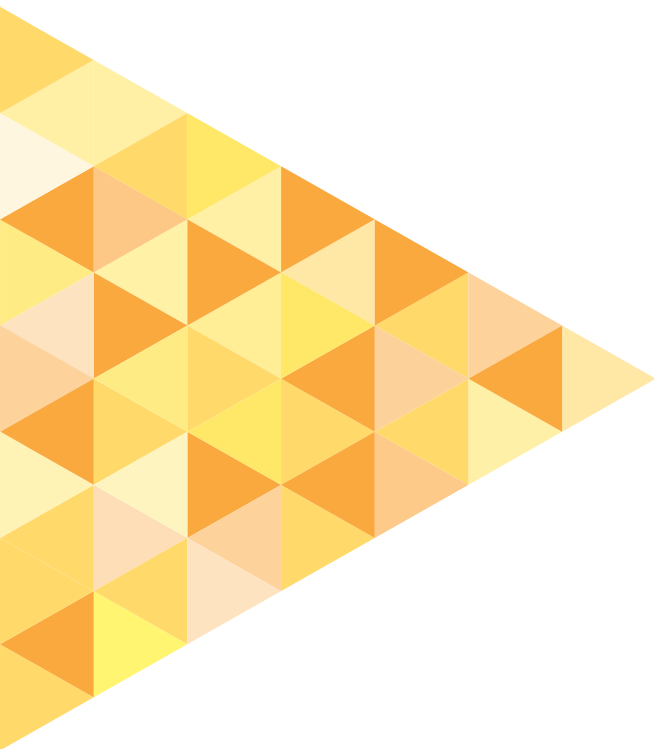


Anke Mönning | Robert Helmrich

Comparative quantitative data analysis for logistic and commerce sector in France and Germany



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*COMPARATIVE QUANTITATIVE DATA ANALYSIS FOR
LOGISTIC AND COMMERCE SECTOR
IN FRANCE AND GERMANY*

Anke Mönnig, Gesellschaft für Wirtschaftliche Strukturforschung (GWS)

Robert Helmrich, Bundesinstitut für Berufsbildung (BIBB)

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1 INTRODUCTION

France and Germany are the core countries of the European Union. Both are the steering wheel and engine for the European integration. Both countries are connected with a long history of rivalry. However, since the end of World War Two the French-German friendship continues to build and grow. Nevertheless, France and Germany are different in many aspects – ranging from the location and size of the country, to administrative organisation and to cultural and social differences.

This paper concentrates on the economic similarities and differences between both countries. The paper aims to exercise a quantitative analysis on the comparison of the sectoral, occupational and educational structure of the economy and the labour market between France and Germany. Different objectives are pursued:

1. Development of a set of indicator which allows to fastly pinpoint similarities and differences between these two economies.
2. The set of indicator is universally applicable for different economies and different sectors.
3. The indicators are discussed and tested on the example of the logistic and commerce sector in France and Germany.
4. The indicators are a mix on data on sectoral, occupational and educational level.

In order to meet these objectives, the paper concentrates in the first step on an ex-post analysis in both countries which includes data collection (chapter 2), data processing (chapter 3) and the development of comparative indicators (chapter 4). A synopsis of all indicators is performed in chapter 6.

2 DATA IDENTIFICATION AND COLLECTION

Every quantitative analysis starts with the search for data. In comparative analysis, the data has to be comparative with each other to allow to draw conclusions. In the case of two-country-comparisons, this is especially important as mostly the national statistics do not comply to the same methods, classification systems etc. In the case of Germany and France – two countries of the European Union – it is easier as both countries have to report to Eurostat or OECD statistics. These supra-national statistical offices either require from member states to provide harmonized statistics or the supra-national statistical office harmonizes the received data by themselves. In both cases, data from Eurostat or OECD are further processed in such a way that they allow to be compared with each other. The advantage of not having to harmonize data by yourself is opposed to the disadvantage of less detailed data in some cases. In general, data from the national statistical offices are more detailed in classification, time coverage etc.

The present analysis uses supra-national data sources in order to use comparative data for

Germany and France. The main data source is Eurostat which offers a wide range of different indicators and covers a wide range of different topics. OECD data is used as well.

Table 1 summarizes the collected data. Not all but most of the listed data in Table 1 was used. The table lists the topic, the indicator, the classification level, time coverage and source. All data is available for Germany and France. In general three data categories were used:

- **Input-Output-accounts:** Input output tables and supply and use tables summarizes all economic transaction in an economy and describes their interlinkages.
- **National accounts:** The national accounts describe the creation, use and distribution of the gross domestic product. They are linked to the input-output accounts.
- **Labour market data:** Labour market indicators are separate from the national accounts. They describe supply and demand on the labour market by industries, occupation, educational attainment.

All nominal data is in million Euro. Real indicators are chain-linked volumes (2015) in million Euro. Hours worked are in thousand hours. Head numbers are in thousand.

Table 1: Data overview

Topic	Description		Time	Source
Input-Output-Analysis	Input output table	65 x 65 products	2009-2016	Eurostat
	Supply table	65 x 65 products x industries	2009-2016	Eurostat
	Use table	65 x 65 products	2009-2016	Eurostat
National accounts	Consumption of HH by consumption purpose, nominal and real	61 COICOP	1995-2018	Eurostat
	Value added, nominal and real	91 NACE	1995-2018	Eurostat
	Gross domestic product at market prices, nominal	Aggregate	1991-2018	Eurostat
	Value added, gross, nominal and real	Aggregate	1991-2018	Eurostat
	Final consumption expenditure of general government, nominal, real	Aggregate	1991-2018	Eurostat
	Individual consumption expenditure of general government, nominal, real	Aggregate	1991-2018	Eurostat
	Collective consumption expenditure of general government, nominal, real	Aggregate	1991-2018	Eurostat
	Final consumption expenditure of	Aggregate	1991-2018	Eurostat

COMPARATIVE QUANTITATIVE DATA ANALYSIS FOR LOGISTIC AND E-COMMERCE SECTOR IN FRANCE AND GERMANY

	households, nominal, real			
	Final consumption expenditure of NPISH, nominal, real	Aggregate	1991-2018	Eurostat
	Gross capital formation, nominal, real	Aggregate	1991-2018	Eurostat
	Gross fixed capital formation, nominal, real	Aggregate	1991-2018	Eurostat
	Changes in inventories and acquisitions less disposals of valuables, nominal	Aggregate	1991-2018	Eurostat
	Exports of goods and services, nominal, real	Aggregate	1991-2018	Eurostat
	Exports of goods, nominal, real	Aggregate	1991-2018	Eurostat
	Exports of services, nominal, real	Aggregate	1991-2018	Eurostat
	Imports of goods and services, nominal, real	Aggregate	1991-2018	Eurostat
	Imports of goods, nominal, real	Aggregate	1991-2018	Eurostat
	Imports of services, nominal, real	Aggregate	1991-2018	Eurostat
	External balance of goods and services, nominal	Aggregate	1991-2018	Eurostat
	External balance - Goods, nominal	Aggregate	1991-2018	Eurostat
	External balance - Services, nominal	Aggregate	1991-2018	Eurostat
	Compensation of employees, nominal	Aggregate	1991-2018	Eurostat
	Wages and salaries, nominal	Aggregate	1991-2018	Eurostat
	Employers' social contributions, nominal	Aggregate	1991-2018	Eurostat
	Taxes on production and imports less subsidies, nominal	Aggregate	1991-2018	Eurostat
	Taxes on production and imports, nominal	Aggregate	1991-2018	Eurostat
	Subsidies, nominal	Aggregate	1991-2018	Eurostat
	Taxes less subsidies on products,	Aggregate	1991-2018	Eurostat

COMPARATIVE QUANTITATIVE DATA ANALYSIS FOR LOGISTIC AND E-COMMERCE SECTOR IN FRANCE AND GERMANY

Labour market	nominal, real			
	Taxes on products, nominal, real	Aggregate	1991-2018	Eurostat
	Subsidies on products, nominal, real	Aggregate	1991-2018	Eurostat
	Final consumption expenditure, gross capital formation and exports of goods and services, nominal, real	Aggregate	1991-2018	Eurostat
	Hours worked	91 NACE	1995-2018	Eurostat
	Persons employed	91 NACE	1995-2018	Eurostat
	Total employment, national concept	Aggregate	1991-2018	Eurostat
	Total population national concept	Aggregate	1991-2018	Eurostat
	Employees national concept	Aggregate	1991-2018	Eurostat
	Self-employed national concept	Aggregate	1991-2018	Eurostat
	Compensation per employee	Aggregate	1991-2018	Eurostat
	Compensation of employees per hour worked	Aggregate	1991-2018	Eurostat
	Employment by educational attainment level (ISCED), by age, sex	5 age groups, 2 sex + total	2005 (2014 for FR) – 2018	Eurostat
	Part-time employment and temporary contracts, by age, sex	5 age groups, 2 sex + total	2005 (2014 for FR) – 2018	Eurostat
	Labour force, total, male, female	Aggregate	1991-2018	OECD
	Employment, total, male, female	Aggregate	1991-2018	OECD
	Self-employment	Aggregate	1991-2018	OECD
	Unemployment, total, male, female	Aggregate	1991-2018	OECD
	Percentage of employees with the right to bargain	Aggregate	1991-2018	OECD
	Shares of employment by type in total industry employment, male, female	23 NACE, 3 age groups, 3 ISCED	2008-2017	EU KLEMS
	Employment by occupation and economic activity	23 NACE, 11 ISCO	2008-2018	Eurostat

	Employment by occupation and educational attainment level	12 ISCO, 5 ISCED	2008-2018	Eurostat
	Employment by educational attainment level and socio-economic group	5 ISCED, 47 EUSEG	2011-2018	Eurostat
	Population by educational attainment level, 15-64	5 ISCED	2008-2018	Eurostat

Source: see data sources; own description

3 DATA PROCESSING

In order to work with the collected data it is necessary to transfer the data into a databank. This allows to work with the data in a more sophisticated way: (other) indicators can be calculated, data can be linked, adjusted etc.

The integration of all data into one databank requires the following steps:

- Rearrange the original data into a data format that can be read into the databank
- Define variable names for the data in order to identify them in the databank

After the original data has entered the databank, further data processing can be easily handled. Some data requires further processing, e.g. by filling gaps, by adjusting to similar classification scheme (e.g. aggregation routines may be necessary), in order to make data comparable.

Because a harmonized dataset has been used, the need for data processing is limited. However, some additional adjustments had to be made:

1. The leading sectoral classification is given by the dimension of the input-output-tables. The i-o-tables provided by Eurostat differentiate between 65 products. In order to link employment data with production data (for instance for calculating sectoral productivity), both datasets have to have the same sectoral differentiation. Employment data used in this analysis is more aggregated than in i-o-tables. Therefore, in order to obtain an equal sectoral level, employment data had to be disaggregated for some sectors. This was done by assuming that employment distributes according to its production. The same hypothesis was used for disaggregating hours worked to 65 sectors.
2. In all circumstances, it has been ensured, that all aggregates equal their sum over the sectors. That is, for instance, total production equals the sum over all sectoral production or number of female and male employees equal total number of employment.
3. It has also been ensured, that all identities of an economy remain stable. Total supply equals total demand at all times, for instance.

4 EX-POST ANALYSIS FOR THE TWO ECONOMIES FRANCE AND GERMANY

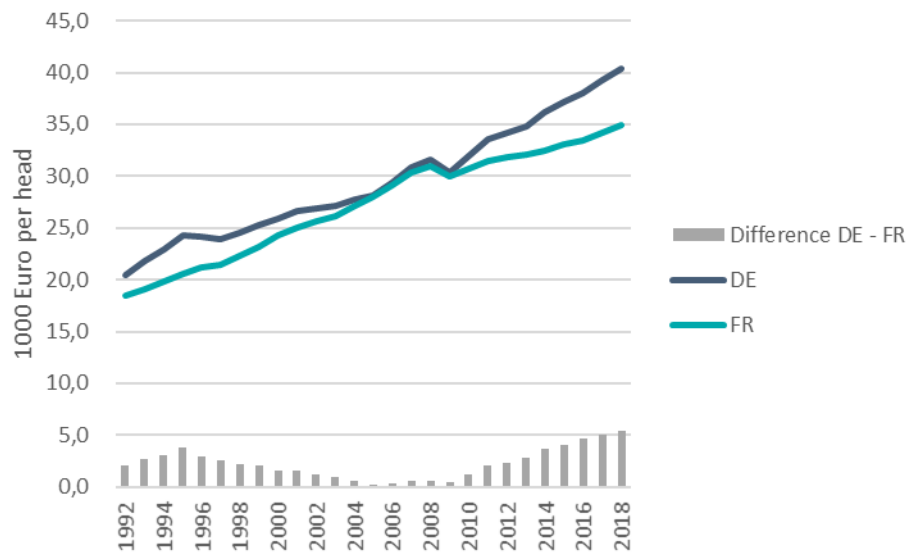
The analysis is based on five different angles to look at the economy: first, the aggregate angle (chapter 4.1) which helps to classify the overall economy in a more general way. Then, in chapter 4.2, the observation closes in on sectoral level. By applying input-output analysis, it is possible to tickle economic specifications that are not possible to see on aggregate level. Follow-up, chapter 4.3 concentrates on labour demand and describes the employment situation in France and Germany not only on sectoral but also on occupational and educational level. Chapter 4.4 looks at the supply side of the labour market. And, finally, chapter 4.5 matches both sides of the labour market.

4.1 MAIN AGGREGATES

4.1.1 GROSS DOMESTIC PRODUCT (GDP) PER HEAD OF POPULATION

Gross domestic product is a widely accepted indicator to measure the economic power of a country, although its drawbacks and alternative indicators has been intensively discussed (e.g. Stiglitz et al 2010). Nominal GDP in absolute values is, however, only limited useful for comparison because GDP depends on the size of a country in resources, technology or manpower. A better indicator therefore is the relation **GDP per head of population**. It measures the economic output per head. Figure 1 shows GDP per head of population for Germany and France. Over the total observed period, Germany continues to have a higher GDP per head compared to France. The indicator adjusts considerable during 2004 and 2010. Different reasons can explain this adjustment process: on the one hand, Germany was economically in a very bad shape in 2004 and the years after and had to suffer especially strong from the world economic crisis in 2008/2009. On the other hand, Germany's population was continuously shrinking during 2003 and 2011, unlike France's population which kept on growing. The drift apart of GDP per head in the years after 2011 is mainly due to the strong GDP increase in Germany, although Germany's population began to increase as well as follow-up of European depth crisis in the aftermath of 2009 and the increase in refugees in 2015.

Figure 1: GDP per head of population



Source: Eurostat

4.1.2 GROWTH CONTRICUTION OF GDP COMPONENTS

Table 2 represents real GDP growth and **growth contributions of GDP components** for France and Germany. Growth contribution of domestic demand components are in general very similar in both countries, only fluctuations due to different economic cycles can be observed. This is especially the case in the economic downswing in Germany in 2004 and the years after. However, a remarkable difference can be seen when looking on export and import demand growth components. Independent of economic cycles, export growth contribution is in general higher and import growth contribution in general lower in Germany compared to France. This is a first indicator that Germany is stronger integrated in world markets than France.

