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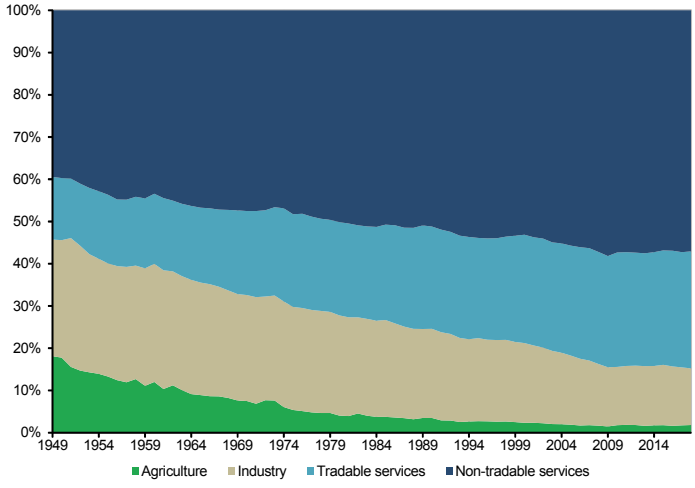
Composition and competitiveness of the French economy

- The French economy's sectoral specialisation changed between 2006 and 2016. High-value added sectors emerged in both manufacturing (aeronautics, pharmaceuticals, chemicals) and services (R&D, finance, information and communication, corporate services). Conversely, the medium technology industry, primarily motor vehicles, electrical products and machinery and equipment, declined. However, in many cases including the automotive industry, these changes were accompanied by a significant rise in the ratio of turnover of foreign subsidiaries to overall turnover.
- In a closed economy, production specialisation evolves according to preferences and productivity gains which vary across sectors. In an open economy, there are also external factors such as the economy's overall competitiveness, sectoral comparative advantages and businesses' internationalisation strategies. Changes to the tradable sector in France are essentially due to external factors.
- Over the last decade, the recasting of the French tradable sector has mainly involved the concentration of comparative advantages on a reduced number of growth industries (aeronautics, tourism, corporate services) whilst previously strong industries have slumped (automotive, agri-food).
- Sectoral shifts have economic, social and regional repercussions. Specialisation in strong value added professions buoys up growth and the expansion of personal services meets growing demand. But, this two-pronged trend polarises the labour market and thus heightens inequality.
- Industry also remains one of the main drivers of productivity and its contraction can put a drag on potential growth. In addition, industry is spread out more evenly throughout France and is less concentrated in large metropolitan areas. Lastly, some industrial sectors help bolster France's technological independence.
- Above and beyond the essential horizontal policies (investing in high-quality basic research, boosting the skillsets of the labour force, consolidating businesses' competitiveness, etc.), sectoral interventions may help address societal issues such as the ecological transition, technological advances or the aging population. The "*Pacte Productif 2025*" is in line with this approach and strives to marshal all available leverage to ensure that the production structure is able to cope with the challenges raised by the coming changes.

France's production specialisation
(% of total value added in nominal terms)



Source: Insee, DG Trésor calculations.

How to read this chart: Tradable services cover market services with the exception of real estate activities, other services, wholesale and retail trade activities and accommodation/food service activities. Non-tradable services include these categories, construction activities and non-market services.

1. The French economy's specialisation has kept evolving

1.1 A scorecard of sectoral changes between 2006 and 2016

The specialisation of the French economy is demonstrated by the structural gap between its supply and the main demand items. The momentum of sectoral specialisation derives from simultaneous changes in the features of both domestic and international demand and supply, especially in terms of competitiveness gains in each sector.

In order to map out the development of French production specialisation between 2006 and 2016, we can use a scorecard setting out the performance levels of the sectors of activity (broken down into occupational sectors at level A38 – only the "transport equipment" sector is divided between "motor vehicles" and "other transport equipment" with the industrial sectors being distinguished by their degree of technology measured by R&D intensity (see box 1), while the distinction between non-tradable and tradable sector is based on the extent of openness of the occupational sectors.[1] The table below sets out, for each sector, the change in value added in real terms, in total employment, in the trade balance, in the import coverage ratio, in labour productivity,[2] in unit labour costs,[3] in investment "quality" indicators and labour force qualifications indicators,[4] in the internationalisation of production[5] and in competitive intensity.[6] Where possible, the table also shows comparisons with Germany.

Table 1: Sectoral scorecard monitoring French competitiveness (2006-2016)

			Value added				Employment				International trade				Productivity		ULC	Innovation (relative to Germany)					Internationalisation		Competition		
			Weight 2016	Weight relative to Germany	Value added 2006-2016	Relative to Germany	Weight 2016	Poids rel. All	Value added 2006-2016	Relative to Germany	Balance 2016	Δ 2006-2016	Import/ prod 2016	Value added 2006-2016	Value added 2006-2016	Relative to Germany	2006-2016 relative to Germany	R&D	Inno	Coop.	ICT	Highly-skilled persons 2017/Δ2008-17	Ratio of subsidiaries' turnover/domestic turnover 2015	Δ 2010-2015	Mark-up	Exposure	Concentration
Industry	High technology	A88.30	0,7 %				0.3%																				
		A38.CI	0,8 %				0.3%																				
		A38.CF	0.7%				0.2%																				
	Medium-high technology	A38.CE	1.0%				0.4%																				
		A38.CJ	0.3%				0.3%																				
		A38.CK	0.6%				0.5%																				
		A88.29	0.6%				0.4%																				
	Medium-low technology	A38.CD	0.2%				0.0%																				
		A38.CG	1.0%				0.9%																				
		A38.CH	1.4%				1.4%																				
	Low technology	A38.CA	2.1%				2.3%																				
		A38.CB	0.3%				0.4%																				
		A38.CC	0.6%				0.7%																				
		A38.CM	1.3%				1.4%																				
Services	Tradable services	A10.JZ	5.9%				3.1%																				
		A38.KZ	4.7%				2.9%																				
		A38.MA	5.4%				4.6%																				
		A38.MB	1.7%				1.6%																				
		A38.MC	0.8%				1.0%																				
		A38.NZ	5.2%				7.7%																				
		A38.HZ	4.3%				5.0%																				
	Non-tradable services	A38.LZ	12.6%				1.3%																				
		A38.GZ	11.3%				13.4%																				
		A38.IZ	2.6%				4.3%																				
		A38.PZ	5.3%				7.2%																				
		A38.QA	9.2%				14.1%																				
Others	Others	A38.DZ	1.4%				0.5%																				
		A38.EZ	0.6%				0.6%																				
		A38.FZ	5.1%				6.3%																				

Source: DG Trésor.

