of job polarization in France, we would like to begin with the study by Catherine, Landier and Thesmar (2015)¹¹ considering that the proposed graphic representation is closest to Autor and Dorn's U-shaped curve (see chart 6).

¹¹ Sylvain Catherine, Augustin Landier and David Thesmar, 2015, *Marché du travail : la grande fracture*, Etude de l'Institut Montaigne, February



France - EU: Employment shifts by wage quintile over 2008-2016

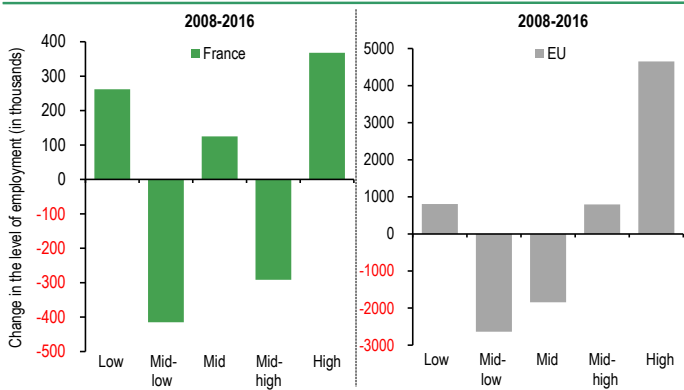


Chart 5 Source: Eurofound (2017), BNP Paribas

Job polarization in France over 1990-2012: The Autor and Dorn's U curve

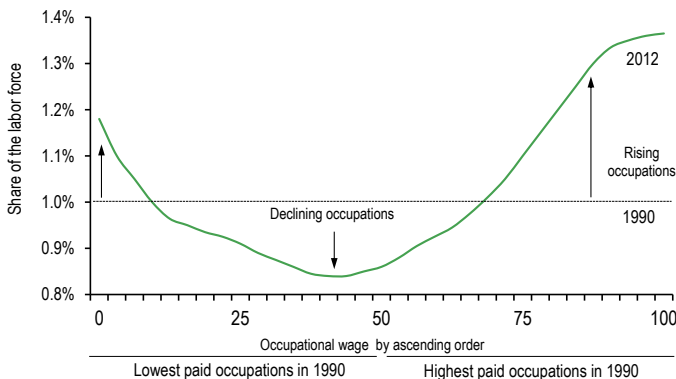


Chart 6 Source: Catherine, Landier, Thesmar (2015), BNP Paribas

Note: each point represents 1% of the labour force in 1990. Using the PCS classification, professions are ordered from left to right by the level of the average wage in 1990. The group of professions comprising 1% of the employed population in 1990, which separates the 5% of the best paid from the 94% of the least paid, accounted for 1.35% of the employed population in 2012. This means that the number of jobs within this group increased by 35%, faster than the total number of jobs.

We then look at research by Goos et alii (2009¹², 2014¹³). This was the first team to try to evaluate whether job polarization was specific to the Anglo-Saxon countries, or to the contrary, whether it was a more global phenomenon and was also affecting Europe. They conclude that job polarization is the rule rather than the exception. Our interpretation of their 2009 results is less affirmative, however: their first research, covering the period 1993-2006, shows job polarization that is J-shaped rather than U-shaped for the EU as a whole, and especially in France. Moreover, trends in the 16 European countries under review are more

¹² Maarten Goos, Alan Manning and Anna Salomons, 2009, *Job Polarization in Europe*, *American Economic Review*, May

¹³ Maarten Goos, Alan Manning and Anna Salomons, 2014, *Explaining Job Polarization: Routine-Biased Technological Change and Offshoring*, *American Economic Review*, August

heterogeneous than homogenous (see chart 7). The only point in common is the decline in jobs in the middle of the distribution. In contrast, in the updated 2014 version of their research, which adds four years to the observation period (1993-2010), job polarization is more distinct and homogenous, and France is no exception (see chart 8).