Table 2: Price adjusted GDP and its components, growth contribution in %

	1995	2000	2005	2010	2015	2016	2017	2018
France								
Gross domestic product	2,1	3,9	1,7	1,9	1,1	1,1	2,3	1,7
Private consumption	0,8	1,8	1,3	0,9	0,8	0,9	0,7	0,5
NGO consumption	0,1	0,1	0,0	0,1	0,0	0,0	0,0	0,0
State consumption	0,0	0,4	0,3	0,3	0,2	0,3	0,3	0,2
Gross fixed capital formation	0,3	1,4	0,6	0,5	0,2	0,6	1,0	0,6
Inventories	0,6	0,4	-0,0	0,2	0,2	-0,4	0,2	-0,3
Exports	1,6	3,0	1,0	2,2	1,4	0,5	1,2	1,1
Imports	-1,3	-3,2	-1,5	-2,3	-1,8	-0,9	-1,3	-0,4
Germany								
Gross domestic product	1,5	2,9	0,7	4,2	1,7	2,2	2,5	1,5
Private consumption	0,8	0,9	0,4	0,4	1,0	1,2	0,7	0,6
NGO consumption	0,1	0,1	-0,0	0,0	-0,0	0,0	0,0	0,1
State consumption	0,4	0,3	0,1	0,3	0,5	0,8	0,5	0,3
Gross fixed capital formation	-0,0	0,5	0,2	1,0	0,4	0,8	0,5	0,7
Inventories	0,3	0,4	-0,5	1,3	-0,4	0,1	0,6	0,3
Exports	1,2	3,4	2,2	5,4	2,5	1,1	2,3	1,0
Imports	-1,3	-2,6	-1,7	-4,2	-2,2	-1,7	-2,1	-1,5

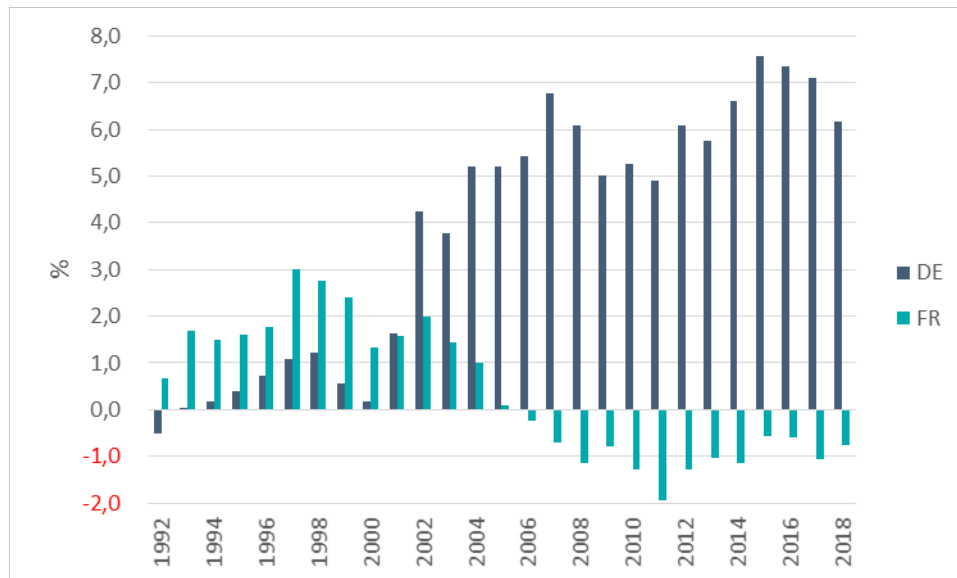
Source: Eurostat

4.1.3 RATIO OF EXTERNAL BALANCE TO TOTAL GDP

The **ratio of external balance to total GDP** is shown in Figure 2. It illustrates the above observation of Germany's strong integration on world markets more dramatically. While in the 1990s, France had a positive external balance which was also larger than Germany's external balance, the situation changed in the early years of the twenty-first century. Germany's external balance began to grow rapidly with the beginning of the European Monetary Union (EMU). At the same time, the French external balance began to decline and its ratio to nominal GDP even turned negative in 2006. Germany's export growth was accompanied also with an increase in imports, however to a much smaller extent. Germany's external balance ratio reached the above six percent level the first time in 2007 and continues

to remain over that benchmark level since 2013 onwards.¹ France, instead, continues to import more than it can export.

Figure 2: External balance ratio to total GDP, nominal



Source: Eurostat

4.1.4 AVERAGE GROWTH RATE OF TOTAL EMPLOYMENT

Looking at the labour market, the picture is the same: in the 1990s and early 2000s, France's employment growth was much stronger than the one in Germany. Only since 2006, this has changed. Since then, employment continues to grow in Germany stronger than in France. However, the **average growth rate of total employment** from 2000 until 2017 is almost similar: for Germany 0,6 % for France 0,5 %.² The Hartz-IV-reforms implemented in 2005 were not unambiguous in Germany, but studies have shown that they were at least one reason why Germany experienced a strong recovery on the labour market (Krebs & Scheffel 2013, Fahr & Sunde 2009).

4.1.5 EMPLOYMENT RATE

The **employment rate**³ in Germany exceeds the employment rate in France by 12 percentage points in 2017 (compare Figure 3). The employment rate in Germany always has been higher than compared to the employment rate in France, however, since 2007, Germany's employment rate continues to grow, despite a growing population since 2011. Therefore, job creation in Germany was very dynamic within the last decade. More and more people were able to enter the labour market. The reasons for that are various: the economic upswing after the world financial crisis was strong and lasting. At the same time, the labour market became tighter and firms "invested" in human capital. Also, labour market reforms

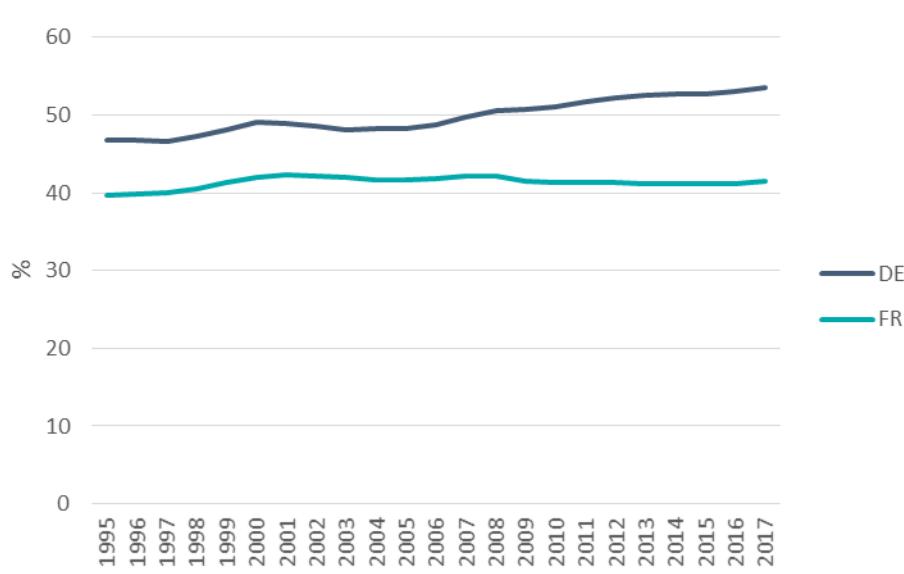
¹ European Commission regards an external balance ratio of above six percent as an external imbalance.

² The time span 2000 until 2017 has been chosen in order to keep the data clean from Germany's adaptation process on the labour market (especially in the construction sector) due to the unification process.

³ Total employment in relation to total population.

(e.g. increase of retirement age from 65 to 67 years of age), a growing participation rate of females and immigration of foreign labour had its impact on the overall employment rate in Germany. In France, in comparison, the employment rate remains more or less on the same level since early 1990s.

Figure 3: Total employment rate



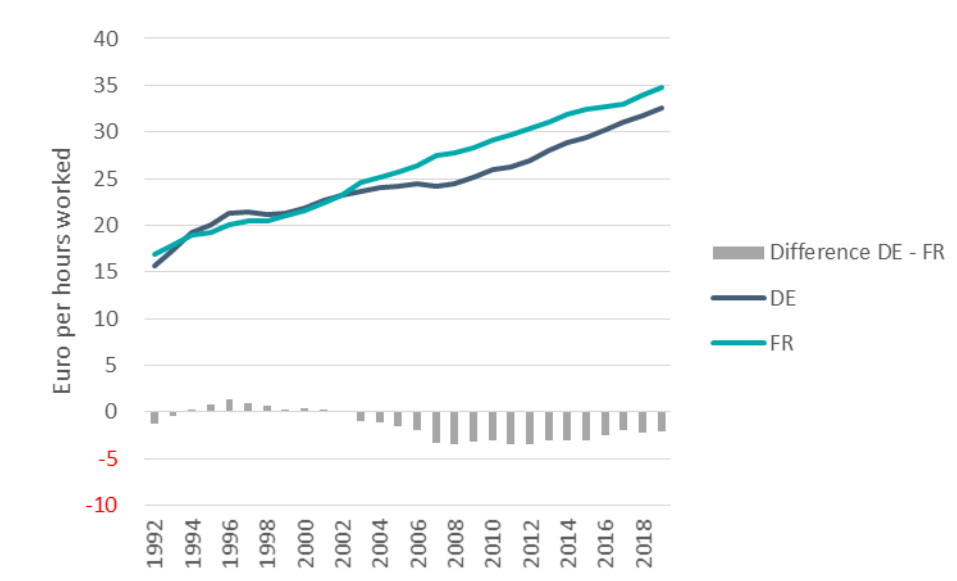
Source: Eurostat

The **employment rate by gender** differs considerably between both countries. In France, the employment rate of females exceeds the employment rate of females in Germany with 1,6 percentage points (2017). The overall employment rate of French females is 48,1 percent, in Germany this indicators is at 46,5 percent. Vice versa, male's employment rate is in Germany higher than in France. The larger proportion of female employment in France seems to be caused by a better reconciliation between family and work (Luci 2011). Also, French female employees work much more often in full-time jobs than German female employees (Luci 2011) which may be caused, according to Rötter (2014), among other by the high status of marriage in Germany.

4.1.6 COMPENSATION OF EMPLOYEES PER HOURS WORKED

Although France's labour market employs relative to its population less people than in Germany, the **compensation of employees per hours worked** is slightly higher in France. In France, one our worked – in average – is compensated with 34,7 EUR; in Germany with 32,6 EUR. During the 1990s, the average compensation of employees per hours worked were very similar in both countries. Only since the beginning of this century and together with the foundation of the EMU and the strong export growth in Germany, the increase in Germany's hourly compensation of employees slowed down considerably. A gap between France and German average hourly compensation of employees began to grow. Until today, the gap has not been declined considerably.

Figure 4: Compensation of employees per hours worked

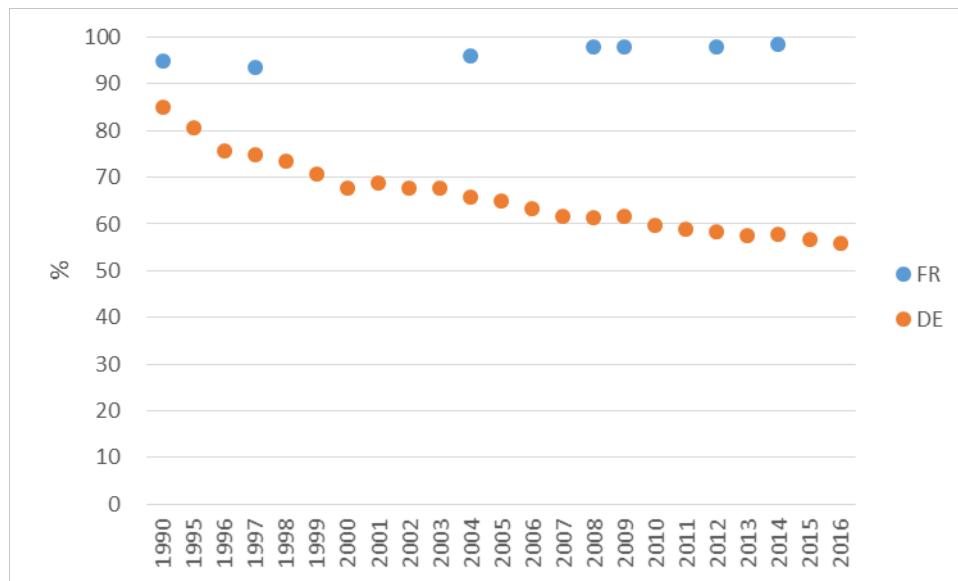


Source: Eurostat

4.1.7 COLLECTIVE BARGAINING COVERAGE

In the 2000s, Germany had been accused by applying a “beggar-thy-neighbour” policy – which is short for one country’s attempt to solve its economic problems by means that tend to worsen the economic problems of other countries. In the case of Germany, its increasing current account surplus was only possible because domestic wage increases were too moderate. And because Germany did not import enough, other economies could not earn enough with their exports. Slow wage increases in Germany were induced by the bad labour market situation in the early 2000s when unemployment rate was high. Until today, wages in Germany are still below European average (Herzog-Stein et al. 2016). Wages are the result of wage bargaining between social partners. However, Germany has become less organised in unions which lowers the wage power of employees in many sectors. Figure 5 shows collective bargaining coverage in France and Germany. The difference is enormous: while France reaches nearly a coverage of 100 percent, Germany is approaching a coverage of 50 percent.

Figure 5: Collective bargaining coverage



Source: OECD, own presentation

4.1.8 SUMMARY OF INDICATORS

Table 3 summarizes the main indicators for describing the general economy in France and Germany. Overall, Germany is the economically more powerful country – although mostly driven by its excessive positive external balance. The labour market in both countries seems to be evenly dynamic, whereas in Germany more people participate on the labour market while in France employed persons get better payed. One reason for that may be the much better collective wage bargaining coverage in France than in Germany. Female employment is more pronounced in France than in Germany.