How to read this table: colour code for changes (either absolute or in comparison with Germany).
Dark green: very favourable; light green: favourable; white: identical; light orange: unfavourable; dark orange: very unfavourable; dark grey: data unavailable.
The diversity of performance indicators meant that an expert had to be sometimes called upon to determine the occupational sectors' ranking thresholds.

(1) We use a minimum openness rate threshold of 10% to define a tradable sector. There are other definitions, in particular those based on the extent of geographic concentration of productivity-enhancing activities, see P. Frocrain and P.N. Giraud (2018), "The Evolution of Tradable and Non-Tradable Employment: Evidence from France", *Economics and Statistics* No. 503-504.

(2) Gross value added per person employed (Eurostat).

(3) Ratio of labour costs to labour productivity (Eurostat).

(4) R&D: Business expenditure on R&D (percentage of value added in 2013) (Eurostat). Innovation: Share of enterprises having carried out product or process innovation in 2014 (Eurostat). Cooperation: Share of enterprises having undertaken cooperation in 2014, excluding collaboration within the same group (Eurostat). ICT: Share of enterprises that provided training to develop/upgrade ICT skills of their personnel (Eurostat). High-skilled persons: Share of tertiary education graduates in the science and technology field (Eurostat).

(5) Ratio of the turnover of French subsidiaries abroad to domestic turnover (Eurostat).

(6) Mark-up: difference between price and marginal production cost (Deutsche Bundesbank Monthly Report December 2017). Exposure: ratio of total imports and exports in absolute value to the turnover of companies which had this sector as their main activity in 2015 (Insee). Concentration: sum of squares of the proportion of the number of employees per company in relation to the number of employees in the sector (DG Trésor calculations using the SIRENE database).

Box 1: Typology of occupational sectors

Table 1 breaks down the industrial manufacturing sectors depending on their degree of technology. The chosen typology is based on the Eurostat classification according to average R&D expenditure for each sector in relation to its value added for European countries between 2005 and 2014.

High technology incudes other transport equipment (A88.30), computer, electronic and optical products (A38.CI) and the pharmaceutical industry (A38.CF).

Medium-high technology encompasses the chemical industry (A38.CE), electrical equipment (A38.CJ), machinery and equipment (A38.CK) and the motor vehicle industry (A88.29).

Medium-low technology covers coking and refining (A38.CD), rubber and plastic (A38.CG) and metallurgy (A38.CH).

Low technology takes in the agri-food industry (A38.CA), the textile industry (A38.CB), the wood and paper sector (A38.CC) and other manufacturing industries (A38.CM).

The services are divided between tradable services (those exposed to international competition if their openness ratio has been more than 10% on average over the last decade) and sheltered (non-tradable) services.

Tradable services include information and communication (A10.JZ), finance and insurance (A38.KZ), legal, accounting and management activities (A38.MA), scientific R&D (A38.MB), other specialised activities (A38.MC), administrative and support service activities (A38.NZ) and transportation and storage services (A38.HZ).

Non-tradable services cover real estate activities (A38.LZ), wholesale and retail trade (A38.GZ), accommodation and food service activities (A38.IZ), education (A38.PZ) and human health (A38.QA).

Other activities encompass the production and distribution of electricity and gas (A38.DZ), the production and distribution of water (A38.EZ) and construction (A38.FZ).

1.2 Manufacturing has declined and has continued to specialise in high and medium-high technology

Over the decade from 2006 to 2016, industry's share of employment and value added fell.[7] There was an almost blanket decline in terms of employment but this was more segmented for value added. Basically, three major industrial sector groups can be identified on the basis of the momentum of their value added.[8]

A first group of sectors witnessed a fall in its share of value added.

- Within this group, a number of sectors have experienced significant reductions in value added and in employment which are usually related to strong growth in the ratio of turnover of subsidiaries based abroad to overall turnover due to relocation. This trend primarily affects the automotive industry and electrical products.
- Other sectors whose value added remained stable in the early 2000s have been declining since the economic crisis in terms of both value added and employment. These sectors are coking and refining, the manufacture of rubber and plastic goods, the manufacture of machinery and equipment and other manufacturing industries

The value added of a second group of sectors has remained stable having progressed at the same pace as that of the economy. These are the low and medium-low technology sectors such as the agri-food industry, where employment has held up, wood and paper, and metallurgy, which have experienced productivity gains and job losses. Broadly speaking, they use less digital technology and are less innovative, invest less in R&D and collaborate less than high-technology sectors. Nevertheless, when compared to Germany, some of these sectors have high R&D investment levels and lower innovation capabilities, which raises the issue of the quality of R&D expenditure in these sectors.

The value added of a third group of sectors has grown faster than the economy as a whole. These are essentially high or medium-high technology sectors: other transport equipment covering aeronautics, where employment has remained stable, and chemicals, the pharmaceutical industry and computer, electronic and optical products, which have recorded productivity gains and job losses.

(7) Industry's share of value added fell by 1.6 points between 2006 and 2016 (down 4.7 points between 2000 and 2016).
(8) This is the sectoral value added in real terms at the chain-linked prices for the previous year. Its change compared to total value added therefore remains unaffected by relative price effects.

These productivity gains appear to be closely related to more widespread uses of digital technologies in these sectors and to stronger innovation, higher R&D expenditure and greater cooperation with external entities (although this does not apply to certain sectors). A comparison with Germany confirms that the sectors in which France (respectively Germany) is ahead in terms of innovation, such as aeronautics and computer and electronic products (respectively the chemical or pharmaceutical industry) are also those with the highest R&D investment levels and which cooperate more with innovation stakeholders (other businesses, universities, R&D centres) than their German counterparts (respectively French).