Job polarization in Europe over 1993-2006

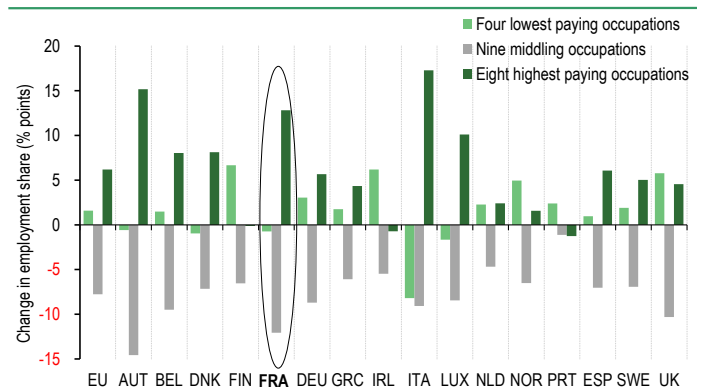


Chart 7 Source: Goos et alii (2009), BNP Paribas

Job polarization in Europe over 1993-2010

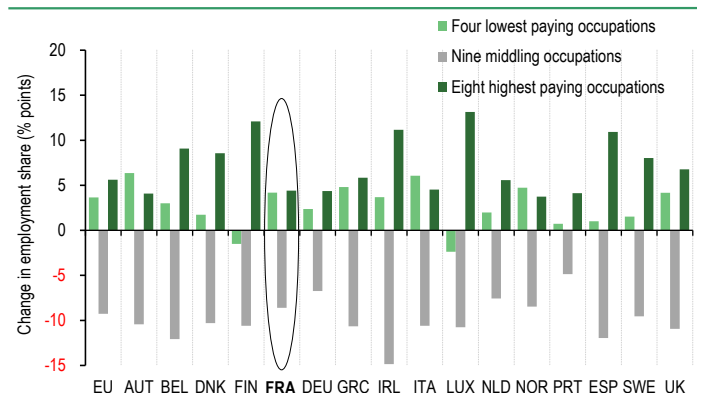


Chart 8 Source: Goos et alii (2014), BNP Paribas

Note: the professions are divided into three broad groups based on the average wage in 1993. The 8 professions that were paid the highest correspond to the following ISCO-88 classification codes: 12, 13, 21, 22, 24, 31, 32 and 34. For the 9 professions with mid-level pay, the ISCO-88 codes were 41, 42, 71, 72, 73, 74, 81, 82 and 83. For the 4 lowest paid professions, the ISCO codes were 51, 52, 91 and 93. See table 1 for more information on the labels.

The OECD (2017)¹⁴ also divides the professions into three major groups based on the level of skills, and not on the level of wages like Goos et alii do. The OECD study covers a broad range of developed countries over a rather long observation period (1995-2015). It shows that job polarization is a widespread and rather distinct phenomenon (see chart 9). The charts presented by both the OECD and Goos et alii

¹⁴ OECD, *Employment prospects 2017*, Chapter 3, *How technology and globalization are transforming the labor market*



studies have the advantage of being visual (polarization can be clearly seen), but the high level of data aggregation masks some interesting details: not all low-skilled or middling jobs are in the same boat.

Job polarization in OECD countries over 1995-2015

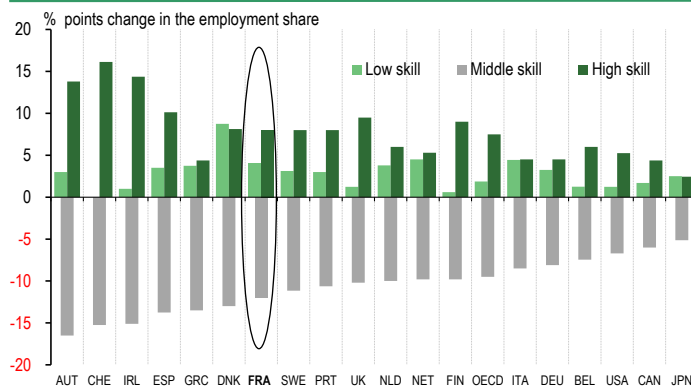


Chart 9 Source: OECD, BNP Paribas
Note: the highly skilled professions correspond to those in groups 1, 2 and 3 of the ISCO-88 classification; medium-skilled professions to those in groups 4, 7 and 8, and the least skilled professions to groups 5 and 9.

This is made particularly clear in the Peugny study (2018)¹⁵ which offers two advantages: a greater level of data disaggregation¹⁶ and a European comparison (see chart 10). The only common tendency shared by the 15 European countries under review was the decline in the share of skilled manual jobs and the increase in the share of management jobs (to varying degrees). The increase in the share of elementary occupations and skilled service providers combined with the decline in clerical jobs was true virtually across the board. Trends varied more widely for small entrepreneurs (craftsmen and retailers) and middle-paying jobs.

Amidst this diversity, job polarization was distinctly U-shaped in France. To complement his findings, Peugny also tried to look at polarization in terms of job conditions, via the frequency of involuntary part-time work. Seen from this angle, job polarization is particularly acute in France and Spain. This brings him to the rather pessimistic conclusion that both France and Spain have accumulated the expansion of a large service

¹⁵ Camille Peugny, 2018, *L'évolution de la structure sociale dans quinze pays européens (1993-2013): quelle polarisation de l'emploi?*, Sociologie n°4, vol. 9. Like Goos et alii, he uses the EU-LFS (European Union Labour Force Survey) but he bases his groups on the ESeG European socio-economic nomenclature and not on the basis of a wage indicator.

¹⁶ To improve readability, we have presented seven major groups here, but data is available for nine groups: managers; professionals; technicians and associated professional employees; craftsmen and other small entrepreneurs; agricultural workers; administrative employees; skilled service employees; skilled workers; and low skilled workers. The three Eastern European countries (Hungary, the Czech Republic and Romania) were also excluded from the study. In ESeG nomenclature, employees in food services, beauty services and childcare as well as home care services for the elderly are classified as skilled service providers. Housekeepers, other cleaning and maintenance service providers and retail employees are classified as low-skilled professions.

sector comprised of poor-paying jobs with mass unemployment, which contradicts the prevailing thought that the boom in service sector jobs would resolve the unemployment crisis.