Table 3: Summary of indicators: Main Aggregates

	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
GDP per head	2018	40,3			35,0			Thousand Euro per head
Ratio external bal- ance	2018	6,2			-0,8			Percent of nominal GDP
Average growth rate of total em- ployment f	2017	0,6			0,5			Percent 2000- 2017
Employment rate, total	2017	53,5			41,5			Percent of to- tal population
Employment rate, female	2017	46,5			48,1			Percent of to- tal employ- ment
Compensation of employees per hours worked	2018	32,6			34,7			Euro per hours worked
Collective wage bargaining cover- age	2014	57,8			98,5			Percent

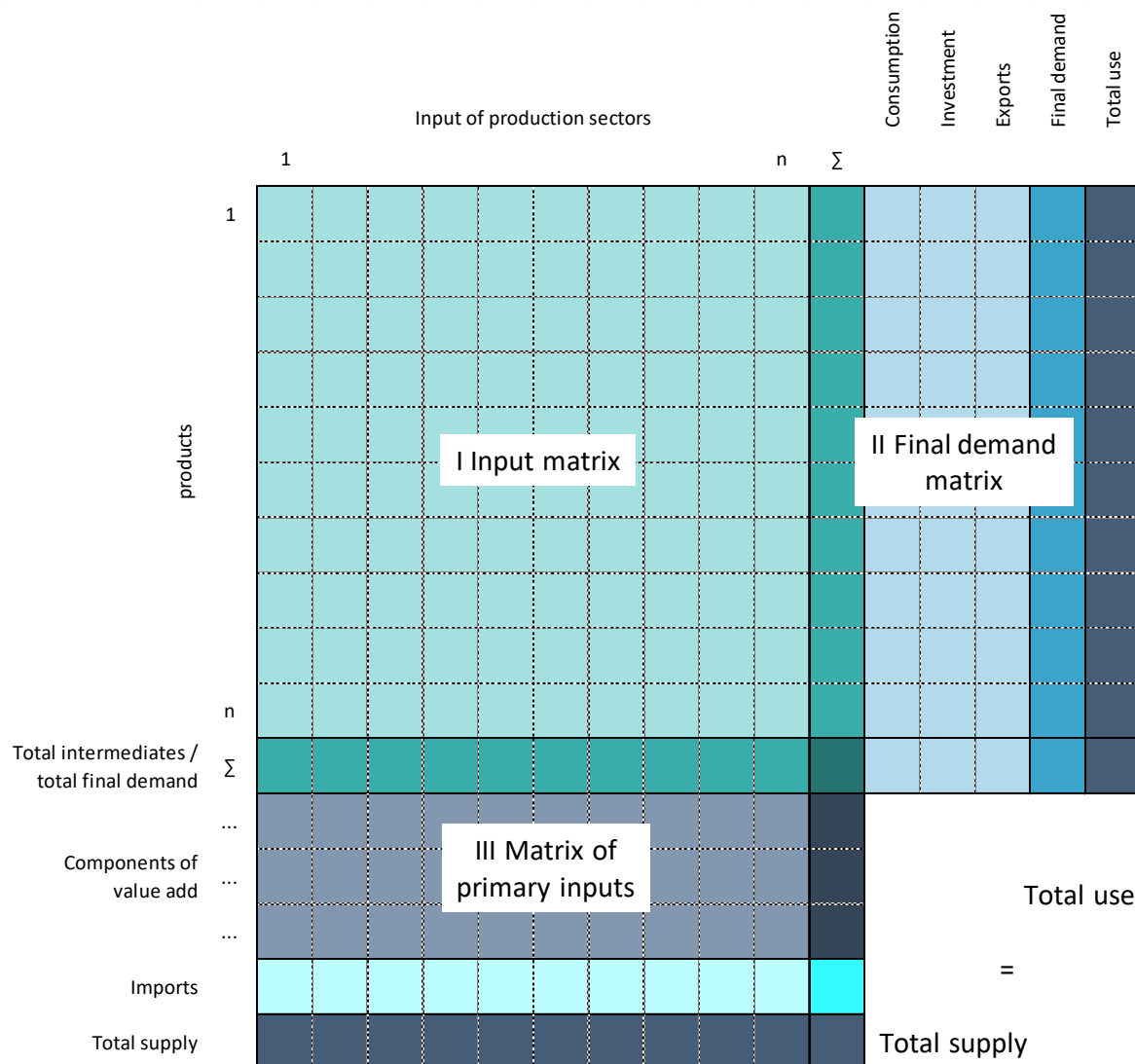
4.2 SECTORAL ECONOMIC DIFFERENTIATION

Sectoral economic differences and similarities can be easily disclosed by using input-output-analysis. Input-output-analysis is based on supply and use tables together with input-output tables. They provide detailed information for a given year on production activities, the supply and demand of goods and services, intermediate consumption, primary inputs and foreign trade. They give information – among others – on the structure of the costs of production and the value added, which is generated in the production process, on the interdependencies of industries, on the flows of goods and services produced within the national economy and on the flows of goods and services with the rest of the world.

Figure 6 shows schematically the logic of input-output tables. The turquoise marked part shows the input-output interdependence, which describes the cost and demand structure between products and production sectors. The light blue boxes together form the final demand. The primary inputs (compensation of employees, net production taxes, depreciation) are the grey boxes. The row and column totals give the total use and the total supply (dark grey boxes), which by definition must be identical. Domestic production is the sum of intermediate consumption inputs and gross value added. If imports are added, total supply is

obtained.

Figure 6: The three quadrants of input-output-tables



Source: Statistisches Bundesamt 2010, own presentation

Supply, use and input-output tables (i-o-tables) are taken from Eurostat. They distinguish between 65 products and 65 production sectors. Table 34 in the Annex describes the sector coverage. The input-output tables follow ESA 2010 methods and concepts. The i-o-tables from Eurostat differ in one aspect to the i-o-tables published by the German statistical office:

The i-o-table from the German statistical office include intra-firm deliveries and services (also called processing production) in the production values and intermediate consumption. The input-output tables explicitly show which internal company deliveries and services are included in the production values of the individual production areas. The Eurostat tables exclude intra-firm deliveries and services and are therefore in general lower in value. For some industries, processing production is more important than others. For example, the agriculture industry shows a much higher intermediate demand value when processing production is included.

While chapter 4.1 described the economic similarities and differences on aggregation level, input-output-analysis allows to describe economic activities on sectoral level. The aggregation level is defined by the dimension of the i-o-tables. The following analysis considers all 65 sectors. But main focus is given to these two industries:

- **Commerce sector**

corresponds to NACE Rev. 4 level 47 - *<Retail trade services, except of motor vehicles and motorcycles>*. It covers the resale of new and second-hand goods mainly to households for private use or consumption, in sales premises, including department stores, at market stalls, by mail order companies, in street trading and door-to-door sales, consumer cooperatives, etc. E-Commerce is part of this industry, but is not separated within the systematic of supply, use and input-output-tables.

- **Logistic sector**

is represented in two sectors following the NACE Rev. 4 classification: *<Warehousing and support services for transportation>* (NACE Rev 4 level 52) and *<Postal and courier services>* (NACE Rev 4 level 53). *<Warehousing and support services for transportation>* includes warehousing and the provision of other transport services, such as the operation of transport infrastructures (e.g. airports, ports, tunnels, bridges, etc.), traffic brokerage and freight handling. *<Postal and courier services>* includes postal, courier and express services such as the collection, transport and delivery of letter and parcel post under various regulations. Local delivery and courier services are also included.

4.2.1 DIVERSIFICATION DYNAMIC: PRODUCTION IN MAIN AND SIDE ACTIVITIES

The field of activity of companies usually covers a wide range of activities. In addition to the core economic activity, activities in areas that do not fall within the company's main economic focus are also incurred as a side effect or for reasons of diversification. The volume of gross production generated in secondary fields of activity can be quantified using the supply tables. The supply table shows the production values of the individual economic sectors broken down by groups of goods. Total production whether over groups of goods or over economic sectors has to be equal.⁴

However, **production by economic sector or production by group of goods** can be different. If production by economic sector is larger than production by product groups, the economic sector is more diverse. The main economic focus (specified by production by product group) is not the only area of activity. If production by economic sector equals production by product group, the sector is purely concentrated on its key activity. If production by economic sector is lower than production by product group, the economic sector is less active in its key activity and more engaged in other activities.

The diversification in production by economic sectors is very different between France and

⁴ The following analysis is limited by the German supply table published by Eurostat which does not equal in row sum and column sum. Confidential data for the two economic sectors *<Real estate activities excluding imputed rents>* and *<Imputed rents of owner-occupied dwellings>* are the reason for that.

Germany. Using the European supply tables, Germany shows a much stronger diversification of its sectors than France.

In Germany, most sectors are also very active in side activities. Especially the manufacturing industry is more diverse: the motor vehicle industry, pharmaceutical and chemistry industry followed by manufacturer of machines are those industries with strong additional production in side activities. Among service sectors, it is the financial industry that also is very active in side activities.

In France, it is the other way round. The manufacturing industry is mainly concentrated on their main activities. They hardly engage in other activities. Meanwhile, it is the service sector that is more productive also in other areas. This is especially the case of public administration, scientific research and human health. Beside that, it is the agriculture sector that is also very diverse.

Table 4 shows production in main and side activities for the two sectors <logistics> and <commerce>. It confirms that in France as well as in Germany, the production difference between main and side activities are very small respectively do not exist.

For both countries the observation is valid that between 2010 and 2016, the production in side activities has gained importance. Whereas in Germany, it is mainly the manufacturing industry that is getting more diverse in production, in France it is the public sector as well as the agricultural sector which is following this strategy. In both countries, the two sectors under focus, logistic and commerce, no or hardly no diversification strategy can be observed within the last years. It is only the German logistic sector that shows between 2010 and 2016 a stronger dynamic in production growth by industry than by products and therefore a stronger tendency for diversification. The average growth difference is 0.4 percentage points.

Table 4: Summary of indicators: Diversification dynamic

	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
Dynamic of diversification in production	2016		0,0	0,4		0,0	0,0	Difference in average growth rate in % points

4.2.2 NOMINAL PRODUCTION, SHARE OF TOTAL EMPLOYMENT AND DYNAMIC IN HOURS WORKED

France and Germany have different core industries in production. Looking at the **share of nominal production**, Germany's main production industry is the car industry and France's major production industry is construction. Construction is also an important industry for Germany. However, the share of production is with 5,5 percent significantly smaller than the share in France (7 percent of total production). Although France hosts major car companies like PSA, the car industry only holds a share of 1,5 percent of total production. The German

car industry, instead, has a share of 6,2 percent. The importance of public administration in France is represented by a share in total production of 4,9 percent. In Germany, public administration reaches a similar high share of 4,7 percent. Only slightly overtaken by the real estate industry with 4,8 percent. Focusing on the two sectors under observation, Germany is more dominant in logistics, while France is more dominant in commerce. However, the difference is more significant in the logistic sector, than in the commerce industry (compare Table 5).

Table 5: Sub-summary: share of production

	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
Share of total pro- duction	2016		3,3	3,1		3,8	1,9	%

The **dynamic in production** differs between both countries in total and in sectors. Between 2010 and 2016, Germany's nominal production grew by average 3,1 percent per year. At the same period, France's production increased with 1,6 percent per year considerably slower. However, the reason for these growth differences can be twofold: either price changes (value growth) or quantity changes (volume growth) stimulate higher or lower growth rates.⁵ In both countries, the increase in nominal production takes place especially in service sectors. The manufacturing sector is not the driving engine for production growth. Moreover, especially in France, it is the manufacturing sector that has to cope with declining average growth rates in production. The logistic sector is one of the major growing sectors in Germany. While it is also a sector with an above-average growth rate of production in France (2,2 percent), the average increase is significantly lower compared to Germany (4,8 percent). Production in the commerce sector is growing only slightly below average in Germany. With 2,0 average growth rate, in France, it is a sector with an above-average growth rate (compare Table 6).

Table 6: Sub-summary: dynamic in production

	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
Average growth rate of nominal production	2016	3,1	2,9	4,8	1,6	2,0	2,2	Percent 2010- 2016

Employment concentrates in France and in Germany on service sectors. In France, most

⁵ Input-output-tables are not published price-adjusted.

employment is concentrated in the public administration sector (8,7 percent of total employment), in Germany it is the commerce sector that employs most people (7,3 percent of total employment). The commerce sector (compare Table 7) is also in France a major employer with a **share of total employment** of 7,5 percent. In Germany it is the health and care sector that employs many people as well, in France it is the education sector. The logistic sector only has an employment share of 2,8 percent in Germany which is slightly higher than in France (1,8 percent).

Table 7: Sub-summary: share of total employment

	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
Share of total employment	2017		7,3	2,8		7,5	1,8	%

The **dynamic in hours worked** corresponds in general with the dynamics in employment. Whereas between 2000 and 2017 total employment grew in average with 0.6 percent in Germany and by 0.5 percent in France, hours worked grew in the same period by 0.3 percent in both countries. This slightly less dynamic development in working time can be explained with a growing demand in part-time work. The development in France and Germany for commerce and logistics is very different. In Germany, the commerce sector declined in terms of hours worked whereas in France the same sector grew. Vice versa the logistic sector: Germany shows a strong upswing in hours worked and France a decline (compare Table 8).

Table 8: Sub-summary: dynamic in hours worked

	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
Average growth rate of total hours worked	2017	0,3	-0,4	1,0	0,3	0,6	-0,5	Percent 2000-2017

4.2.3 DIRECT AND INDIRECT PRODUCTION

Domestic production is the result of direct and indirect production processes. With Input-output-tables those production impacts can be decomposed.

Total production is calculated via the Leontief equation. Using the Leontief inverse $(I - A)^{-1}$ – A is the domestic input coefficient matrix and I is the identity matrix – and by multiplying it with final domestic demand (fdd) gives gross production (ygn) for each of the 65 products considered. The Leontief inverse can be referred to as total (inverse) input coefficients. They show the direct and indirect input of products i absorbed by the production of one unit

of final demand of product j .

$$[1] ygn = (I - A)^{-1} * (fdd)$$

Direct production effects considers all production related to produce one unit of this product in other industries. This direct effect on other industries is calculated by multiplying final demand with the input coefficient matrix A . A represents direct (technical) input coefficients. They show the immediate use of product i per unit of output of product j . The direct input coefficients reflect the structure of costs on purchases of intermediate products.

$$[2] ygnd = A * (fdd)$$

Indirect production effects are the remaining volume in order to balance total production. Indirect production effects $ygni$ are production effects induced by those industries that are directly affected by the production of one additional unit of a certain product. The indirect production effect for cars extends the direct impact by adding the intermediate demand of those industries (e.g. copper) that need to produce their intermediate product (e.g. electronic devices) for the car industry.

$$[3] ygni = ygn - ygnd$$

Table 9 shows the decomposition of production for selected industries for the year 2016 in percentage of total production. In nearly all sectors, indirect production is higher than direct production. For the total economy, direct production accounts for around one fifth of total production. The average is for France (21 percent of total production) and Germany (23 percent of total production) more or less the same. The indirect effects are therefore the main drivers of an economy. The higher (the lower) the direct (the indirect) effect, the less interconnected is the economy respectively the sector. Generally speaking, the indirect production effect is higher the more the sector is integrated in production chains. Looking at Table 9, the agriculture sector has a relative low share of indirect production, both in Germany and in France. In contrast, the indirect effects induced by the car industry are very high. The indirect production effects of the car industry are nearly two third larger compared to the agricultural sector.⁶

Table 9: Direct and indirect production share in % to total production, 2016

		Germany			France		
		Direct	Indirect	Total	Direct	Indirect	Total
1	Agriculture	46	54	100	40	60	100
20	Car industry	16	84	100	8	92	100
30	Commerce	22	78	100	3	97	100
34+35	Logistics	42	58	100	42	58	100

⁶ Figure 19 in Annex shows for the twenty top production industries the decomposition of direct and indirect production.

The logistic sector shows a similar decomposition of direct and indirect effects in France and in Germany. The share of indirect effect on total production is in both countries at 58 percent. Compared to overall average, the logistic sector has – similar to the agriculture business – more directly affected than other sectors. Different the commerce sector. Production in this sector nearly almost totally depends on indirect production. Table 10 illustrates the ratio of direct and indirect production for 2016. The lower the ratio the higher the indirect production effect. In commerce services, France shows a much larger indirect production than Germany.