1.3 On the other hand, the service sector's share of the economy has grown, with a move towards certain services with high value added

The value added of services with high labour productivity has risen significantly (faster than the rest of the economy). This is especially true for information and communication activities (driven, for instance, by IT services), financial and insurance services, and specialised, scientific and technical activities. Scientific R&D and other specialised activities grew more after the financial crisis whereas real estate activities slowed. Similarly, over the last decade, the export balance for all these services has improved owing, mainly, to the development of financial services and legal, accounting and management activities whilst the surplus for information and communication services has become a slight deficit.

Among the services with low labour productivity that are therefore more labour-intensive, the value added of the most non-tradable services has grown at a similar pace to that of the economy as a whole. For instance, the value added of human health and social work, and wholesale and retail trade, has risen faster than employment, whilst employment in accommodation/food service activities and education has been more vibrant than value added. The proportion of these services in value added as a whole has increased whereas it has fallen in Germany. Conversely, the value added of the most tradable services has stalled in real terms and their proportion of total value added has declined: the trade deficit for transportation and storage services has significantly worsened whilst the surplus for administrative services has remained almost stable.

The trade balance for services is still running a surplus. The shift of the French production structure towards the services has created a number of exporter sectors (financial, insurance, legal and accounting) whose strong performance levels over the last decade do not offset the worsening of the balance for transportation and storage, and information and communication, services.[9]

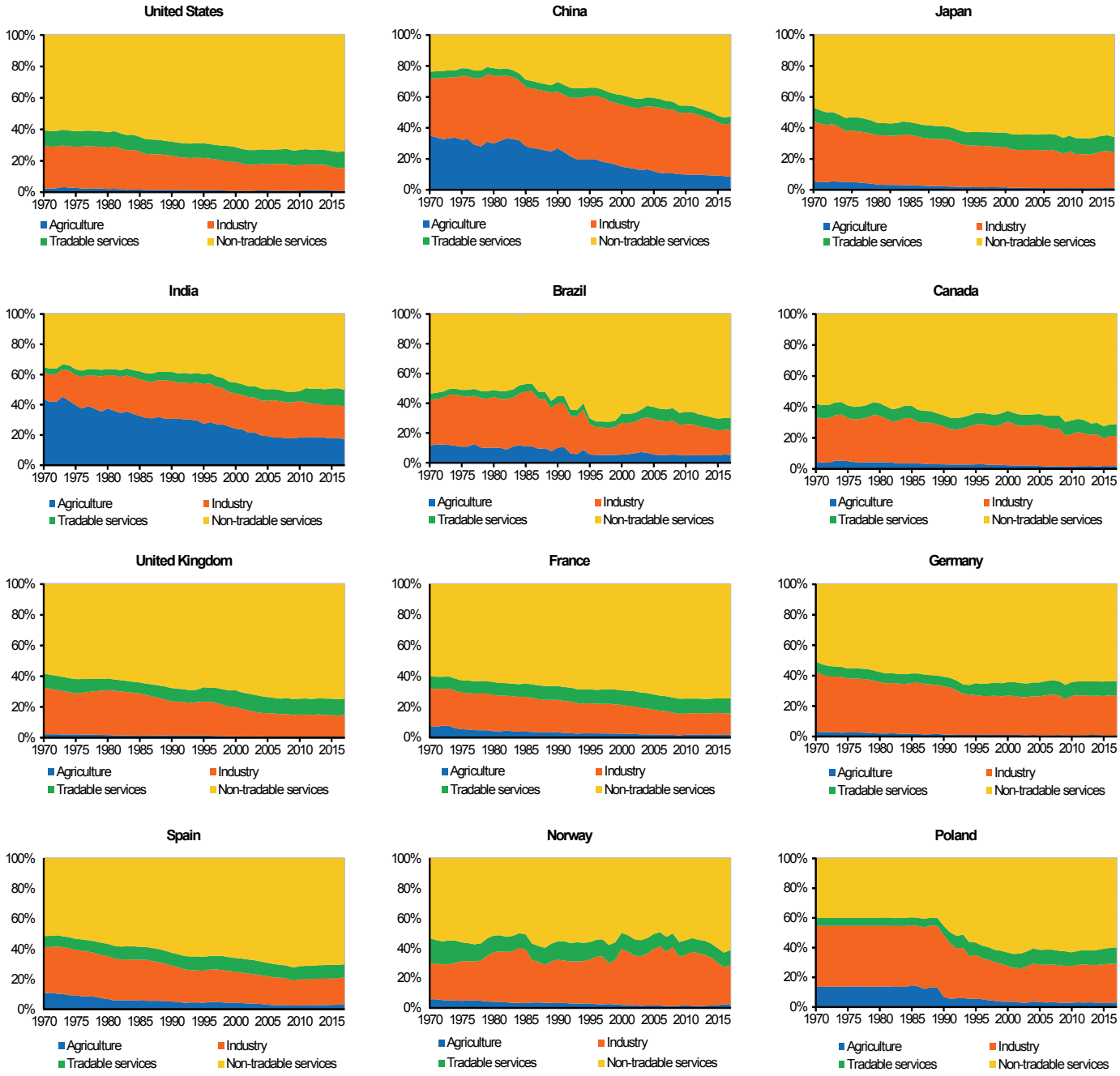
2. The recasting of the tradable sector mostly reflects the concentration of the French economy's comparative advantages

2.1 The last decade's sectoral specialisation is not primarily related to distortion of domestic demand

Over the long-term, the shift in sectoral specialisation gauged by distortion in the composition of value added measured in nominal terms, which is occurring in the majority of advanced or developing economies (see chart 1),[10] demonstrates both volume and price effects.[11]

(9) Tourism is also included in this balance but its measurement using territorial adjustment does not allow for a detailed examination of its breakdown by sector.
(10) In this chart, the United Nations' international standard industrial classification is different from that of INSEE.
(11) See L. Demmou (2011), "The Decline in Industrial Employment in France Between 1980 and 2007 – Scope and Main Determinants: An Assessment", *Economics and Statistics*, No. 438-440.