Job polarization in Europe over 1999-2013: A detailed view

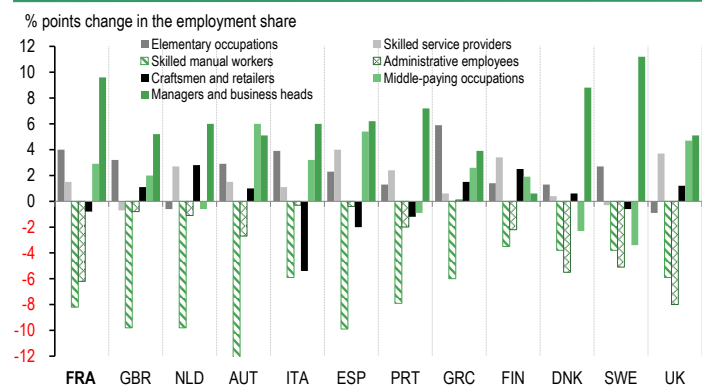


Chart 10 Source: Peugny (2018), BNP Paribas

We conclude our review of the literature by looking at research on France by Harrigan, Reshef and Toubal (2016)¹⁷ and Reshef and Toubal (2019)¹⁸, which stand out for the remarkable level of detail of their data (by datamining the annual social data report – DADS). Each job in the DADS database is identified by a two-digit PCS code. It identifies 22 types of private sector occupations, but excludes farming, professional activities and the public sector (see the appendix for a table listing the job titles and the underlying data in the charts).

The authors conclude that job polarization in France has been distinct and rapid since the mid-1990s, comparable in scope to the movement in the United States. Their 2016 publication includes an interesting graphic representation combining three dimensions. In addition to the usual two dimensions -- the change in the share of jobs for each occupation (Y axis) as a function of their level of skills/wages (X axis), they also show the weight of each occupation in the job market (see chart 11). It is also interesting to note the distinction between the non-manufacturing and manufacturing sectors. Job polarization can be observed in the non-manufacturing sector but not in manufacturing (see charts 12 and 13). In the updated 2019 version of their study, the authors point out the intensification of polarization since the 2008 crisis (see charts 14-16). The structural deformation of the job market in the first period studied (1994-2007) occurs over a 13-year period, while the deformation in the second period (2008-2013) occurs in just five years. In particular, the annual rate of decline in the share of skilled manual workers, and to a lesser extent, middling jobs, has been faster in the recent period.

¹⁷ James Harrigan, Ariell Reshef and Farid Toubal, 2016, *The March of the Techies: Technology, Trade, and Job Polarization in France, 1994-2007*, NBER Working Paper n°22110, March

¹⁸ Ariell Reshef and Farid Toubal, 2019, *Job polarization in France: what has worsened since the 2008 crisis*, CEPREMAP collection, Editions Rue d'Ulm



Job polarization in France over 1994-2007: A detailed view by occupations - whole economy



Chart 11 Source: Harrigan et alii (2016), BNP Paribas

Job polarization in France over 1994-2013: A detailed view

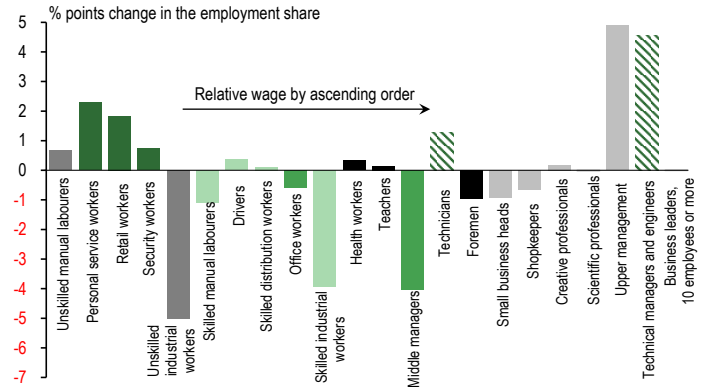


Chart 14 Source: Reshef and Toubal (2019), BNP Paribas

Job polarization in France over 1994-2007: A detailed view by occupations - non-manufacturing sector



Chart 12 Source: Harrigan et alii (2016), BNP Paribas

Job polarization in France over 1994-2013: A more aggregated view

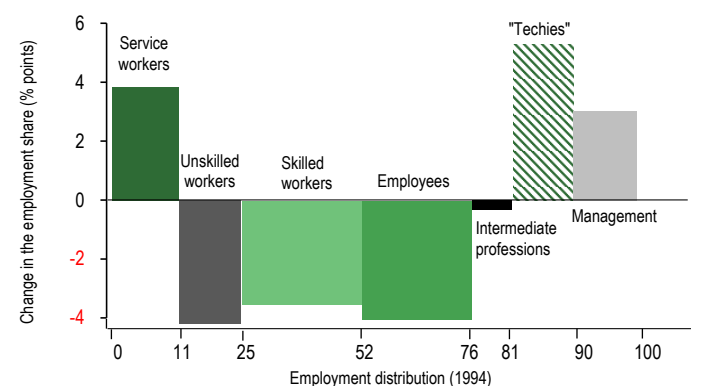


Chart 15 Source: Reshef and Toubal (2019), BNP Paribas

Job polarization in France over 1944-2007: A detailed view by occupations - manufacturing sector