Table 10: Sub-summary: Direct and indirect production ratio, 2016

	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
Ratio of direct to indirect production	2016	0,30	0,27	0,73	0,27	0,04	0,73	ratio

4.2.4 EXPORT-INDUCED PRODUCTION

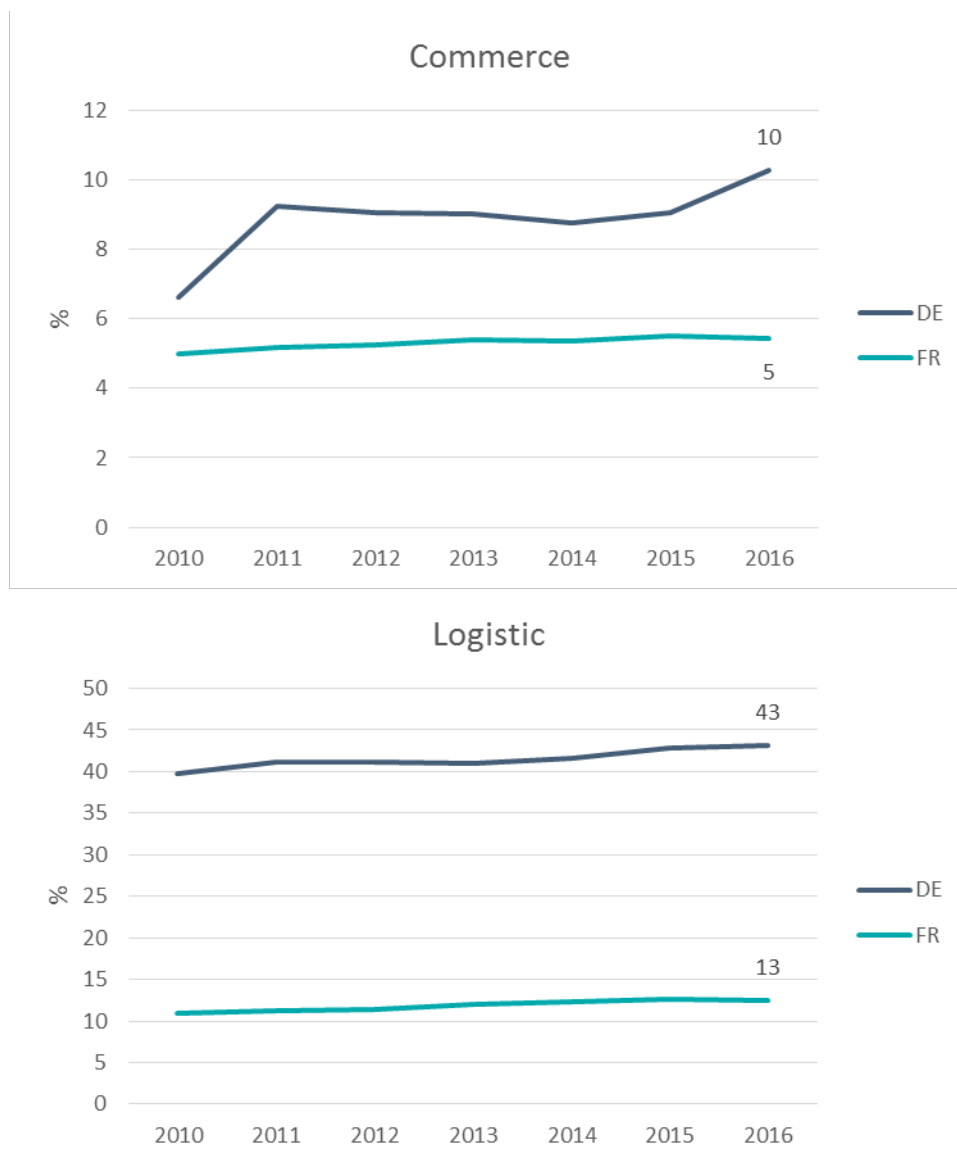
Export induced production indicates to which extent a sector's domestic production depends on export demand. A country or sector with a strong export dependency can have many advantages but also a lot of disadvantages. In times of dynamic world trade, an export-dependent production is beneficial for an economy. In times of world trade recession, the negative impact on domestic production can be very large.

Direct and indirect export-induced production exy is calculated by multiplying domestic export demand vector $dexn$ with the (domestic) Leontief inverse $(I - A)^{-1}$.

$$[1] \text{ } exy = (I - A)^{-1} * (dexn)$$

In Germany, over one third of total production (36 percent) is linked to export demand. In France, it is 26 percent of total production – ten percentage points less. The strong export dependency can be observed in nearly all sectors in Germany. In general, all of the 65 sectors have a larger share of export dependent production in Germany compared to France. Figure 7 shows for commerce and logistic sector the share of export induced production to total production for Germany and France. In both sectors, production in Germany depends more on exports than in France. The difference is especially striking for the logistic sector. France is therefore more resilient towards global crisis, but it has also more difficulties in taking advantage of global upswings.

Figure 7: Share of export induced production to total production by sectors



Source: Eurostat, own calculation

Table 11: Sub-summary: Share of export induced production to total production in %, 2016

	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
Share of export in- duced production to total production	2016	36	10	43	26	5	39	%

4.2.5 IMPORT DEPENDENCY OF PRODUCTION

Nowadays, an autarkic situation of an economy is not common. Usually, economies show a certain degree of import dependency in their production. Domestic production can be

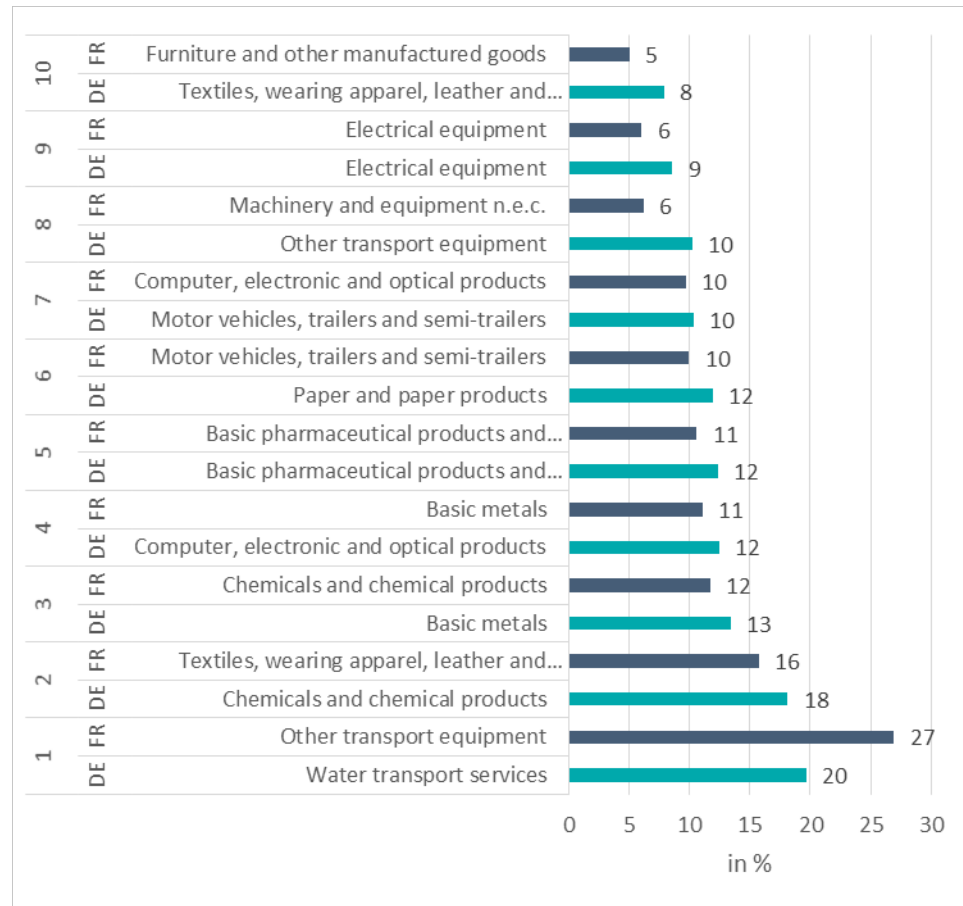
generated through domestic input factors alone, or through a combination of domestic and imported input factors. Again, **import dependency of production** can have advantages but also disadvantages for an economy. Usually, high import dependency of production indicates that an economy – or sector – takes advantage of better production opportunities in other economies of the world. Better production opportunities in other economies can have different characteristics: e.g. low labour costs, access to resources etc. Together they can be summarized as comparative advantages of trade (Ricardo 1817). In contrast, high import dependency of production is vulnerable to global or regional crisis when global supply chains stagnate or collapse.

Total import for the output of total final demand goods im requires the multiplication of the import coefficient matrix MNC with the Leontief-inverse $(I - A)^{-1}$ and final domestic demand fd .

$$[2] \quad im = MNC * (I - A)^{-1} * fd$$

Figure 8 summarizes the ten sectors with the highest share of total imports required for output of total final demand goods. The graph shows that France's import content is strongly concentrated by sectors, whereby Germany shows a more diverse but also strong import content across sectors. For the total economy, the share of imports needed for the output of total demand to total production is roughly 3 percent and therefore larger than for France (1,8 percent). The indicator confirms, that Germany's production, overall, is more dependent on global value chains than France. In both countries, production in the commerce sector has no import influence. The logistic sector, again, depends more on imports in Germany than in France.

Figure 8: Share of import content of production to total production by top-10 industries in France (FR) and Germany (DE), 2016



Source: Eurostat, own calculation

Table 12: Sub-summary: share of import dependent production to total production in %, 2016

	Year	DE			FR			Unit
Share of import dependent production to total production		Total	Com-merce	Lo-gistic	Total	Com-merce	Lo-gistic	
	2016	2,8	0,0	1,2	1,8	0,0	1,0	%

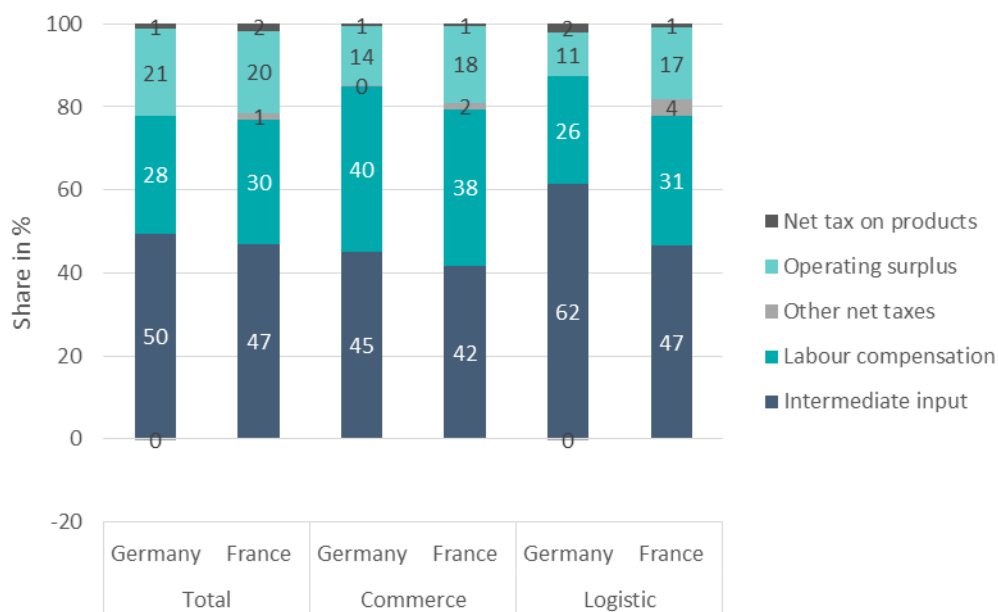
4.2.6 COMPOSITION OF PRODUCTION

Domestic production is the sum over intermediate input, value added and net taxes on products. Intermediate input can be interpreted as (material) costs necessary for production. Gross value added describes the income generated by each sector through labour compensation, operating surplus or other net taxes. Net taxes on products are taxes on products minus subsidies on products. While intermediate inputs are (material) inputs for production, value added are costs on top of intermediate products necessary to produce

one unit. The primary input matrix therefore measures the use of primary production factors – material (“land”), capital and labour – in the production process (Statistisches Bundesamt 2010).

Figure 9 shows the **composition of production** for the whole economy. Value added is decomposed in its single components. German production is determined with 49 percent by value added and 50 percent by intermediate input. It is almost half:half the share between material costs and other costs (mainly labour costs). In France the composition of production is only slightly different with a little bit more emphasis on value added (51 percent) than on intermediate input. The commerce sector shows in both countries a below average share of intermediate inputs. Production in commerce is less material intensive than most other sectors. Instead, value added is rather high and mainly determined by labour costs. The logistic sector, instead, functions differently in France and in Germany. Whereas in Germany, production is mainly and significantly above average determined by intermediate inputs (62 percent), France’s logistic sector shows an average composition of production. The share of value added is much larger compared to the German logistic sector.

Figure 9: Components of net production, 2016



Source: Eurostat, own calculation

Table 13: Sub-summary: share of value added to production in %, 2016

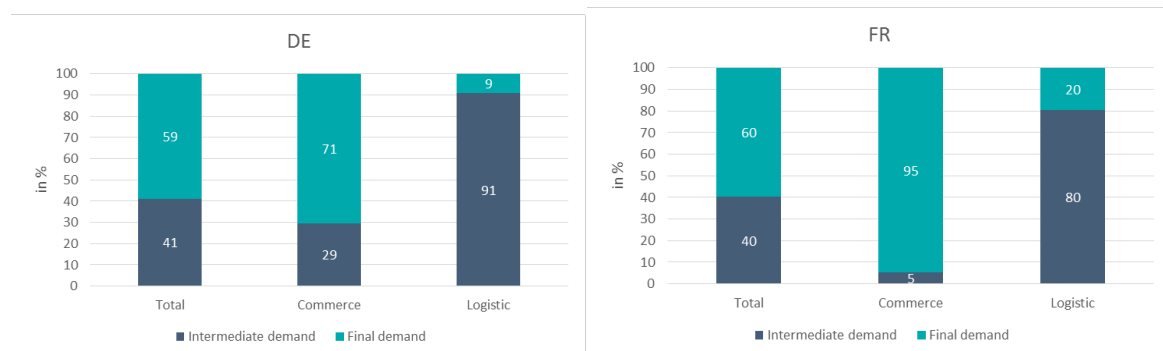
	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
Share of value added to production	2016	49	54	36	51	58	52	%

4.2.7 COMPOSITION OF TOTAL FINAL USE

The demand structure offers information about the total final use by products. It is represented in the final demand matrix in Figure 6. Total final use can be decomposed by demand in intermediate products and demand for products for final demand. One part of the domestically produced or imported goods is used as intermediate consumption, which is the content of the first quadrant. Another part is available for final demand, i.e. for goods that do not circulate in the economy. Column wise, the demand matrix shows the goods composition of the categories of final demand, such as consumption and exports. Row wise, the matrix shows what the manufactured end products are ultimately needed for.

Total final use is the sum over total intermediate consumption and total final demand. Total intermediate consumption is the demand of sectors for intermediate products. Final demand is the demand for products that are not further processed (end product). In Germany as well as in France, final demand dominates with around 60 percent total use. The share of intermediate demand is in both countries around 40 percent in total use. Sector specific differences are, however, striking. Although, in tendency, in both countries commerce is less and logistic is more dependent on intermediate demand, the differences between German and French firms are significant. In France, the commerce sector depends nearly completely on final demand, in Germany the sector also experiences demand from other sectors. In Germany, around one third of intermediate demand is derived from food sector, accommodation and food sector and health sector. The German logistic sector, instead, is nearly completely dependent on intermediate demand, while the logistic sector in France is significantly stronger influenced by final demand components.