Chart 1 : Production specialisation in the main economies (% of total value added in nominal terms)



Source: UNCTADstat, DG trésor calculations.

Note: The value added of production activities is based on the United Nations' international standard industrial classification of all economic activities (ISIC Revision 3). Tradable services include transportation and storage services as well as information and communication services. Examples of non-tradable services are wholesale and retail trade services, accommodation and food service activities, construction and other activities.

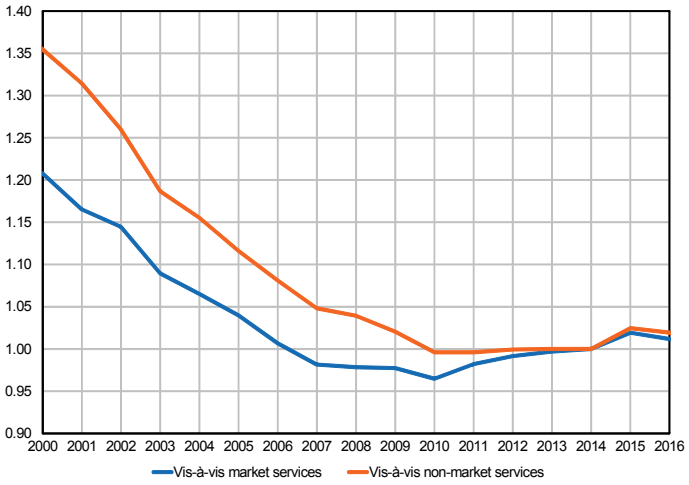
Price effects – also called Balassa effects – reflect productivity gains which show a tendency to be higher in industry. This causes reductions in relative industrial prices and also weighs negatively on industry's share in nominal terms of value added over the long term. In the recent past, the slowdown of sectoral distortion is the result of a downswing in these Balassa effects: whereas industrial prices changed much less rapidly than the prices for services between 2000 and 2006, changes for both have been more aligned during the past decade (see chart 2). This is essentially due to lower productivity gains in industry. Between 2006 and 2016, industry's share declined at a slower pace than in previous decades (see table 2).

Table 2: Level and changes in value added in the main sectors (in % of total value added in nominal terms)

	2000	2006	2016	between 2000 and 2006	between 2006 and 2016
Agriculture	2.3%	1.7%	1.6%	−0.6 pt	−0.1 pt
Industry	18.9%	15.8%	14.2%	−3.1 pt	−1.6 pt
Tradable services	25.6%	26.4%	27.1%	0.8 pt	0.7 pt
Non-tradable services	53.1%	56.1%	57.0%	2.9 pt	0.9 pt

Source: INSEE, DG Trésor calculations.

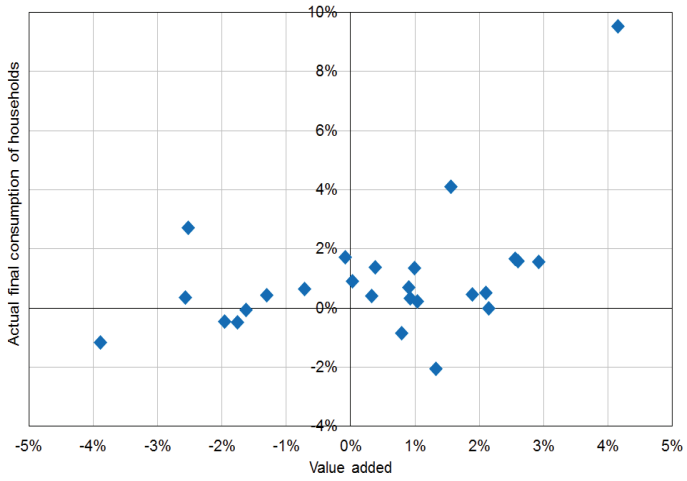
Chart 2: Relative prices of value added in manufacturing



Source: INSEE, DG Trésor calculations.

Volume effects arise from changes in domestic demand and the momentum of net exports. French domestic demand is shifting towards non-tradable services, in particular personal services. Within the tradable sector, the recent ongoing reconfiguration is however not significantly related to the distortion of domestic demand. Over the last decade, there has been little correlation between the change in sectoral value added and that of the actual final consumption of households (see chart 3). This means that specialisation in real terms within the tradable sector is due to foreign trade.

Chart 3: Average annual sectoral growth rates of value added and household consumption between 2006 and 2016



Source: INSEE, DG Trésor calculations. The point at the top right-hand side of the chart represents computer, electronic and optical products.

2.2 Now, sectoral specialisation appears to be little affected by a global lack of competitiveness

In open economies, there are also external determinants of production specialisation such as the economy's overall competitiveness, sectoral comparative advantages and businesses' internationalisation strategies. The global lack of competitiveness is no longer the main driver for the current shift towards specialisation. The indicator for the misalignment of the equilibrium exchange rate, as calculated by the IMF, shows that this is now very limited (see box 2). The French economy's competitiveness has capitalised on the reforms introduced in recent years to lower labour costs and corporate taxation, despite the slow pace of price and wage adjustments within the euro area.[12]

(12) See G. Gaulier, V. Vicard (2018), "Some Unpleasant Euro Arithmetic", *CEPII Policy Brief* No. 21.

Box 2: Gauging the global lack of competitiveness of the French economy using an indicator for the misalignment of the equilibrium exchange rate

Misalignments of the real effective exchange rate (REER)[a] have an impact on the breakdown of production activities between a sector exposed to international competition and a sheltered (non-tradable) sector. An overvalued real exchange rate reflects an excessive current account deficit[b]

(in relation to the basics: demography, level of development, openness of the economy, cyclical developments), due to price and cost levels which are not competitive enough; this causes atrophy of the sector exposed to international competition and hypertrophy of the sheltered (non-tradable) sector.