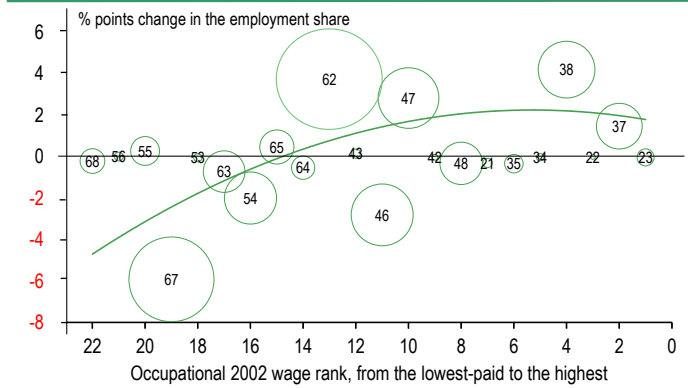


Chart 13 Source : Harrigan et alii (2016), BNP Paribas

Job polarization in France before and after the 2008 crisis

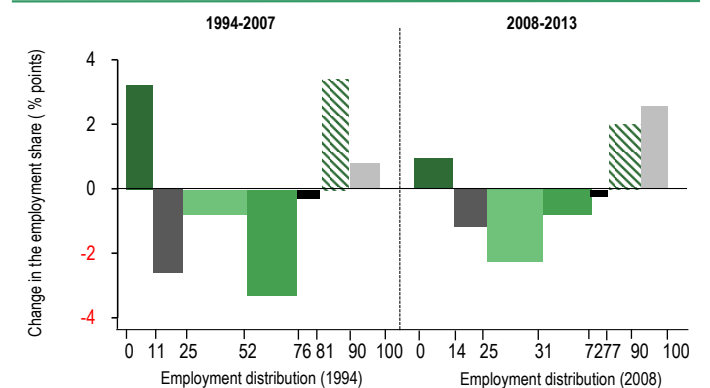


Chart 16 Source: Reshef and Toubal (2019), BNP Paribas

Note: the numbers in the bubbles correspond to the profession's PCS code (see table in the appendix) and the size of the bubble reflects its weight within the job market in 2002 (measured in the number of hours paid).

Note: the detailed version of chart 14 is aggregated in charts 15 and 16 using the same colour code. For example, the dark green bar in charts 15 and 16 represents the category "service providers", which comprises home-care services to individuals, retail employees and protective service employees, which are represented by the three dark green bars in chart 14.



Some explanatory factors

In the research we have just reviewed, the main explanation given for job polarization is technological progress. Yet considering the great diversity of situations from one country to the next, this is only one explanation among several, and not necessarily the most important one. Explanations may vary depending on the part of the curve being taken into consideration: it is not necessarily the same factors that are driving up employment at the top and bottom of the wage distribution, or pulling down the share of middling jobs. The forces at play might be interfering with each other, or with other factors working in the opposite direction. A factor that might have come into play at one moment might be replaced by another factor in a different period. For instance, according to Mandelman (2013)¹⁹, job polarization in the United States was triggered by technological progress in the 1980s, offshoring in the 1990s and the “savings glut” in the 2000s.

Technological change

The theory of skill-biased technological change (SBTC) is commonly put forward as the main explanation for job polarization. Yet it provides only a partial explanation. SBTC effectively explains, at least in part, the development of the right side of the U, but it does not explain the left side. Research by Autor, Levy and Murnane (2001, 2003)²⁰ provides some additional explanatory factors by looking more closely at the specific effects of computerisation and the type of tasks that computers replace. They distinguish between routine and nonroutine tasks, but also between intellectual (cognitive) and manual work. Their hypothesis is that computers replace routine human labour (repetitive tasks governed by specific rules that can be codified and automated), whether the work is intellectual (accounting, data entry and processing) or manual (assembly line work, harvesting, sorting). Computers complement non-routine tasks, whether intellectual (medical diagnoses, legal work, team management) or manual (truck driving, cleaning and maintenance services, home-care services).

According to this analysis, known as the ALM hypothesis, technological progress is not only biased in favour of skilled labour, it also favours nonroutine tasks²¹. This modifies the relative demand for labour at different skills levels. This modification favours the top and bottom of the skills ladder, where jobs tend to involve nonroutine tasks that are hard to automate. On the contrary, middling jobs are disadvantaged because they tend to involve routine tasks that are easily automated.

¹⁹ Federico S. Mandelman, 2013, *Labor Market Polarization and International Macroeconomic Dynamics*, Federal Reserve Bank of Atlanta, Working Paper n°2013-17, December

²⁰ David Autor, Frank Levy and Richard R. Murnane, 2001, *The Skill Content of Recent Technological Change: an Empirical Exploration*, NBER Working Paper n°8337, June. The article was also published in November 2003 in volume 118 of the *Quarterly Journal of Economics*.