Figure 10: Composition of total final use, 2016



Source: Eurostat, own calculation

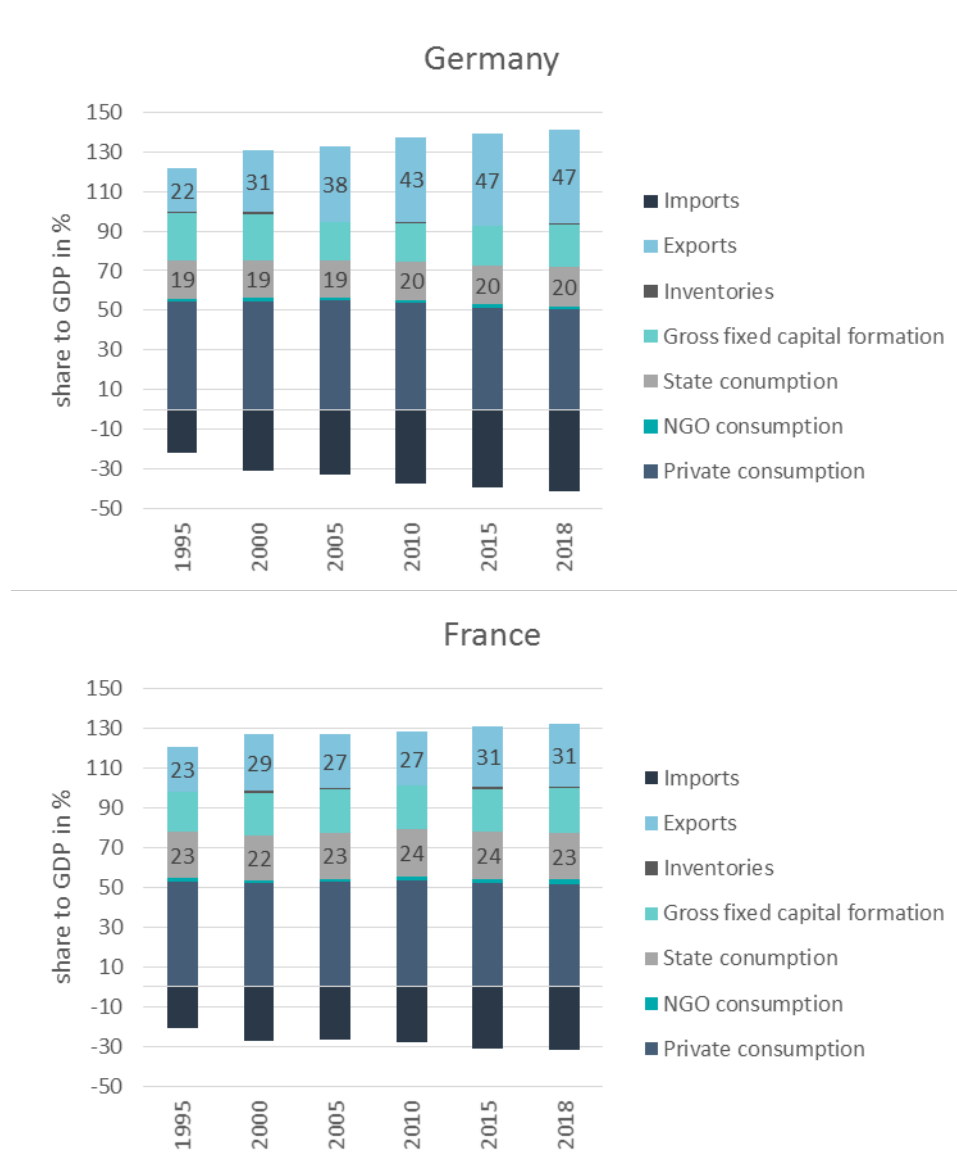
Table 14: Sub-summary: share of final demand on total use in %, 2016

	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
Share of final de- mand on total use	2016	59	71	9	60	95	20	%

4.2.8 COMPONENTS OF FINAL DEMAND

Final demand by sectors can be decomposed by its single demand components: private consumption, consumption of non governmental organisations (NGO), state consumption, gross fixed capital formation, inventories or exports. For the total economy, the decomposition of final demand differs not in all but in some aspects. The largest difference can be observed in the share of exports and imports to nominal GDP. The shares are significantly larger in Germany than in France. In contrast, France shows a much larger share of state consumption to nominal GDP than Germany. Therefore, nominal GDP depends in France more on state consumption and in Germany more on external balance (compare Figure 11).

Figure 11: Share to nominal GDP in %



Source: Eurostat, own calculation

Table 15 summarizes for selected years the demand components for the commerce and

logistic sectors in percent of total final demand. The commerce sector is very similar decomposed in France and Germany. The majority of final demand is dedicated to private consumption. The share to total final demand is a little bit higher in Germany than in France. In France, the commerce sector is also affected to a larger extent by state consumption and foreign demand. The logistic sectors, instead, is differently decomposed in both countries. In France, the share of private consumption in total final demand is nearly twice as high as in Germany. In contrast, the logistic sector in Germany depends to a larger extent on foreign trade. Also, state consumption plays a role on the demand side of the logistic sector; in France not at all.

Table 15: Decomposition of final demand components, % of total final demand

		DE	FR	DE	FR	DE	FR
		2010	2010	2013	2013	2016	2016
Commerce sector	Private consumption	94	88	93	88	92	88
	Consumption of NGOs	0	0	0	0	0	0
	State consumption	4	7	5	7	5	7
	Gross fixed capital formation	2	1	2	1	3	1
	Inventories	0	0	0	0	0	0
	Exports	0	3	0	4	0	4
	Private consumption	33	60	36	60	35	55
Logistic sector	Consumption of NGOs	0	0	0	0	0	0
	State consumption	18	0	17	0	14	0
	Gross fixed capital formation	0	1	0	1	0	1
	Inventories	0	0	0	0	0	0
	Exports	49	39	47	39	52	45

Source: Eurostat, own calculation

Table 16: Sub-summary: share of final demand components in %, 2016

	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
Share of private consumption to total final demand	2016	34	92	35	38	88	55	%
Share of exports to total final demand	2016	35	0	52	23	4	45	%

4.2.9 IDENTIFICATION OF KEY SECTORS: BACKWARD AND FORWARD LINKAGES

The previously discussed indicators in chapter 4.2.3 to 4.2.5 were indicators that comment on the integration of an economy/sector in domestic and global value chains. A different way to analyse industrial interdependency is to use the inverse input coefficient matrix which shows the direct and indirect linkages between sectors. The inverse matrix can be interpreted in two ways: backward and forward linkages.

Backward linkages describe the connection of an industry with its **suppliers**. If industry j increases its output, it will increase its demand on other sectors whose goods are used as inputs to production in j . This effect is known as backward linkage and shows the direction of causation in the usual demand-side model (Gorska 2015: 31). The column sum of the inverse (technical) input coefficient gives the total backward linkages bl for sector j . The sector with the biggest backward linkage is important, because if the final demand of all industries' goods increases by 1 unit, it will result in the biggest increase in total output of this sector. The most backward-linked industry provides the biggest demand-push effects on the economy.

$$[3] \ bl_j = \sum_{i=1}^n INVERSE_{i,j}$$

Forward linkages describe the connection of the industry with its **clients**. The increased output in industry j means that additional amounts of its products are available to be used as inputs to other sectors for their own production – there will be increased supplies from sector j for the sectors that use its goods in their production. Forward linkages shows the direction of causation in the supply-side model (Gorska 2015: 31). The row sum of the inverse (technical) input coefficient gives the total forward linkages fl for sector i .

$$[4] \ fl_i = \sum_{j=1}^n INVERSE_{i,j}$$

The deficits of the two definitions of forward and backward linkages above described are that the weight of each transaction in total transaction is not accounted for. Therefore, some normalisation measures can be applied to better account for the different proportion of an industry to total output.

First the weights matrix W describes the share of each cell of the intermediate demand matrix Z to total intermediate demand.

$$[5] W_{i,j} = \frac{Z_{i,j}}{\sum_{i=1}^n \sum_{j=1}^n Z_{i,j}}$$

Multiplied with the inverse input coefficient matrix defines the weighted Leontief inverse matrix $WINVERSE$.

$$[6] WINVERSE_{i,j} = INVERSE_{i,j} * (1 + W_{i,j})$$

With the weighted inverse matrix $WINVERSE$ the column sum and row sum are recalculated with weighted backward linkage wbl and weighted forward linkage wfl .

$$[7] wbl_j = \sum_{i=1}^n WINVERSE_{i,j}$$

$$[8] wfl_i = \sum_{j=1}^n WINVERSE_{i,j}$$

Both indicators are always larger than 1 because the diagonal elements are always above 1. That means, that one additional demand for product i at least produces one additional unit of product in sector j .

Table 17 categorizes sectors by their forward and backward linkages. Compared to the total average linkage factor, weak linkage sectors show in both attributes below average linkages. Strong forward linkage sectors are those sectors with an above average forward linkage and a below average backward linkage. Strong backward linkage sectors are vice versa. Key sectors can be identified by linkage factors that are above average in both forward and backward linkages.

Table 17: Categorizing sectors by forward and backward linkages

		Forward linkage	
		Low (<average)	High (>average)
Backward linkage	Low (<average)	Weak linkage sector	Strong forward linkage sector
	High (>average)	Strong backward linkage sector	Key sector

Source: Temursho (2016), own presentation

Germany and France have a similar but not identical average linkage factor. Germany's average forward and backward linkage factor is 1,7, in France it is 1,6. According to the classification of Table 17 and in combination with the average linkage factor, the following four categories of sectors can be described. Table 18 summarizes for 2016 and for all sectors their position in numbers and in colours (according to Table 17).

Weak linkage sectors: these are sectors that are relatively independent to other sectors, both along the supply chain and the input demand chain. Their backward and forward linkage factors are both below average. In France and Germany, weak linkage sectors are especially service sectors like human health or care services, personal services or sport and creative services. But also some manufacturing industries demonstrate weak linkages

like the pharmaceutical industry or the production of computer, electronic and optical products.

Strong backward linkage sectors: backward linkage sectors are especially dependent on interindustry supply. Sectors with a dominance in backward linkages can be found especially in manufacturing sectors like wood production, motor vehicle industry, basic metal production or furniture production. The sectors listed are both strong backward linkage sectors in Germany and France. However, both countries also show differences: Whereas food production is classified as a backward linkage sector in Germany, it is a key sector in France. Vice versa, rubber and plastic production is in France a backward linkage sector, but a weak linkage sector in Germany.

Strong forward linkage sectors: those sectors are especially dependent on interindustry demand. Sectors with a dominance in forward linkages can be found especially in service sectors like rental and leasing services, employment services or real estate services. The sectors listed are both strong forward linkage sectors in Germany and France. However, both countries also show differences: Whereas architectural services are classified as a forward linkage sector in Germany, it is a key sector in France. Vice versa, land transport services are in France a strong forward linkage sector, but a key sector in Germany.

Key sectors: key sectors are defined as sectors with a high potential of spreading growth impulses throughout the economy due to their strong and extensive linkages with other sectors. Key sectors have above average backward linkages sectors and above average forward linkages sectors. Some sectors are key sectors in Germany as well as in France: these are for example fabricate metal products, construction or telecommunication services. However, some differences exist, too: For instance, in France, the agriculture industry is a key sector, which is a backward linkage sector only in Germany. Vice versa, postal and courier sector is a key sector in Germany, but only a weak linkage sector in France.

Table 18: Backward and forward linkages in 2016

		forward linkage (client) DE 2016	backward linkage (supplier) DE 2016	forward linkage (client) FR 2016	backward linkage (supplier) FR 2016
1	Products of agriculture, hunting and related s	1,3	1,8	1,8	1,9
2	Products of forestry, logging and related serv	1,3	1,4	1,6	1,8
3	Fish and other fishing products, aquaculture p	1,0	1,4	1,0	1,7
4	Mining and quarrying	1,2	1,7	1,2	1,7
5	Food, beverages and tobacco products	1,5	2,1	2,1	2,1
6	Textiles, wearing apparel, leather and related	1,2	1,8	1,2	1,6
7	Wood and of products of wood and cork, exce	1,4	2,1	1,4	2,0
8	Paper and paper products	1,5	1,8	1,5	1,8
9	Printing and recording services	1,5	1,7	1,3	1,7
10	Coke and refined petroleum products	1,4	1,4	1,4	1,4
11	Chemicals and chemical products	1,5	1,7	1,6	1,7
12	Basic pharmaceutical products and pharmace	1,1	1,4	1,0	1,5
13	Rubber and plastic products	1,5	1,6	1,5	1,6
14	Other non-metallic mineral products	1,4	1,9	1,4	1,9
15	Basic metals	1,7	1,8	1,4	1,9
16	Fabricated metal products, except machinery	2,1	1,8	2,0	1,7
17	Computer, electronic and optical products	1,2	1,6	1,1	1,5
18	Electrical equipment	1,3	1,7	1,1	1,6
19	Machinery and equipment n.e.c.	1,5	1,8	1,2	1,7
20	Motor vehicles, trailers and semi-trailers	1,4	1,9	1,2	1,8
21	Other transport equipment	1,3	1,9	1,1	1,6
22	Furniture and other manufactured goods	1,0	1,7	1,1	1,6
23	Repair and installation services of machinery	1,6	1,8	1,6	1,6
24	Electricity, gas, steam and air conditioning	2,5	2,0	3,3	2,0
25	Natural water, water treatment and supply se	1,1	1,5	1,3	1,8
26	Sewerage services, sewage sludge, waste col	1,7	1,8	2,0	1,7
27	Constructions and construction works	2,8	1,8	1,9	1,9
28	Wholesale and retail trade and repair service	1,6	1,4	1,3	1,4
29	Wholesale trade services, except of motor ve	3,0	1,7	4,2	1,8
30	Retail trade services, except of motor vehicle	2,0	1,7	1,2	1,6
31	Land transport services and transport services	2,4	1,8	2,1	1,6
32	Water transport services	1,0	1,6	1,0	2,2
33	Air transport services	1,4	1,6	1,2	1,7
34	Warehousing and support services for transp	3,5	1,9	2,8	1,7
35	Postal and courier services	1,8	1,9	1,3	1,4
36	Accommodation and food services	1,2	1,8	1,8	1,7
37	Publishing services	1,4	1,9	1,2	1,7
38	Motion picture, video and television program	1,5	1,8	1,5	1,8
39	Telecommunications services	2,2	2,1	2,0	1,8
40	Computer programming, consultancy and rela	3,1	1,5	1,8	1,5
41	Financial services, except insurance and pens	2,5	1,7	3,5	1,7
42	Insurance, reinsurance and pension funding s	1,6	1,9	1,5	2,3
43	Services auxiliary to financial services and ins	1,6	1,7	2,2	1,8
44	Real estate services excluding imputed rents	3,6	1,5	2,8	1,4
45	Imputed rents of owner-occupied dwellings	1,0	1,3	1,0	1,1
46	Legal and accounting services, services of hea	4,1	1,8	5,2	1,9
47	Architectural and engineering services, techn	1,8	1,6	2,0	1,7
48	Scientific research and development services	1,0	1,4	1,0	1,6
49	Advertising and market research services	1,3	1,8	1,5	1,7
50	Other professional, scientific and technical se	1,7	1,8	1,4	1,7
51	Rental and leasing services	2,4	1,4	2,2	1,6
52	Employment services	1,7	1,3	2,1	1,1
53	Travel agency, tour operator and other reserv	1,1	1,7	1,4	2,1
54	Security and investigation services, services t	2,6	1,6	2,9	1,7
55	Public administration and defence services, c	1,8	1,5	1,0	1,3
56	Education services	1,3	1,3	1,6	1,3
57	Human health services	1,1	1,4	1,1	1,3
58	Residential care services, social work services	1,0	1,5	1,0	1,2
59	Creative, arts, entertainment, library, archive	1,2	1,5	1,0	1,6
60	Sporting services and amusement and recreat	1,3	1,6	1,2	1,6
61	Services furnished by membership organisati	1,2	1,4	1,1	1,5
62	Repair services of computers and personal an	1,0	1,5	1,2	1,5
63	Other personal services	1,2	1,5	1,1	1,4
64	Services of households as employers, undiffe	1,0	1,0	1,0	1,0
65	Services provided by extraterritorial organisa	1,0	1,0	1,0	1,0

Source: own calculation

Looking at the commerce and logistic sector alone. The commerce sector is neither a weak linkage sector nor a key sector in both economies. However, commerce has different focus in the economies: Whereas commerce is a strong backward linkage sector in Germany, it is a strong forward linkage sector in France. This contrary function of a sector is quite interesting and shows that commerce in Germany is more demand-driven and commerce in France is more supply-driven. The logistic sector has also different roles. In Germany, the logistic sector is a key sector. Strong forward and strong backward linkages indicate that this sector is strongly sensitive to demand and supply changes. In France, the logistic sector is a forward linkage sector only (compare Table 19).