According to IMF calculations,[c] France's real effective exchange rate is overvalued by 4%. As a result, its current account balance posted a slight deficit in 2017[d] compared to its level justified by economic fundamentals.

Conversely, the euro area's REER is thought to be slightly undervalued (–4%) with Germany's being very significantly undervalued (–15%). The differences in competitiveness between France and German result from strategies rolled out in the early 2000s (Hartz reforms, fiscal consolidation in Germany, increase in opt-out clauses in industry-specific agreements); the gaps have started to narrow since the crisis due to initiatives to foster competitiveness introduced in France since then (Competitiveness and Employment Tax Credit (CICE), Responsibility Pact).

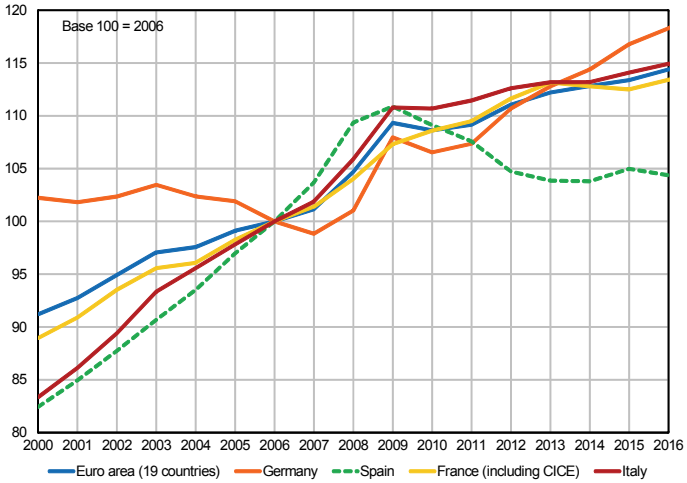
a. The effective exchange rate is defined as the average exchange rate vis-à-vis all trading partners.
b. As a reminder, the current account balance is defined as the gap between savings and investment.
c. 2018 External Sector Report.
d. It has been at around –1% of GDP since 2008, and was –0.6% in 2017.

The remaining competitiveness shortfall measured by the IMF suggests that there is still scope for progress in France as regards cost competitiveness.[13]

Recently, and particularly with the introduction of the CICE, unit labour costs have had less momentum in France than in Germany: +1.3% on average per year between 2006 and 2016, as against +1.7% in Germany (see chart 4). Since the introduction of the euro, around half the gap in accumulated labour costs for the entire economy compared to Germany has been closed.

Whilst in industry, the pre-crisis gap in labour costs with Germany has been totally closed,[14] this does not hold true for services which constitute a significant proportion of inputs and therefore a significant component of the price competitiveness[15] of the industrial sector.[16] The gap between France and Germany for the unit costs of service inputs for the manufacturing sector, which is especially wide for corporate support services, has only closed slightly.[17] One of the main reasons for the difference in prices for these services is a gap in margin dynamics for the "legal and accounting activities" sector where unit labour costs are broadly similar. This sector, which previously had numerous barriers to entry (qualification requirements, quotas, mandatory membership of a professional association) was substantially deregulated in Germany in the 2000s and this squeezed its margins by four points between 2000 and 2007.

Chart 4: Change in ULCs in the euro area



Source: Eurostat, DG Trésor calculations.

Moreover, an examination of the extent of competition at sector level shows that France still has scope to bolster competition in the corporate services and transportation sectors where the average mark-ups could reflect overly moderate competition (see table 1). In a recent study,[18] the European Commission highlights a lack of competition

(13) Defined as the ratio of domestic and foreign unit labour costs converted into euros.
(14) Nevertheless, unit labour costs are still higher than in Germany in a number of declining sectors (automotive, agri-food).
(15) Defined as the ratio of domestic and foreign export prices converted into euros.
(16) In 2010, the cost in inputs accounted for 71.5% of the value of manufacturing, including 13.7% of service inputs.
(17) The CICE caused a highly localised fall in the prices of service inputs (transportation and administrative and support services). See R. Monin and M. Suarez Castillo (2018), "L'effet du CICE sur les prix : une double analyse sur données sectorielles et individuelles", *Insee working document*.
(18) "Identifying priority service sectors for reforms in France", European Commission, Economic Brief 035, March 2018.

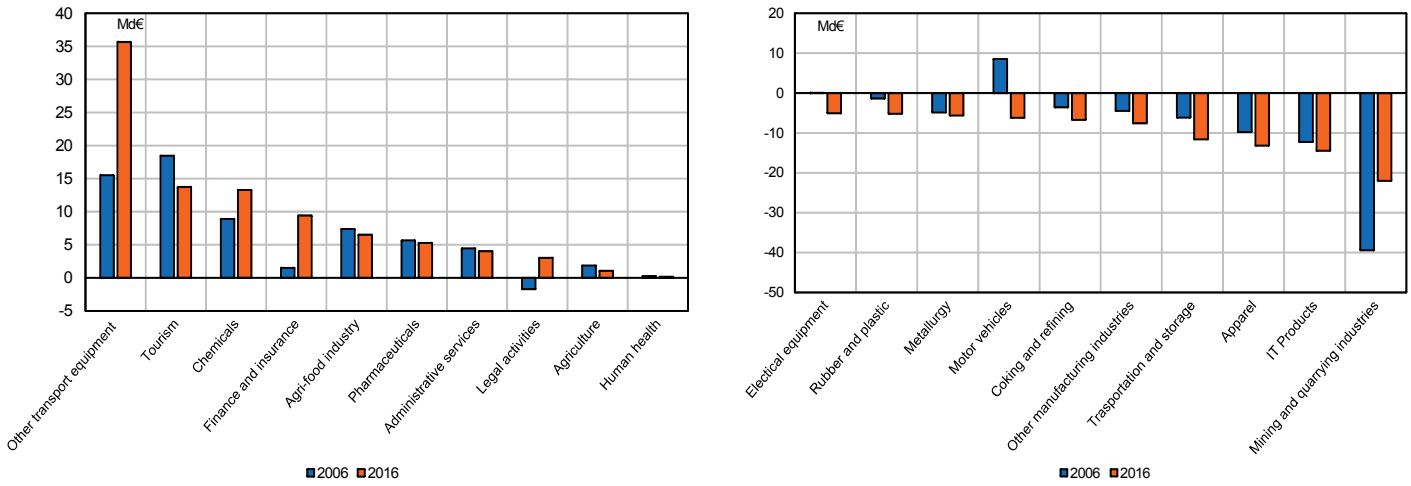
compared to the leading European countries (Germany, Spain, Italy, United Kingdom), in particular for architectural and engineering activities, and administrative and support services.[19]