²¹ This theory is summarized by the acronym RBTC (*routine-biased technological change*) or TBTC (*task-biased technological change*) as a counterpart to SBTC (*skill-biased technological change*). Yet it is somewhat misleading in so far as technological change is biased towards nonroutine work.

In other words, technological change promotes the growth of jobs that involve the most nonroutine tasks, which cannot be automated, and these jobs are located at the top and bottom of the skills and wage ladder. The jobs that disappear under the impact of technological progress are those that involve the most routine tasks that can be easily automated, which are generally located in the middle of the distribution. This is precisely the description of job polarization.

Catherine, Landier and Thesmar (2015) also argue that workers employed in routine jobs that are eliminated tend to shift towards jobs at the bottom of the ladder. They identified the low or unskilled PCS (defined as jobs paying less than 1.5 times the minimum wage) that have boomed and contracted between 1990 and 2012 (see table 2). Their concrete examples help to well gauge the differentiated impact of technological change. All unskilled jobs are not threatened in the same manner. Those that can be automated effectively decline, but they are replaced by other unskilled jobs that are not easily automated. Moreover, according to the authors, there is a major deficit of this type of jobs in France (estimated at 4 million), which potentially represents as many new jobs.

Low-skilled occupations that are rising or falling

	Number of jobs		Change
	1990	2012	
Jobs on the rise			
Childcare and family services	176 051	663 798	487 747
Computer engineers and experts (except technical sales representatives)	119 071	348 852	229 781
SME financial or administrative managers	162 070	338 291	176 221
Nurses	172 149	338 563	166414
Administrative supervisors and technicians (except financial and accounting)	102 026	230 660	128 634
Self-service employees	33 677	158 021	124 344
Caregivers	173 655	294 645	120 990
Food service waiters and assistants	115 033	214 356	99 323
Household employees and personal housekeepers	164 612	254 077	89 465
Technical service managers and bank sales representatives	89 042	173 338	84 296
Jobs in decline			
Unskilled labourers in metallurgy, glass, ceramics and building materials	623 74	24 791	-37 583
Metal workers, locksmiths, unskilled repairmen	101 738	60 680	-41 058
Unskilled concrete and civil engineering labourers	101 065	56 761	-44 304
Other types of unskilled industrial labourers	152 872	105 788	-47 084
Unskilled textile and leather goods labourers	58 681	97 02	-48 979
Unskilled chemicals labourers	92 733	43 517	-49 216
Bank technical service and teller window employees	153 475	87 121	-66 354
Unskilled clothing labourers	97 231	6 554	-90 677
Unskilled labourers in assembly, monitoring and mechanics	191 166	84 137	-107 029
Secretaries	415 474	262 887	-152 587

Table 2

Source: Catherine, Landier, Thesmar (2015)



Globalisation

The second set of explanatory factors behind job polarization is globalisation, competition from low-cost countries, offshoring and outsourcing. This set of factors is linked to the previous one, and the impact of globalisation on job polarization comes on top of and blends in with the effects of technological change.

Like technological change, globalisation changes the relative demand for labour in favour of skilled and unskilled jobs, and middling jobs are disadvantaged. The main differentiating factor is whether or not the job can be relocated abroad. This is especially true for routine jobs that can be easily offshored at a lower cost. In addition to the usual capital/labour substitution, a labour/labour substitution is observed, or more precisely imports/labour. Middling jobs tend to be hit hardest. In contrast, jobs involving close human relations, face-to-face interactions, local businesses and non-tradeable services are less likely to be relocated abroad. Numerous low-skill jobs fit this bill and their development is sheltered from globalisation. At the top end of the ladder, the positive impact can be attributed to new demand for skilled employees as companies grow, expand internationally and develop more complex structures. More generally speaking, the rise in exports and the access to new markets is seen as positive for the job market, whereas the impact of imports is more equivocal. They can replace part of the domestic production and employment but they can also be a supportive factor via their induced competitiveness, productivity and purchasing power gains.

Krenz, Prettnner and Strulik (2018)²² take an interesting approach by analysing the impact of reshoring made possible by advances in automation and robotization. This phenomenon is also a partial vector of job polarization. Although it does not lift low wages or increase jobs at the bottom of the skills ladder, it does have a favourable impact on the top of the ladder.

Institutional and economic factors

The third group of explanations highlights the role played by institutions and economic developments. Among institutional factors, the influence of job market regulations (minimum wage, job protections, social dialogue, etc.) and employment policies (reduced charges for low-wage earners, etc.) are put forward not as an explanation for job polarization itself, but for the difference in scope between the European countries and the Anglo Saxon ones. Although it is agreed that they have an impact, there is no consensus on whether they augment or alleviate job polarization. It depends on what we are looking at.

In the research we have reviewed, regulatory factors are considered to favour the most skilled jobs, but also to put a damper on the creation of low-skilled jobs (the minimum wage being more specifically pointed out).