Table 19: Sub-summary: backward and forward linkages, differences to average linkage factor, 2016

	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
Backward link- ages	2016		0,0	0,2		0,0	0,0	Differences to average link- age factor in points
Forward linkages	2016		0,3	0,9		-0,4	0,4	Differences to average link- age factor in points

4.2.10 DIRECT EMPLOYMENT EFFECTS: EMPLOYMENT COEFFICIENT AND LABOUR PRODUCTIVITY

Employment coefficient represent employment per unit of production. The indicator is inverse to labour productivity (see below) and indicates the labour intensity of production. The higher the employment coefficient in a sector the more labour intense is production. The labour coefficient shows the number of working persons necessary to produce one million Euro of output. Nationwide, labour intensity (measured in number of persons employed not in hours worked) is slightly higher in Germany than in France. In Germany, in average, 7,6 persons and in France 7,1 persons are needed to produce one million Euro of production. However, since 2010, labour intensity has declined in both countries. In general, service sectors are more labour intense than sectors of the manufacturing industry. For both sectors of interest, Germany is more labour intense than France. The difference to France is more prominent in commerce than in logistic.

The employment coefficient can be also calculated in hours worked which is the ratio between the number of hours worked per unit of production. The hours worked coefficient shows the necessary number of hours worked to produce one million Euro of output. The labour intensity per hours worked is slightly smaller in Germany than in France. In Germany, in average, 10.738 hours have to be worked to produce one million unit of output. In France it is 10.766 hours.

Combining both observation: to produce one million Euro of output Germany needs more employees but less hours than France. Vice versa, France needs less employees but more hours to produce one million of output. The difference is not significant. But they indicate that in Germany, in tendency, more people work part-time than in France which may explain the difference in the coefficients (compare Table 20).

Table 20: Sub-summary: employment coefficient, 2016

	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
Employment coef- ficient	2016	7,6	16,8	6,8	7,1	14,2	6,5	Number of persons per 1 Mio. Euro of output

Labour productivity is the ratio of production per number of employees, respectively numbers of hours worked. It is one of the most important performance indicators of an economy – next to GDP. Labour productivity is the inverse to labour coefficient (see above) and describes in the following the proportion between (nominal) production and numbers of persons employed. An economy or sector with high labour productivity indicates that the economy/sector can produce more output with a given input than other economies/sectors. Overall, Germany shows a lower productivity ratio than France. In 2016, Germany produced 131.331 EUR per employed person, while in France it was 141.216 EUR. France is also more productive in the two sectors under observation: commerce and logistics. The difference is less prominent when labour productivity is measured in hours worked.

Table 21: Sub-summary: labour productivity output per person employed, 2016

	Year	DE			FR			Unit
		Total	Com- merce	Logistic	Total	Com- merce	Logistic	
Labour productivity	2016	131.331	59.367	146.444	141.216	70.406	153.825	Euro of out- put per per- son em- ployed

4.2.11 INDIRECT EMPLOYMENT EFFECTS: EMPLOYMENT FACTOR

Employment factor shows the factor to which a sector induces employment in other sectors. The higher the factor the more indirect employment effects can be expected. The employment factor is calculated in two steps. First the direct and indirect employment inverse matrix MDI is calculated by multiplying the employment coefficient b (input of human resource) with the domestic Leontief multiplier $(I - A)^{-1}$.

$$[9] MDI = b * (I - A)^{-1}$$

Aggregation over products i retrieves the direct and indirect employment multiplier mdi .

$$[10] mdi_j = \sum_{i=1}^{65} MDI_{i,j}$$

The direct employment multiplier md is represented in the diagonal elements of the employment inverse. The employment factor is the ratio between direct and indirect employment multiplier mdi over direct employment multiplier md .

$$[11] f_i = mdi_i / md_i$$

Figure 20 in the Annex shows the employment factor of all 65 sectors in the year 2016. The employment factor equals 1 when no additional employment is generated through production. All values above 1 represent the additional employment effect. In general the employment factor is larger in manufacturing industries than in service sectors and agriculture industry. Table 22 summarizes the employment factor for commerce and logistic industry in Germany and France. In both sectors, the employment factor is larger in Germany than in France which means that both sectors generate more employment in other sectors in Germany than in France. The difference is, however, more prominent in the logistic industry than in commerce.

Table 22: Sub-summary: employment factor, 2016

	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
Employment fac- tor	2016	1,8	1,3	1,6	1,9	1,3	1,4	factor

4.2.12 HOURS WORKED PER HEAD

Hours per head is a further indicator that helps to describe the difference between head and volume concept of labour market activities. The higher the ratio the more hours are worked per employee. It is an indicator of the extent to which part-time work exist in the economy or in a sector. Overall, France has a higher number of hours worked per employee than Germany which means that France employs in average more full-time workers than Germany. This can be observed over nearly all sectors. Exceptions are e.g. the chemical industry, electricity sector or telecommunication sector. In both sectors under review, however, the number of hours worked per employee are again higher in France compared to Germany. In both sectors, more part-time employees exist in France compared to Germany (compare Table 23).

Table 23: Sub-summary: number of hours worked per employee, 2016

	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
Number of hours worked per employee	2016	1395	1353	1439	1522	1563	1542	number

4.2.13 SUMMARY OF INDICATORS

The following table lists all indicators explained in the chapters 4.2.1 to 4.2.12.

Table 24: Summary of indicators: Production, employment, productivity

	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
Dynamic of diversification in production	2016		0,0	0,4		0,0	0,0	Difference in average growth rate in % points
Share of total production	2016		3,3	3,1		3,8	1,9	%
Average growth rate of nominal production	2016	3,1	2,9	4,8	1,6	2,0	2,2	Percent 2010-2016
Share of total employment	2016		7,3	2,8		7,5	1,8	%
Average growth rate of total hours worked	2016	0,3	-0,4	1,0	0,3	0,6	-0,5	Percent 2010-2016
Ratio of direct to indirect production	2016	0,30	0,27	0,73	0,27	0,04	0,73	ratio
Share of export induced production to total production	2016	36	10	43	26	5	39	%
Share of import dependent production to total	2016	2,8	0,0	1,2	1,8	0,0	1,0	%

production								
Share of value added to production	2016	49	54	36	51	58	52	%
Share of final demand to total use	2016	59	71	9	60	95	20	%
Share of private demand to total final demand	2016	34	92	35	38	88	55	%
Share of exports to total final demand	2016	35	0	52	23	4	45	%
Backward linkages	2016		0,0	0,2		0,0	0,0	Differences to average linkage factor in points
Forward linkages	2016		0,3	0,9		-0,4	0,4	Differences to average linkage factor in points
Employment intensity	2016	7,6	16,8	6,8	7,1	14,2	6,5	Euro of output per person employed
Labour productivity	2016	131331	59,367	146444	141216	70406	153825	Euro of output per person employed
Employment factor	2016	1,8	1,3	1,6	1,9	1,3	1,4	Factor
Number of hours worked per employee	2016	1395	1353	1439	1522	1563	1542	Number

4.3 EMPLOYMENT BY OCCUPATION AND EDUCATION

Total employment and sectoral employment have been described in the previous chapters (see chapter 4.1.4 and chapter 4.2.10 to 4.2.12). This chapter intensifies the look on the labour market by leaving the sectoral level and by looking on occupational and education classification of labour demand.

4.3.1 EMPLOYMENT BY OCCUPATION

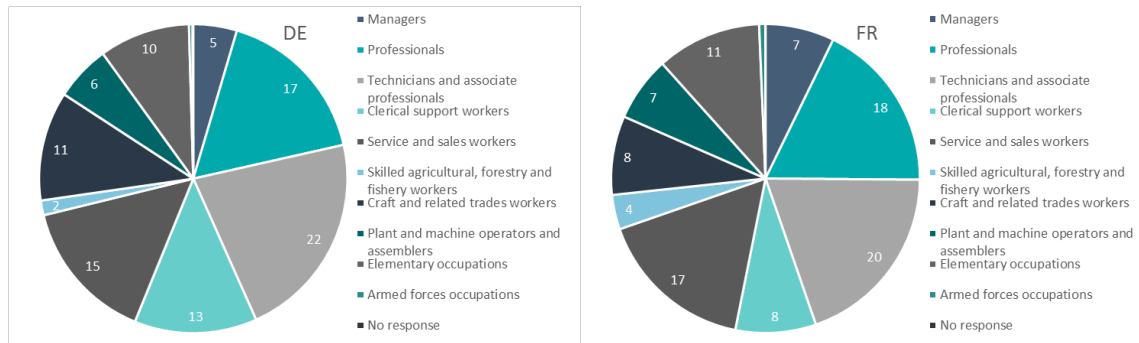
Employment can be also described using the occupation classification scheme. The International Standard Classification of Occupation (ISCO) is a classification structure used by the ILO to structure information on jobs. The latest version of ISCO is ISCO-08. The ILO describes the ISCO classification as “a tool for organizing jobs into a clearly defined set of groups according to the tasks and duties undertaken in the job.”⁷ Eurostat publishes employment by 11 occupations.

Figure 12 shows the distribution of occupation across employment for year 2017. Although different in detail, the majority of employees are employed in three occupations in both countries:

- I. Professionals,
- II. Technicians and associate professionals and
- III. Service and sales workers

In both countries, around 54 percent of all employees are concentrated in these three occupations. Also, in both countries, the increase in Professional occupations is very dynamic with an average growth of above 3 percent between 2008 and 2017. Jobs as Service and sales workers have been at the uprising to a similar extent with an average growth rate of 2.6 percent (Germany) and 3.2 percent (France). The occupation with the largest decline is in Germany Managers (-1.6 percent) and in France Clerical support workers (-3.7 percent).

Figure 12: Distribution of occupation, 2017



Source: Eurostat

⁷ <https://www.ilo.org/public/english/bureau/stat/isco/index.htm>

Table 25: Sub-summary: share of employees by top-3 occupations, 2017

	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
Share of employees as Professionals	2017	17			18			%
Share of employees as Technicians and associate professionals	2017	22			20			%
Share of employees as Service and sales workers	2017	15			17			%

4.3.2 OCCUPATIONAL STRUCTURE BY SECTORS

Which profession is mostly needed in which industry? This information is given from Eurostat at a more aggregated level of industries. Figure 13 shows the occupational structure in total and by selected industries for both countries for year 2017. The two sectors – commerce and logistics – have a very different occupational structure compared to the average structure and compared to each other.

The commerce sector⁸ employs mainly Service and sales workers. With 41 percent in Germany respectively 37 percent in France, it is more than twice as much as in average (15 percent in Germany and 17 percent in France).

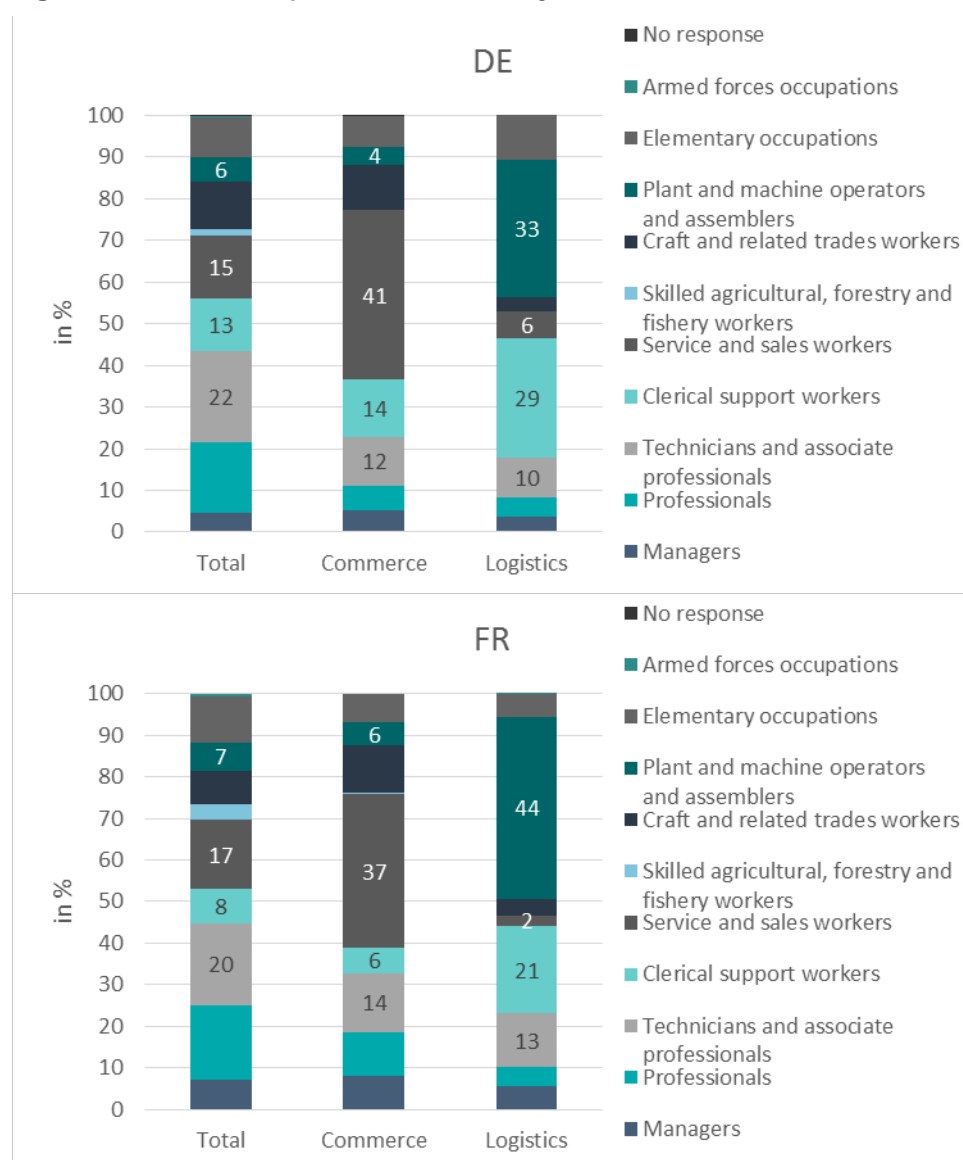
The logistic sector⁹ is slightly more diverse than the commerce sector. However, Plant and machine operators and assemblers are in Germany as well as in France the main occupation in this industry with as share to total employment of 33 percent (Germany) respectively 44 percent (France). In average, this occupation is only employed to 6 respectively 7 percent. Clerical support workers are also important jobs for the logistic sector.

While, the overall occupational structure and the occupational structure of commerce sector is similar in France and Germany, the occupational structure in the logistic sector differs: The dominance of Plant and machine operators and assemblers is more pronounced in France than in Germany with over 10 percentage points difference. Clerical support workers are, instead, more important for the German logistic sector.

⁸ In this aggregation level, the commerce sector consists of three sub-sectors: (i) wholesale and retail trade of motor vehicles (ii) wholesale trade services, and (iii) retail trade services.

⁹ In this aggregation level, the logistic sector consists of five sub-sectors: (i) land transport services, (ii) water transport services, (iii) air transport services, (iv) warehousing, and (iv) postal services.