Besides labour costs and the cost of inputs, France stands out due to its high production-related taxation[20] compared to its main partners. The amount paid by businesses accounts for 5.7% of value added as against 0.6% in Germany, 2.7% in the United Kingdom and 3.2% in Italy. One of these taxes, the corporate social solidarity contribution (C3S), which is levied on turnover,[21] is particularly damaging for competitiveness and productivity through a domino effect. Businesses have to pay the tax and also bear the increase in costs caused by the successive taxation of the inputs used throughout the production chain. This harms their price competitiveness over and above the amount of tax revenue paid by each company.[22] This is especially true in sectors in which the manufacturing process uses a large amount of intermediate consumption. As a result, the C3S spurs businesses to use tax-free imported inputs, to relocate, or even to vertically integrate at the expense of productivity.

2.3 Specialisation reflects the sectoral concentration of comparative advantages and internationalisation strategies

The momentum for industrial specialisation over the past decade reflects changes in sectoral export performance levels.[23] Slack export may have indeed aggravated the decline in manufacturing of motor vehicles (not including equipment), electrical products and textiles (excluding luxury items and technical textiles, sectors in which the performance of major French groups is stable), causing a loss of export market shares which, in addition to competition from imports, lead to a fall of their share of industrial value added. The export market shares of French goods in intra-European trade have been steadily eroded since the 2000s.

Chart 5 : Revealed comparative advantages and disadvantages



Source: Insee, DG Trésor calculations.

Note on method: These charts were drawn up by applying CEPII's RCA calculation formula to foreign trade in nominal terms as measured in INSEE's national accounts.
How to read this chart: France had a revealed comparative advantage of €35.7 billion in other transport equipment in 2016 meaning that its net exports were €35.7 billion higher than theoretical net exports without specialisation.

(19) The Commission advocates reducing barriers to entry and restrictions on carrying on these professions (regulated activities, special voting rights, restrictions on access to capital, ban on merging regulated professions (*inter-professionnalité*) or even the *numerus clausus* provisions restricting access to these professions).
(20) These include the transport contribution, reduced social security contribution, payroll tax, contribution on business value added, property tax on developed land, business premises contribution and the corporate social solidarity contribution.
(21) 0.16% on turnover of more than €19 million. The contribution raised €3.8 billion in 2018.
(22) The *Conseil d'analyse économique* (Council of Economic Analysis) has empirically confirmed this knock-on effect: the price effect of the C3S is double the effective taxation rate in the manufacturing industry. See P. Martin and A. Trannoy (2019), "Les impôts sur (ou contre) la production", *CAE Note* No. 53.
(23) Revealed comparative advantages enable an economy's strengths and weaknesses with respect to exports to be identified. They measure the gap between the trade balance observed for a theoretical product and balance, corresponding to a country without sectoral specialisation.

Over the last decade, the commercial sectoral specialisation of French foreign trade has increased.[24] To provide an illustration, changes between 2006 and 2016 affecting the ten main revealed comparative advantages (RCA) and disadvantages are set out below (see chart 5). Thinking of trade in terms of value added would not alter the relative role of sectors of activity in France's external balance.[25]

A number of conclusions may be drawn from this information.

First, comparative advantages have declined whilst our competitors have increased their market shares due to a sectoral competitiveness differential: the automotive industry for which the RCA is now negative, and to a lesser extent the agriculture and agri-food sectors (where the surplus is now highly concentrated on beverages and cereals)[26] and the pharmaceutical industry. The drop in the French comparative advantage in tourism was short-lived and resulted from the extraordinary events in 2016 (terrorist attacks, bad weather, strikes). It had been fully restored by 2017.

The automotive sector, in which the cost competitiveness has declined in respect of the quality level and market power of its firms, has seen a significant rise in the ratio of turnover of foreign subsidiaries to overall turnover owing to relocation.[27] The French economy is unique among the main economies of the euro area due to the amount of outgoing foreign investment by its multinationals which has again increased in the last decade. French businesses have frequently opted for a multi-site internationalisation strategy with little fragmentation of the value chain.[28] This has generated both significant income and a fall in exports of goods from France. Overall, this income has enabled France to post a current account balance close to equilibrium. German companies have adopted a different internationalisation strategy by relocating intermediate production[29] and by specialising in final assembly work which ensures good export performance levels but without the benefits received by French businesses in the form of income booked to the current account.

Second, comparative advantages have heightened in industry - aeronautics, chemicals – and in services – certain corporate services and financial services. Conversely, all France's comparative disadvantages increased between 2006 and 2016, except in the mining and quarrying industries.

This means that French exports are now focused on a reduced number of growth industries. This greater specialisation may cause cyclical air pockets in the French trade balance when our strengths are undermined by temporary constraints as happened between 2014 and 2017 (problems in the aeronautics sector, less tourism following the terrorist attacks, poor harvests, etc.).