²² Astrid Krenz, Klaus Prettnner and Holger Strulik, 2018, *Robots, Reshoring, and the Lot of Low-Skilled Workers*, Discussion Papers Cege (Center for European Governance and Economic Development Research), n°351, July

Job polarization appears consequently limited, more precisely the expansion of the left arm of the U, which is considered as negative in terms of job dynamics. However, when one looks at job polarization through the wage inequalities and squeezed middle class angle, the minimum wage effect of limiting job polarization is good news because it helps preserve incomes at the bottom and middle of the wage distribution. Furthermore, employment policies designed to foster more job-rich growth and measures to increase labour market flexibility (boom in short-term contracts, greater job insecurity) support growth in low-skilled, low-paying jobs.

The following economic and sociodemographic structural changes also contribute to job polarization: an aging population; changes in family and social structures; a higher level of economic wealth, which creates new needs, life styles and consumer modes, resulting in the development of personal care services; the rise in the level of education and training, a higher female participation rate; immigration; "tertiarisation" and more recently, uberisation.

Lastly, cyclical downturns -- and the 2008 crisis in particular -- are another factor behind job polarization. Cyclical crises hit the bottom part of the U the hardest, because middling jobs, which have already been eroded by automation and globalisation, seem to be the most cyclically sensitive, in part because they tend to be concentrated in the most cyclical business sectors, such as industry and construction²³.

What is the dominant cause of polarization?

In our review of the research that seeks to quantify the impact of these different factors, more often than not technological progress comes out as the dominant factor contributing to job polarisation. Yet this is not a unanimous conclusion.

We will begin with a study by Albertini et alii (2017)²⁴ comparing the US and French job markets. According to the authors, job polarization seems to be similar on either side of the Atlantic (with regard to changes in the share of manual, routine and abstract work, according to their typology), but it is not caused by the same factors. In France, job polarization is mainly due to labour market institutions and their evolution over time, while in the United States, the main factors are technological progress and higher levels of educational attainment. Looking solely at France, Berger and Pora (2017) as well as Harrigan, Reshef and Toubal (2016) claim that technological change (automation) is the dominant explanation. As to globalisation, Harrigan et alii show that its "polarizing" effects are only significant in the manufacturing sector.

²³ Christopher L. Foote and Richard W. Ryan, 2015, *Labor Market Polarization over the Business Cycle*, NBER Working Paper n°21030, March

²⁴ Julien Albertini, Jean Olivier Hairault, François Langot and Thepthida Sopraseuth, 2017, *A Tale of Two Countries : A Story of the French and US Polarization*, IZA Discussion Paper n°11013, September



More surprising are the contradictory conclusions of the Cedefop (2011)²⁵ and Goos et alii (2010)²⁶ studies. For Cedefop, the job polarization observed in Europe over the period 1998-2008 is mainly due to social-demographic and institutional factors such as an aging population, job market institutions and employment and immigration policies. The role of technological change was smaller and more uncertain. To be more exact, technological change played a key role in increasing the number and share of the most skilled occupations but did not boost elementary jobs. For Goos et alii, whose scope of observation encompasses Europe and the period 1993-2006, to the contrary, it is technological change that predominates (ALM hypothesis). Offshoring had a smaller impact while labour market institutions (via differences and changes in wage setting mechanisms) hardly played a role at all. Moreover, changing demand (due to changes in relative prices, which were also shaped by technological change and globalisation) helped attenuate polarization²⁷.

What about tomorrow?

The current digital revolution is unleashing new potential for further automation, robotization and digitalisation, which raises numerous questions and concerns about the future of work and the possibility of a “future without jobs”. We conclude this article by approaching this vast subject from the more restricted perspective of its possible impact on job polarization: will it accentuate or attenuate this phenomenon?

Factors that risk accentuating job polarization include the likely acceleration of routine jobs’ destruction. This trend is likely to spread to other jobs that have been preserved so far, but that are now threatened by the development of artificial intelligence (AI). Certain skilled professions (intellectual or scientific), or at least certain intellectual tasks, are no longer protected from being supplanted by AI, which is capable of conducting complex tasks. If we push the argument a bit further, we can even say that technological progress is less biased towards skilled labour, or it is, but differently, because other skills are required.

The first study that tried to estimate the future impact of automation on employment was by Frey and Osborne (2013)²⁸, and their alarmist conclusions drew a lot of attention. They claimed that 47% of jobs in the United States and 35% of those in the United Kingdom presented a high

risk of automation, and could thus disappear within a 10- to 20-year horizon. Using the same approach for France, Roland Berger estimated that 42% of French jobs were at risk²⁹. Yet their research looks at the level of employment and considers each job as a whole that can be fully automated, which is an exaggeration: each job/occupation involves multiple tasks, some of which can be automated and others not.

By measuring the risk of automation for each occupation according to the types of tasks involved, subsequent research arrived at much less alarming projections. Arntz et alii (2016)³⁰ estimates that 9% of jobs in the United States, and a similar percentage in France, present a high risk of automation (i.e. more than 70%). Le Ru (2016) shows that easy-to-automate jobs (i.e. whose work rate is not imposed by external demand requiring an immediate response, and for which a strict set of rules can be applied) are not as numerous as one might expect³¹. According to his estimates, about 15% of French employees hold this kind of job, and this percentage is even declining slightly (-4 points compared to 1998) in favour of jobs that are focusing on tasks that are hardest to automate. As the author points out, it is not just because it is technically possible to replace a job by a machine that the replacement will necessarily happen. Other factors also come into play, including the organisation of work, social acceptability, market positioning and economic profitability. A good illustration is the feeble level of robotization in France compared to Germany.