Figure 13: Occupational structure by industries, 2017



Source: Eurostat

Table 26: Sub-summary: share of major occupation by sector, 2017

	Year	DE			FR			Unit
		Total	Com-merce	Lo-gistic	Total	Com-merce	Lo-gistic	
Share of major oc-cupation	2017	22	41	33	20	37	44	%

4.3.3 EMPLOYMENT BY EDUCATION

Employment can be also described next to the occupation classification also with education classification. The International Standard Classification of Education (ISCED) is a classification structure used by the UNESCO to structure information on education. The latest

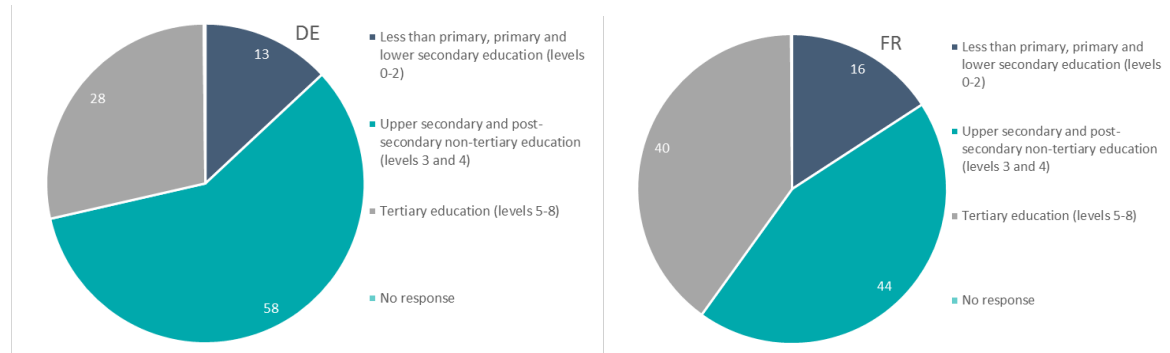
version of ISCED is ISCED 2011. The ISCED classification was designed “as an instrument suitable for assembling, compiling and presenting statistics of education both within individual countries and internationally”¹⁰. Eurostat publishes employment by three education level ranging from low to high education levels.

- [1] Low education level: less than primary, primary and lower secondary education (levels 0-2)
- [2] Medium education level: upper secondary and post-secondary non-tertiary education (levels 3 and 4).
- [3] High education level: tertiary education (levels 5-8).

Figure 14 shows the distribution of education across employment for year 2017. Although different in detail, the majority of employees have a medium education level in both countries (58 percent in Germany and 44 percent in France). However, the share is considerably higher in Germany than in France. In France, medium skilled employees dominate, but only with a view percentage points. The share of high skilled workers are with 40 percent significantly larger than in Germany (28 percent). This indicates the strong job-oriented training approach in Germany and confirms the strong focus in France on high education.

The dynamic change is similar in both countries. A strong increase in high education levels can be observed in Germany as well as in France, although the dynamic is stronger in France (+2.1 percent increase in average in Germany and +3.1 percent average increase in France between 2008 and 2017). The increase in high education jobs is at the expense of low-skilled jobs. In both countries, jobs with a low education level are declining since 2008 in average by -0.7 percent in Germany and by -4.2 percent in France.

Figure 14: Distribution of education, 2017



Source: Eurostat, own calculation

¹⁰ <http://uis.unesco.org/en/topic/international-standard-classification-education-isced>

Table 27: Sub-summary: share of employees by educational level, 2017

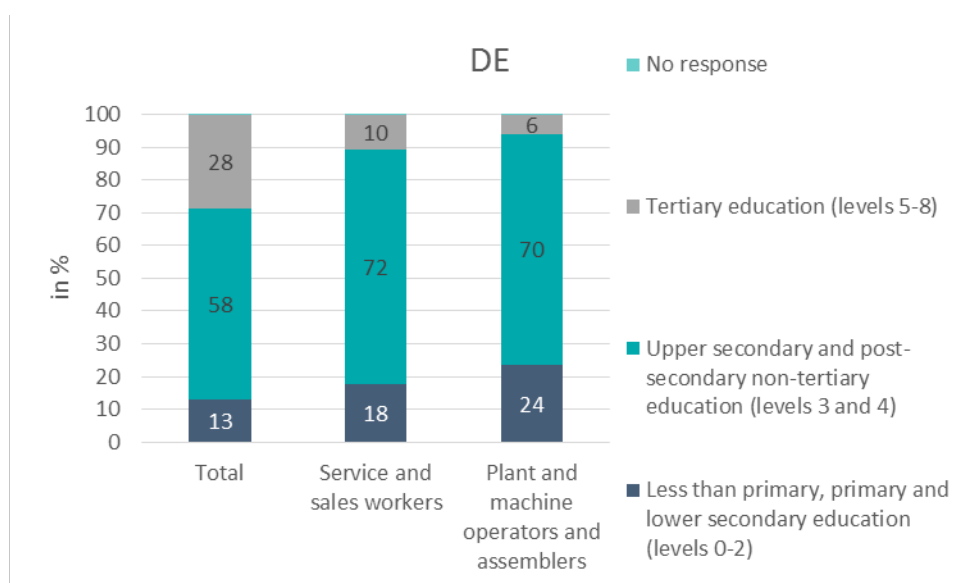
	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
Share of educa- tional level – low	2017	13	15	17	16	16	21	%
Share of educa- tional level – me- dium	2017	58	65	66	44	50	52	%
Share of educa- tional level - high	2017	28	19	17	40	34	27	%

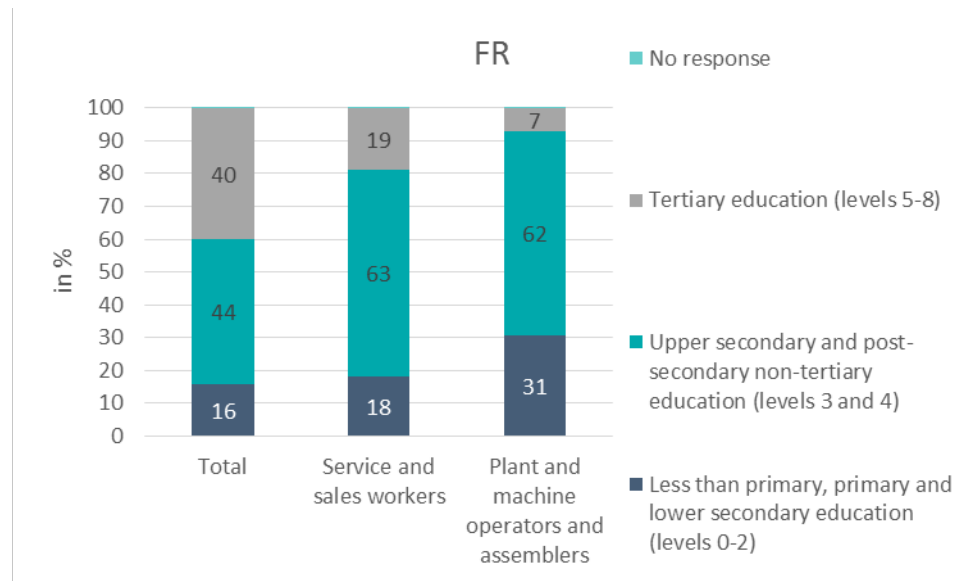
4.3.4 EDUCATION STRUCTURE BY OCCUPATION

Which education level is required in which occupation? This information is given from Eurostat and is shown Figure 13: it shows the educational structure in total and by selected occupations for both countries for year 2017. The two occupations – Service and sales workers and Plant and machine operators and assemblers – has been chosen because they are the dominant occupation for commerce and logistics (see chapter 4.3.2).

In general, the two occupations have a more or less similar educational structure. Both professions require – above average – mostly medium-skilled workers. Also low-skilled workers are needed more than in average. Both occupations are – generally speaking – no high-skilled jobs.

Figure 15: Education structure by occupation, 2017





Source: Eurostat, own calculation

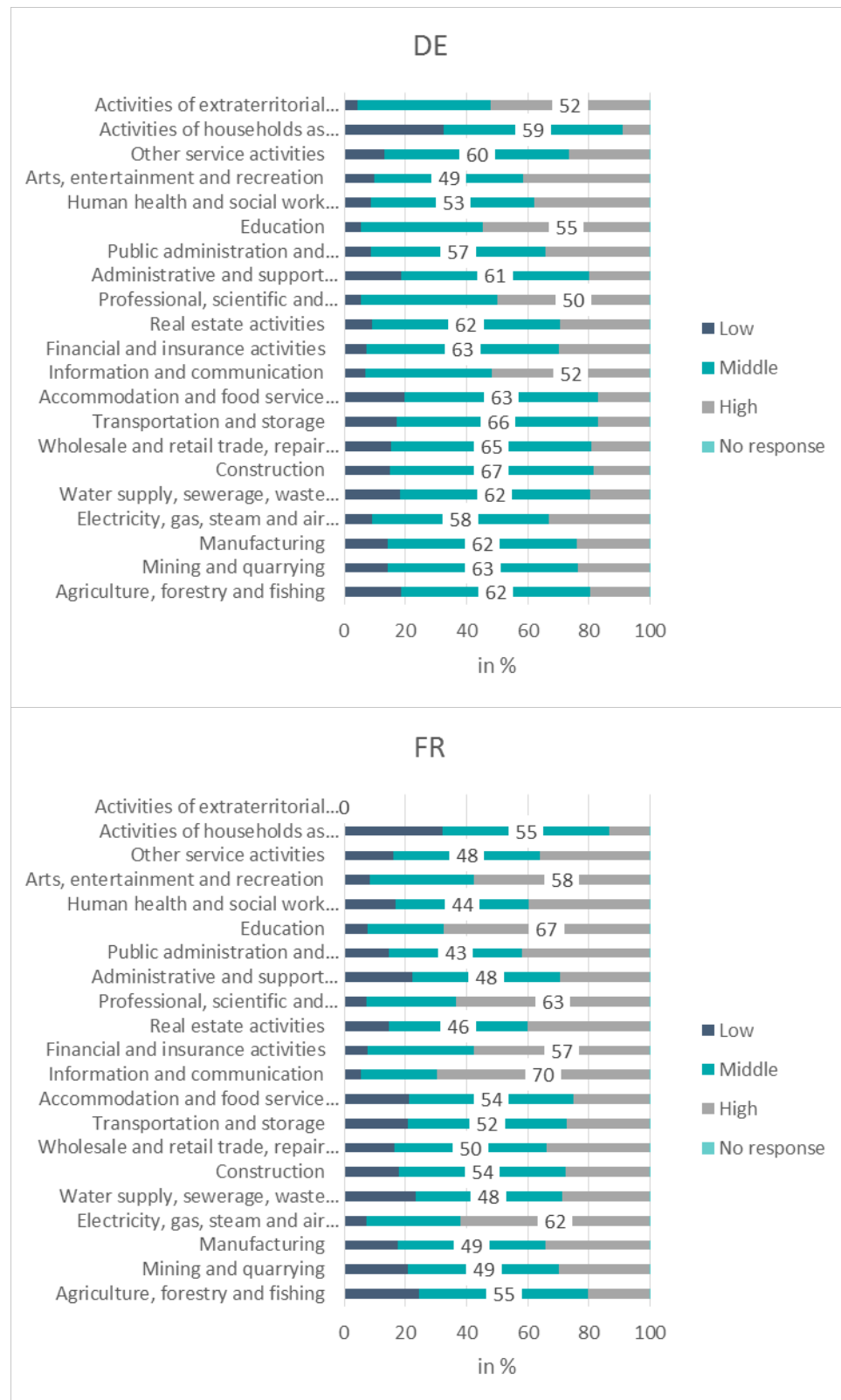
4.3.5 QUALIFICATION REQUIREMENTS BY SECTORS

The single bridge matrices described in chapter 4.3.2 and 4.3.4 can be linked which allows to describe sectors not only by their occupational needs but also by their educational level. This linkage is generated by using the same educational distribution for each occupation in each industry. This assumption neglects, that the educational specification of a profession can be different depending on the economic activity of the sector. However, if one accepts this assumption, statements can be made about the qualification needs in sectors.

Figure 16 show the results for 2017 in percentage of employment per sector. In both countries most sectors require medium-skilled employees which is in line with the overall distribution of qualification (compare chapter 4.3.3). However, the general qualification level is higher in France.

Only selected industries show a dominant need of high-skilled workers. In France these are more industries than in Germany. Information and communication, Professional, scientific and technical activities and Education are those three sectors where the majority of employees have a high education level. In France, three additional sectors require in majority high-skilled labour which are: Electricity, gas, steam and air conditioning supply, Financial and insurance activities and Arts, entertainment and recreation.

Figure 16: Distribution of education level across sectors, 2017



Source: Eurostat, own calculation

The qualification level for commerce and logistic sector are equally distributed in Germany and France with the prominence in medium-skilled workers (compare chapter 4.3.3). Again,

in France both sectors increase their share of high-skilled employees over time. In both sectors, the share increased by over 4 percentage points between 2008 and 2017. The increase was in both sectors at the expense of low-skilled workers.

In Germany, the development looks different: While the logistic sector has also increased its need for high-skilled workers over the years, this development was considerably slower. Different the commerce sector. In this sector, the share of high-skilled workers declined during 2008 and 2017 while medium- and low-skilled workers increased their share.

4.3.6 EMPLOYMENT BY OCCUPATION AND BY SEX

Chapter 4.1.5 already touched slightly the gender topic. The overall employment rate of French females is 48 percent, in Germany the ratio is at 46.5 percent. On occupational level the tendency of more female employees in France is confirmed (compare Table 28). In nearly all occupations, female employment is higher in France than in Germany. The only exception is Technicians and associate professionals where the share of female employees is larger in Germany. Despite that, the female occupations are clearly distinctive and do not differ much between France and Germany. Clerical support, Services and sales as well as Elementary occupations are occupations with a majority of female employees. Distinctive male occupations are Managers, Craft and related trades workers and Plant and machine operators and assemblers. Concerning the commerce and logistic sectors, the findings from chapter 4.3.2 suggest, that employees in commerce are mostly women and in the logistic sector are mostly men.

Table 28: Educational distribution of employees by occupation and sex, %, 2017

	Male		Female	
	DE	FR	DE	FR
Managers	72	68	29	33
Professionals	56	49	44	51
Technicians and associate professionals	44	51	56	49
Clerical support workers	36	25	64	74
Service and sales workers	38	34	62	65
Skilled agricultural, forestry and fishery workers	83	78	18	22
Craft and related trades workers	90	91	11	10
Plant and machine operators and assemblers	87	81	14	20
Elementary occupations	41	36	58	63
Armed forces occupations	95	85	6	15
No responses	57	47	43	53

Source: Eurostat

Table 29: Sub-summary: share of female of employees by sex, %, 2017

	Year	DE			FR			Unit
		Total	Com- merce	Lo- gistic	Total	Com- merce	Lo- gistic	
Share of female employment in service and sales	2017	62			65			%
Share of female employment in plant and machine occupations	2017	14			20			%