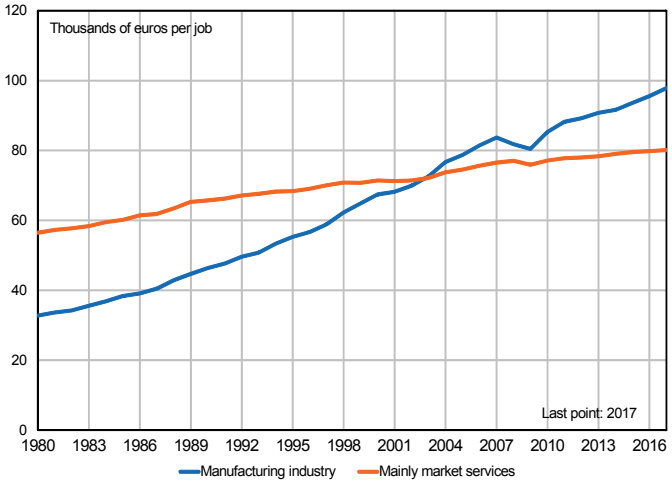
3. Sectoral shifts have economic, social and territorial repercussions

3.1 Sectoral specialisation has an impact on potential growth

The industrial sector has had a significant knock-on effect on the remainder of the economy and is still one of the main drivers for productivity gains (see chart 6).[30] The rise in the services' share of total employment went hand in hand with a fall in the French economy's productivity gains between 2000 and 2016. On the other hand, the shift in French sectoral specialisation towards high value added services generating productivity gains may also drive growth against a backdrop of the trend for falling gains in industry.

(24) The development of a country's commercial specialisation can be measured by the change in the variation of revealed comparative advantages. See Camatte H. and G. Gaulier (2018), "Spécialisation sectorielle et rechute du commerce extérieur français entre 2014 et 2016", *Rue de la Banque* No. 71.
(25) See F. Dauba (2017), "France's trade in value added", *Trésor-Economics* No. 207.
(26) Touze O., F. Dauba and X. Ory (2018), "Investigating France's shrinking agricultural and agri-food trade surplus", *Trésor-Economics* No. 230.
(27) The foreign turnover of French multinationals jumped 60% between 2007 and 2014, which was twice as much as Italian and Germany multinationals. See C. Emlinger, S. Jean, V. Vicard (2019), "L'étonnante atonie des exportations françaises : retour sur la compétitivité et ses determinants", *CEPII Policy Brief* No. 24.
(28) See PA. Buigues and D. Lacoste (2016), "Les stratégies d'internationalisation des entreprises françaises et des entreprises allemandes : deux modèles d'entrée opposes", Annales des Mines, *Gérer et Comprendre*, No. 124.
(29) Germany capitalised on the accession of central and eastern European countries to the European Union in 2004 by structuring its hinterland by keeping a significant proportion of its value added in its territory whilst gleaning competitiveness gains from intermediate production.
(30) Use of the Hodrick-Prescott filter shows that trend productivity gains per job are now at least one point more annually in the manufacturing industry than in market services. These findings also apply to the hourly productivity gap, see B. Ducoudré (2019), "Quel niveau pour les cycles de productivité par branche ?", *Revue de l'OFCE* No. 162. The author also demonstrates that industry accounts for 90% of the fall in total trend productivity gains since 1980 (two thirds of which are related to the drop in trend productivity gains in industry and a third to the reduction of industry's share of total employment).

Chart 6: Labour productivity in the manufacturing industry and mainly market services



Source: Insee, DG Trésor calculations.

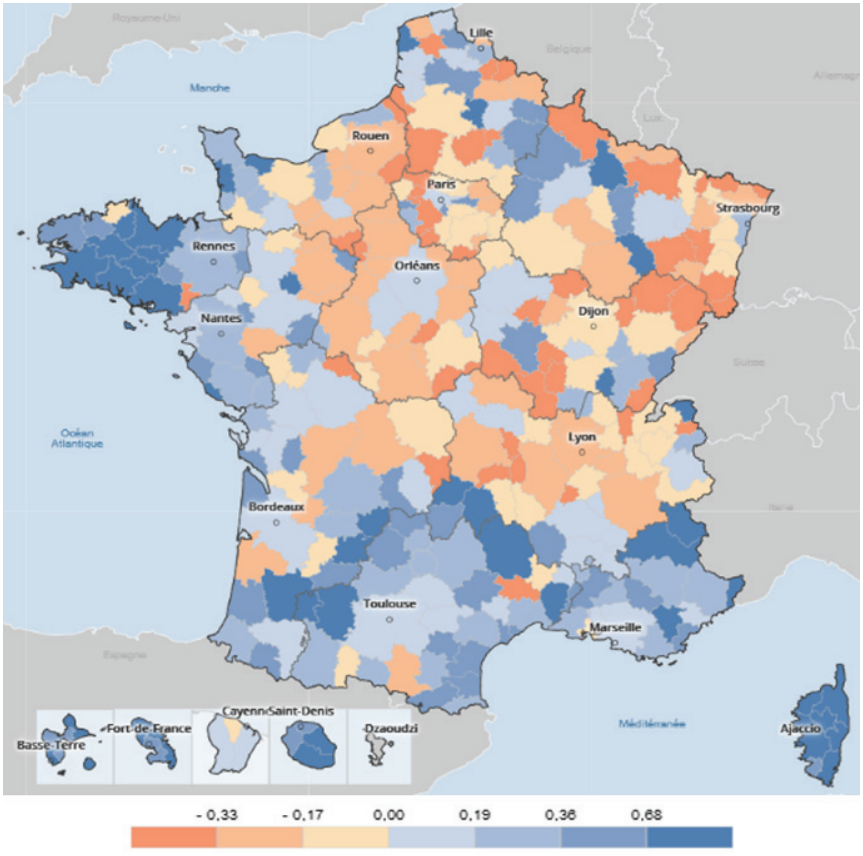
3.2 Changes in production specialisation drives territorial shifts

Movements in production specialisation have many spatial ramifications. The decline of the manufacturing industry has affected the whole of France but it is the north-east that has been the hardest hit (see map 1). These regions are home to those industries that have less momentum in relation to industry as a whole (see box 3). These include motor vehicles, rubber and plastic, machinery and equipment, and the textile and wood industries.

France's western and southern coastal regions tend to host industries that are more vibrant such as agri-food and other transport activities (naval, rail, aeronautics), as well as accommodation and food service activities and wholesale and retail trade. Broadly speaking, the majority of major towns and cities and a large proportion of Occitanie, the north-east of Nouvelle Aquitaine and western Brittany are rather more specialised in thriving tradable sectors (information and communication, finance and insurance, specialised services, hi-tech industries) than the remainder of France.