The COE (*Conseil d’Orientation pour l’Emploi*) has also explored the question, looking solely at the French situation³². The 2017 study highlights two points: 1) the relatively low proportion of “exposed” jobs (“less than 10% of existing jobs present an accumulation of vulnerabilities likely to threaten their existence due to automation and digitalisation”); but also 2) the relatively high proportion of jobs that are “likely to evolve” (“half of existing occupations are likely to evolve in terms of their job content, either significantly or to a very major extent”) (see chart 17). To summarize, using Le Ru’s wording, “the digital revolution might destroy certain jobs, but it above all transforms professions.” In the end, how job polarization will evolve proves to be a much more open-ended question than it might seem at first.

According to OECD estimates, about 16% of jobs in France present a high risk of automation within a 20-year horizon, and 33% risk being profoundly transformed. These figures are slightly higher than the estimated average for the OECD countries (14% and 32%, respectively)³³. Yet the difference is not significant given the considerable amount of uncertainty surrounding this type of estimate.

²⁵ Cedefop, 2011, *Labour-market polarisation and elementary occupations in Europe: Blip or long-term trend*, Research Paper n°9

²⁶ Maarten Goos, Alan Manning and Alan Salomons, 2010, *Explaining Job Polarization in Europe: The roles of Technology, Globalization and Institutions*, CEP Discussion Paper n°1026, November

²⁷ The authors take into account general equilibrium effects. Within this framework, any change affecting the demand of one factor, in this case the job type, is susceptible to carry over to all other job types via price, revenue and substitution effects. For example, automation of the hamburger production process reduces the number of people necessary to make them, but the price of a hamburger also declines, which in turn increases the demand and the number of persons necessary to sell them.

²⁸ Carl Benedikt Frey and Michael A. Osborne, 2013, *The future of employment: how susceptible are jobs to computerization?*, Oxford Martin Working Paper, September

²⁹ Roland Berger Strategy Consultants, 2014, *The middle classes faced with the digital transformation. How to anticipate and accompany the transformation?*

³⁰ Melanie Arntz, Terry Gregory and Ulrich Zierahn, 2016, *The Risk of Automation for Jobs in OECD Countries: a Comparative Analysis*, OECD Social, Employment and Migration Working Papers n°189, June

³¹ Nicolas Le Ru, 2016, *The effect of automation on employment: what we know and what we don’t*, note d’analyse n°49, France Stratégie, July

³² Conseil d’orientation pour l’emploi (COE), 2017, *Automation, digitalisation and employment – Volume 1: The impact on the volume, structure and location of jobs*, January

³³ OECD, 2019, *Employment Outlook: The Future of Work*



The OECD's 2019 study on the middle class also caught our attention³⁴. It sheds new light on the subject by estimating the percentage of workers in jobs at high risk of automation according to their position on the income ladder. In France, one out of six middle-class workers hold jobs with a high risk of automation, which is similar to the average for the developed countries (see chart 18). The OECD believes there is reason to be alarmed by this relatively high percentage, which is close to the figure estimated for workers at the bottom of the wage ladder (about 1 in 5), compared to only 1 in 10 for workers at the top of the ladder. Middle and low income workers both face the same fears that the digital revolution will destroy their jobs.

France: Distribution of the automation index

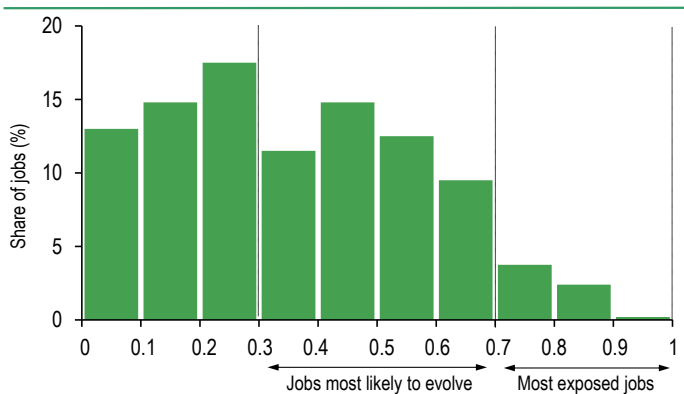


Chart 17 Source: General Secretary of the COE
Note: about 13% of jobs in France have an automation index reading of between 0 and 0.1.