In tandem with this macro-regional divide, employment zones where specialisation has the least momentum are generally less urban and are located in outlying areas of the regions.

Map 1: Industrial specialisation scores in terms of employment



Source: CLAP (Local knowledge of the productive system IS) and Eurostat data, DG Trésor calculations.
How to read this map: The colour blue means that the employment zone is specialised in a sector which has grown relatively more than total industrial employment. The industrial specialisation score of an employment zone in terms of jobs is positive if it specialises in the agri-food, chemical and pharmaceutical industries, other transport, other manufacturing industries and the production and distribution of energy and water, as employment in these sectors is relatively more buoyant than for industry as a whole (see box 3).

Box 3: Building a geographic sectoral specialisation score in jobs

The specialisation indicator in jobs for each employment zone is the total of sectoral contributions, defined as the product of:

- The sector's share in the employment zone in relation to its share of total jobs.
- Growth, over the last decade, of jobs in the sector in relation to the growth in total jobs.
- The sector's share of total jobs in 2006.

$$Ind_E^{ze} = \sum_s Ind_E^{ze} = \sum_s \left(\frac{E_s^{ze}}{E^{ze}} - \frac{E_s}{E} \right) \times \left(\frac{E_s^{2016} - E_s^{2006}}{E_s^{2006}} - \frac{E^{2016} - E^{2006}}{E^{2006}} \right) \times \frac{E_s^{2006}}{E^{2006}}$$

The sign of the employment zone's specialisation indicator will be dictated by the sign and extent of sectoral contributions. The extent of these contributions (whether positive or negative) is dictated in turn by the sector's weight in the economy and the deviation in its performance level in the employment zone from the average (in dynamic and static terms).

- The first term, which represents the specialisation term, is calculated using 2015 CLAP data.
- The second and third terms, the product of which represents the "dynamic" term of the sectoral contribution, are calculated using Eurostat employment data from 2006 and 2016

$$(1)\ \frac{E_s^{ze}}{E^{ze}} - \frac{E_s}{E} \quad (2)\left(\frac{E_s^{2016} - E_s^{2006}}{E_s^{2006}} - \frac{E^{2016} - E^{2006}}{E^{2006}} \right) \quad (3)\ \frac{E_s^{2006}}{E^{2006}}$$

Calculation of the last two terms for all sectors of the economy involves pinpointing the extent of the sector's momentum in relation to the whole. The contributions of all the sectors for each employment zone are then aggregated.

Map 1 applies this indicator to industrial specialisation. This means that, here, total jobs are therefore industrial jobs taken as a whole.

3.3 Sectoral transformation ushers polarisation on the labour market

Labour market polarisation is materialised by falling demand for middle-skilled jobs in favour of very high-skilled and low-skilled ones.[31] Goos *et al.* (2014)[32] claim that between 1993 and 2010, the proportion of low-skilled and very highly-skilled jobs rose by four points in France. This means that for every two middle-skilled jobs that have disappeared one very high-skilled job and one low-skilled job have been created.

According to the same authors, half of the polarisation that has been noted on the labour market can be explained by changes to the production structure. Berger *et al.* (2017)[33]consider that deindustrialisation, owing, for instance, to technical advances and automation, has hurried the decline in jobs involving repetitive tasks. Between 1984 and 2012, the most middle-skilled jobs disappeared in industry with huge cuts in the number of skilled operatives in the graphic industries (−52%), metallurgy (−36%), electricity and electronics (−31%), mechanics (−11%) and motor vehicle repairs (−13%).[34]

This polarisation has also been compounded by the expansion of the service sector. On one hand, the growth in low-skilled jobs comes essentially from personal services and, on the other, the hiring of science and technical graduates to provide high value added services (finance, insurance and real estate) has increased much more than salaried employment in these sectors.

(31) For an overview of the polarisation of the French labour market, see G. Verdugo (2017), "Les nouvelles inégalités du travail", *Presses de Sciences Po*, Paris.
(32) Goos M., Manning A. and A. Salomons (2014), "Explaining Job Polarization: Routine-Biased Technological Change and Offshoring", *American Economic Review*, 104(8), p.2509-2526.
(33) Berger E., Pora P (2017), "Y a-t-il eu polarisation de l'emploi salarié en France entre 1998 et 2014 ? Une analyse selon les catégories socioprofessionnelles et le contenu de l'emploi en tâche", France portrait social, *Insee références*.
(34) D. Ast, (2015), "En 30 ans, forte progression de l'emploi dans les métiers qualifiés et dans certains métiers peu qualifiés de services", *Dares Analyses* No. 28.

Furthermore, by looking at average gross wages for a five-year cohort according to the sector and highest educational attainment level,[35] it can be seen that the wage level is, on average, higher in industry than in the services, for given qualifications and age. In addition, it is more frequent for people with a low educational attainment level to hold supervisory positions in industry than in the services which means that career opportunities are more favourable in the former (see table 3).

Table 3: Rate of access to supervisory positions in France according to the sector under review, the employee's age and the highest educational attainment level

	Industry			Services		
Highest educational attainment level	30-40 years	40-50 years	50-60 years	30-40 years	40-50 years	50-60 years
Low	8%	9%	15%	9%	9%	9%
Medium	17%	23%	21%	14%	17%	17%
High	33%	40%	24%	24%	31%	29 %

Source: Eurostat (Labor Force Survey).
How to read this table: The percentage of employees whose educational attainment is medium and who are between 40 and 50 years old holding supervisory positions is 23% in industry and 17% for the services.

Romain Faquet, Laura Le Saux, Chakir Rachiq

(35) The reconstruction of "average" salaried careers using the Labour Force Survey shows that for a given level of qualifications and age, the average gross wages of the cohort of employees born between 1965 and 1970 are systematically lower for workers in the service industries than those working in industry. For those with few qualifications (less than the baccalaureate), the wage gap between industry and the services increases with age up to 35 and then remains almost stable until the age of 50. The authors thank Marie Khater for this information.

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(01 44 87 18 51)
tresor-eco@dgtresor.gouv.fr

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