Share of workers in occupations with high risk of automation by income class

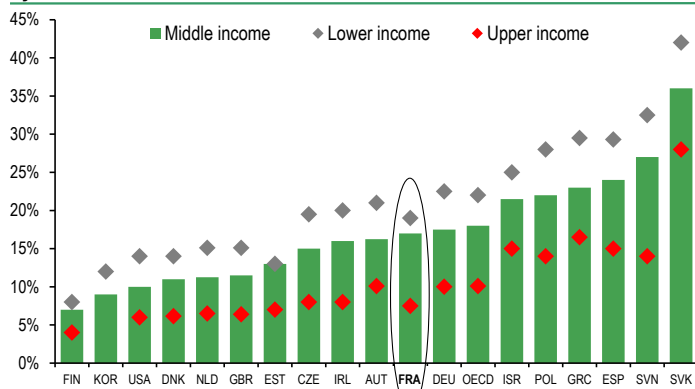


Chart 18 Source: OECD
Note: Low-income households are defined as households whose revenue is lower than 75% of the national median. Middle income household are those whose revenues account for between 75% and 200% of the national median. High-income households have revenues that are more than twice the amount of the national median. The risk of automation is calculated as the average automation risk per profession, weighted by the share of each profession in the revenue category.

As important and instructive as these figures may be, they present only one side of the coin: technological progress is also a source of job creations. As the COE points out, retrospective studies converge to show a net positive effect. Moreover, the digital revolution's impact on middling jobs and skills is not completely negative. Autor (2015) defends the idea of a greater man-machine complementarity, and an increase in related services that will favour intermediary skills, which should help attenuate job polarization³⁵. In his analysis, many of the middling jobs that will remain and develop in the future will combine routine tasks with nonroutine ones in which men will conserve a competitive advantage over machines (personal interactions, flexibility, versatility, problem solving). This positive outlook for the "augmented man" winning out over the pessimistic forecast of the "useless man" nonetheless depends on a major challenge to be met: adapting skills through an educational and vocational training system that is up to the task.

12 September 2019
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³⁴ OECD, 2019, *Under Pressure: The Squeezed Middle Class*

³⁵ David H. Autor, 2015, *Why are there still so many jobs? The History and Future of Workplace Automation*, Journal of Economic Perspectives, volume 29, n°3, Summer

Appendix: List of professions and social professional categories (PSC) and quantified characteristics

PCS code	PCS title	Employment share (% , 1994)	Total change (pp, 1994-2013)	Annual change (entire period: 1994-2013 / pre-crisis: 1994-2007 / post-crisis: 2008-2013)	Employment share (% , 2013)	Relative wages (1994)	Rank (occupational mean wage in 2002*)
Business leaders, management and high-skilled professionals		10.0	2.74	+0.14 / +0.03 / +0.46	12.7	1.96	
21	Small business heads	1.0	-0.9		0.1	1.32	7
22	Shopkeepers	0.9	-0.7		0.2	1.39	3
23	Business leaders, 10 employees or more	0.8	-0.0		0.8	2.70	1
34	Scientific professionals	0.4	-0.0		0.4	1.54	5
35	Creative professionals	0.5	0.2		0.7	1.48	6
37	Upper management	5.6	4.9		10.5	2.04	2
Technical professions ("techies")		9.2	5.18	+0.27 / +0.24 / +0.36	14.3	1.59	
38	Technical managers and engineers	3.9	4.6		8.5	2.04	4
47	Technicians	4.6	1.3		5.8	1.13	10
Mid-level professionals		4.8	-0.36	-0.02 / -0.02 / -0.04	4.5	1.15	
42	Teachers	0.3	0.1		0.5	1.05	9
43	Health workers	1.3	0.3		1.6	0.95	12
48	Foremen	3.3	-1.0		2.3	1.19	8
Service providers		11.2	3.95	+0.21 / +0.23 / +0.15	15.1	0.66	
53	Security workers	0.7	0.7		1.4	0.70	18
55	Retail workers	6.2	1.8		8.0	0.65	20
56	Personal service workers	3.4	2.3		5.7	0.63	21
Office workers		24.5	-4.05	-0.21 / -0.24 / -0.17	20.4	1.00	
46	Middle managers	12.0	-4.0		8.0	1.12	11
54	Office workers	13.0	-0.6		12.5	0.84	16
High-skill workers		26.6	-3.32	-0.17 / -0.05 / -0.52	23.3	0.82	
62	Skilled industrial workers	11.7	-3.9		7.7	0.87	13
63	Skilled manual labourers	9.2	-1.1		8.1	0.73	17
64	Drivers	4.7	0.4		5.0	0.74	14
65	Skilled distribution workers	2.4	0.1		2.5	0.78	15
Low-skill workers		13.8	-4.14	-0.22 / -0.2 / -0.24	9.7	0.70	
67	Low-skill industrial workers	10.2	-5.0		5.1	0.71	19
68	Low-skill manual labourers	3.9	0.7		4.6	0.61	22

Appendix table

Source: Harrigan, Reshef and Toubal (2016), Reshef and Toubal (2019), BNP Paribas

Note: the relative wage of each profession is defined in relation to the median wage in the French economy in 1994. Technical professionals ("techies") accounted for 9.16% of the total number of hours paid in the French private sector in 1994. Their share of employment increased by 5.2 points to 14.3% in 2013. They earned 59% more than the median wage (their wages correspond to 1.59 times the median wage). * The lowest the wage, the highest the rank figure.



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