4.4 THE SUPPLY SIDE OF THE LABOUR MARKET

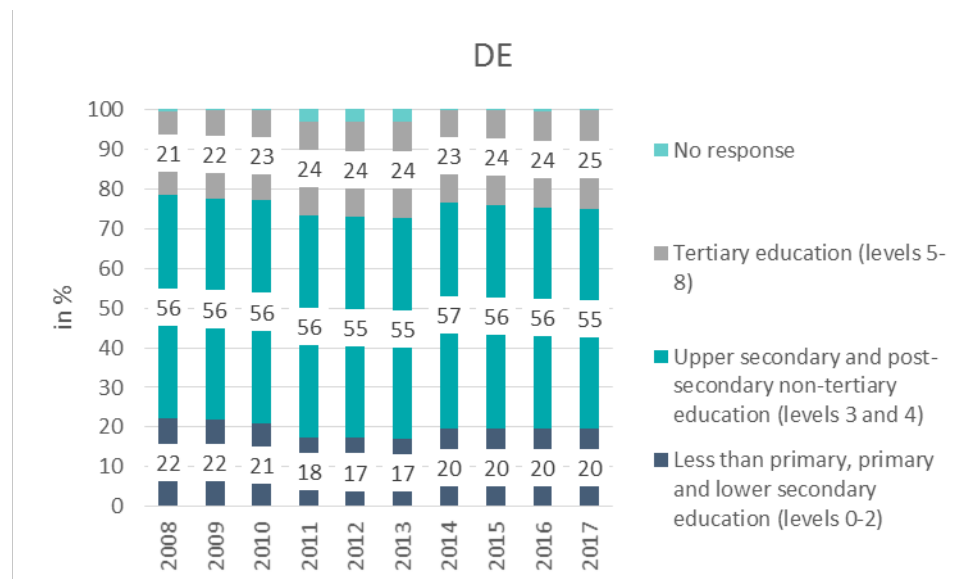
So far, the supply side of the labour market was only described on an aggregate level (see chapter 4.1.1 and 4.1.6). Information on a more detailed level for the supply side of the labour market are less common than for the demand side. However, Eurostat provides information of population age 15 to 64 by different educational levels (further on described as working-age population). This information describes the learned qualification of this part of the population that are employable. They donot describe whether those people are actually

willing to work.¹¹

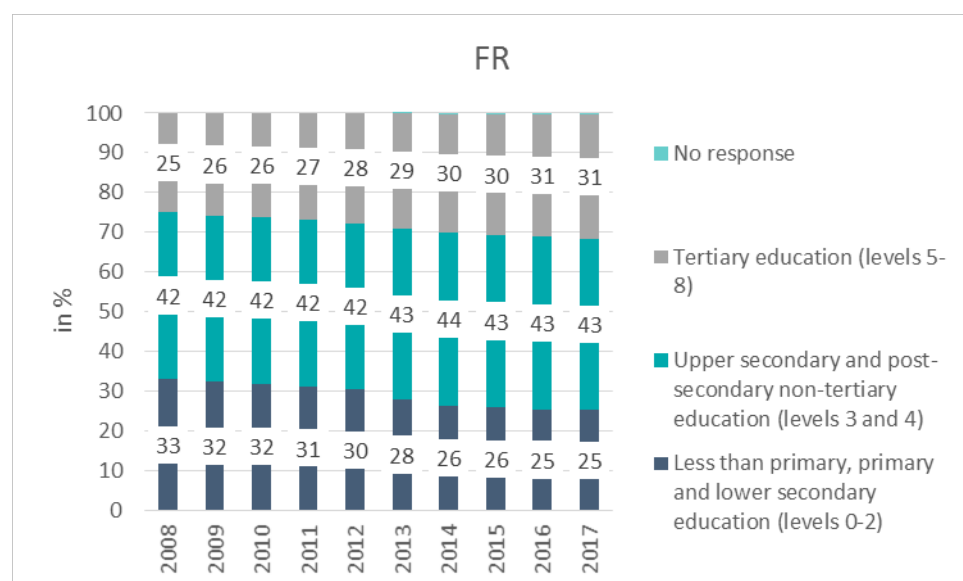
4.4.1 WORKING-AGE POPULATION BY QUALIFICATION

Figure 17 shows the educational distribution of working population (age 15 to 64) for the years 2008 to 2017. The distribution confirms the observation already made on the demand side of the labour market: the majority of working population in Germany as well as in France is medium-skilled, followed by high-skilled people. Low-skilled working population represents the smallest part of the population. The tendencies are in both countries also the same: tertiary education is increasing at the expense of low-skilled education while medium-skilled education share remains more or less stable over the years. However, the speed in dynamics is significantly different between France and Germany. France shows a much faster development towards a high-skilled population than Germany. The share of high-skilled population among working population increased with 6,5 percentage points to 31 percent in 2017. In the same time, the share in Germany increased by only 3,4 percentage points to 25 percent. The decline in low-education shares are equally different in dynamics – only vice versa to the development of high-education shares. In France, the share of low-skilled persons declined by nearly 9 percentage points, in Germany by 3 percentage points. Therefore, in both countries, the tendency towards high-education can be observed however, it is much more prominent in France than in Germany.

Figure 17: Population (15-64 years) by educational level, 2008-2017



¹¹ The difference between labour force and working-age population are those persons who do not want or are not able to work, for instance students, pupils, housewives/men, retired persons etc.



Source: Eurostat

Table 30: Sub-summary: share of working-age population by education, 2017, in %

	Year	DE			FR			Unit
		Total	Com-merce	Lo-gistic	Total	Com-merce	Lo-gistic	
Share of working-age population by education - low	2017	20			25			%
Share of working-age population by education - medium%	2017	55			43			%
Share of working-age population by education - high	2017	25			31			%

4.4.2 WORKING-AGE POPULATION BY QUALIFICATION AND SEX

The working-age population is slightly more female in France than in Germany. Overall, working-age population in France consists to 51 percent (2017) of women, in Germany it is 49 percent. This corresponds to the higher employment share of females in France than in Germany (compare chapter 4.1.5).

Albeit the difference is not too striking on aggregate level, the difference becomes especially prominent when looking at the educational distribution of working-age population (see Table 31 for 2017). The French female working-age population is very high-skilled. The difference to Germany is more than 10 percentage points. In France, 55 percent of working-age population in tertiary education are female, in Germany it is only 45 percent.

Table 31: Educational distribution of working-age population by sex, %, 2017

	Male		Female	
	DE	FR	DE	FR
Less than primary, primary and lower secondary education (levels 0-2)	50	49	50	51
Upper secondary and post-secondary non-tertiary education (levels 3 and 4)	49	52	51	48
Tertiary education (levels 5-8)	55	45	45	55
No responses	54	47	46	52

Source: Eurostat

Table 32: Sub-summary: share of female working-age population per educational level, 2017, in %

	Year	DE			FR			Unit
		Total	Commerce	Logistic	Total	Commerce	Logistic	
Share of female working-age population by education - low	2017	50			51			%
Share of female working-age population by education - medium%	2017	51			48			%
Share of female working-age population by education - high	2017	45			55			%

4.5 MATCHING BY EDUCATION

The supply side of the labour market was described in chapter 4.1.1, 4.1.6 and 4.3.5. The demand side in all other chapters. However, the situation on the labour market can be better described if supply and demand side are simultaneously observed. Due to the limited data situation on the supply side of the labour market, the matching of labour demand and labour supply can be only performed on aggregate and on education level according to ISCED classification.

Figure 18 describes the matching results for Germany and France. Negative numbers indi-

cate a short supply of working-age population for this specific education level. Positive numbers indicate oversupply.

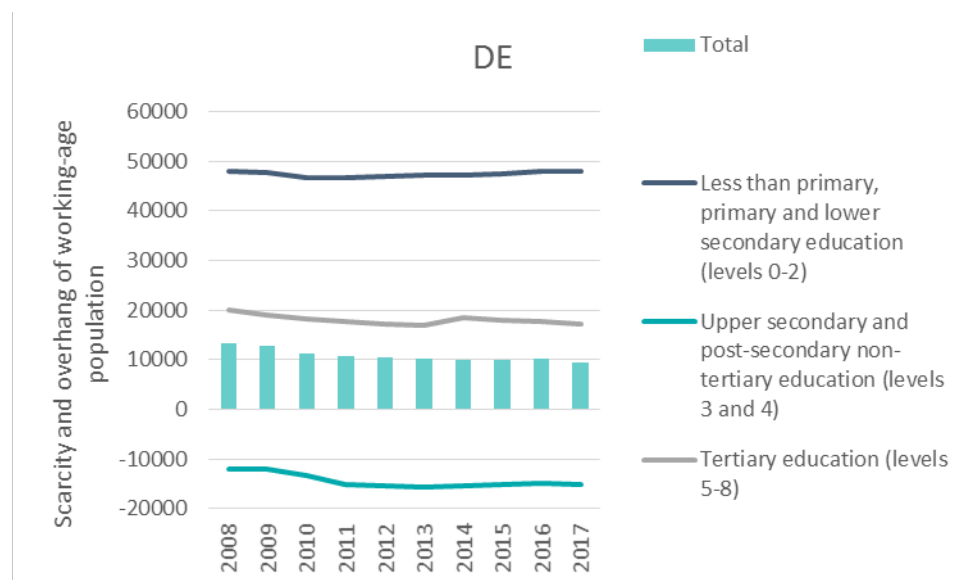
The matching figures do not describe actual shortages or overhangs in the economy because labour supply is only the number of people employable with a learned education. It does not describe whether those people are actually looking for a job. Also, labour demand by formal qualification as represented by ISCED classification scheme is only of limited use. Requirement levels are more suitable for describing employment in terms of skill categories because informal education or work experience also matters for recruitment decisions (BIBB 2017 p. 313).

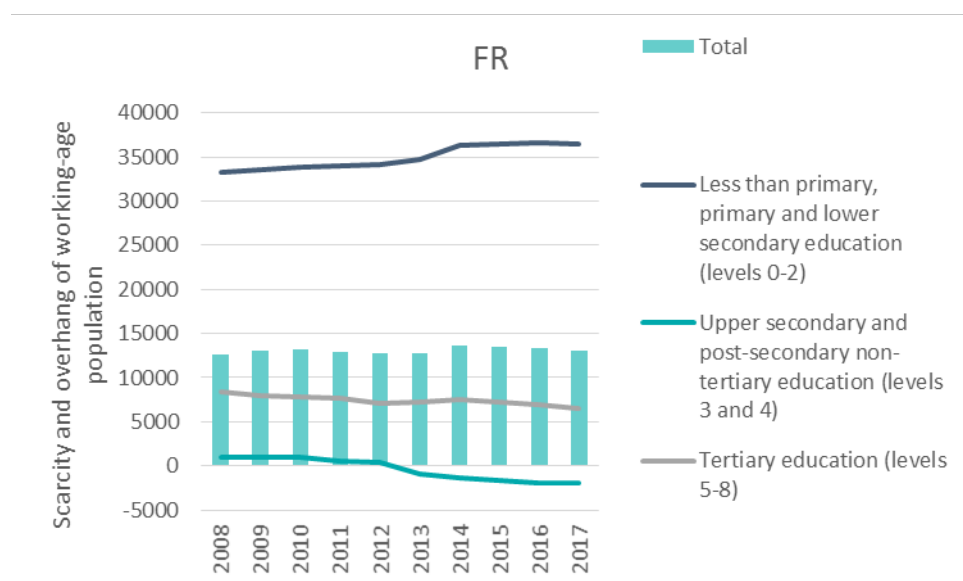
The growing shortage of labour can be observed in Germany on the aggregate level already: the overhang of working-age population is declining indicating a tightening of the overall labour market. This development on aggregate level cannot be observed in this extent in France. Since 2014, the overhang is shrinking also in France, but less dynamic.

With respect to education level, it is especially the medium-skilled level that claims shortage in working-age population: the demand is higher than the supply. In Germany, this shortage is consistent over time, in France, the shortage in medium-skilled working-age population has become prominent only since 2013.

High-skilled overhang exist in both countries and in both countries the supply of high-skilled people is declining since 2014.

Figure 18: Matching of working-age population and employment in total and by education levels, 2008-2017





Source: Eurostat, own calculation

Table 33: Sub-summary: total matching

	Year	DE			FR			Unit
		Total	Com-merce	Lo-gistic	Total	Com-merce	Lo-gistic	
Total working pop-ulation over total employees								
	2017	-0,11			0,01			Difference in points between 2008 and 2017

5 INDICATOR SUMMARY

Table 34 summarizes all discussed indicators in the previous chapter in one table.

In total, 32 indicators were defined and calculated for France and Germany. Due to the use of harmonized tables of Eurostat, all indicators are – in general – available for all members of the European Union. The sectoral indicators are available for all 65 sectors. However, time and priority limited the analysis on only two sectors: commerce and logistics.

Table 34: Overview of indicators

		GERMANY			FRANCE		
		Total	Commerce	Logistic	Total	Commerce	Logistic
MAIN AGGREGATES							
1	GDP per head	2018	40,3		35,0		
2	Ratio external balance	2018	6,2		-0,8		
3	Average growth rate of total employment	2017	0,6		0,5		
4	Employment rate, total	2017	53,5		41,5		
5	Employment rate, female	2017	46,5		48,1		
6	Compensation of employees per hours worked	2018	32,6		34,7		
7	Collective wage bargaining coverage	2014	57,8		98,5		
SECTORAL DIFFERENCES							
<i>Diversification</i>							
8	Dynamic of diversification in production	2016		0,0	0,4		0,0
<i>Nominal production, share of total employment and dynamic of hours worked</i>							
9	Share of total production	2016		3,3	3,1		3,8
10	Average growth rate of nominal production	2016	3,1	2,9	4,8	1,6	2,2
11	Share of total employment	2017		7,3	2,8		7,5
12	Average growth rate of total hours worked	2017	0,3	-0,4	1,0	0,3	-0,5
<i>Direct and indirect production shares and ratios</i>							
13	Ratio of direct to indirect production	2016	0,30	0,27	0,73	0,27	0,04
<i>Export induced production</i>							
14	Share of export induced production to total production	2016	36	10	43	26	5
<i>Import dependency of production</i>							
15	Share of import dependent production to total production	2016	2,8	0,0	1,2	1,8	0,0
<i>Composition of production</i>							
16	Share of value added to production	2016	49	54	36	51	58
<i>Composition of total final use</i>							
17	Share of final demand on total use	2016	59	71	9	60	95
<i>Components of final demand</i>							
18	Share of private consumption to total final demand	2016	34	92	35	38	88
19	Share of exports to total final demand	2016	35	0	52	23	4
<i>Identification of key sectors</i>							
20a	Backward linkages	2016	1,7	0,0	0,2	1,6	0,0
20b	Forward linkages	2016	1,7	0,3	0,9	1,6	-0,4
<i>Direct employment effects</i>							
21	Employment intensity	2016	7,6	16,8	6,8	7,1	14,2
22	Labour productivity	2016	131.331	59.367	146.444	141.216	70.406
<i>Indirect employment effects</i>							
23	Employment factor	2016	1,8	1,3	1,6	1,9	1,3
<i>Hours worked per head</i>							
24	Number of hours worked per employee	2016	1.395	1.353	1.439	1.522	1.563
OCCUPATIONAL AND EDUCATIONAL DIFFERENCES							
<i>Employment by occupation</i>							
25a	Occ_edu - Share of employees as professionals	2017	17		18		
25b	Occ_edu - Share of employees as technicians and associate professionals	2017	22		20		
25c	Occ_edu - Share of employees as service and sales workers	2017	15		17		
<i>Occupational structure by sectors</i>							
26	Occ_edu - Share of major occupation	2017	22	41	33	20	37
<i>Employment by education</i>							
27a	Occ_edu - Share of educational level - low	2017	13	15	17	16	16
27b	Occ_edu - Share of educational level - medium	2017	58	65	66	44	50
27c	Occ_edu - Share of educational level - high	2017	28	19	17	40	34
<i>Employment by occupation and sex</i>							
28	Occ_edu - Share of female employment in service and sales	2017	62		65		
29	Occ_edu - Share of female employment in plant and machine occupations	2017	14		20		
SUPPLY SIDE OF THE LABOUR MARKET							
<i>Working-age population by qualification</i>							
30a	Supply - Share of working-age population by education - low	2017	20		25		
30b	Supply - Share of working-age population by education - middle	2017	55		43		
30c	Supply - Share of working-age population by education - high	2017	25		31		
<i>Working-age population by qualification and sex</i>							
31a	Supply - Share of female working-age population by education - low	2017	50		51		
31b	Supply - Share of female working-age population by education - middle	2017	51		48		
31c	Supply - Share of female working-age population by education - high	2017	45		55		
MATCHING LABOUR SUPPLY AND LABOUR DEMAND							
32	Match - Total working population over total employees	2017	-0,11		0,01		

6 SYNOPSIS OF INDICATORS

In this chapter a summary and comparative overview and comparison of the identified and developed indicators is presented. This chapter identifies similarities and differences between France and Germany. Special focus lies on the logistic and commerce sector.

According to chapter 4, the analysis based on five different angles to look at the economy: first it was the aggregate angle (chapter 4.1) which helped to classify the overall economy

in a more general way. Then, in chapter 4.2, the observation closed in on sectoral level. By applying input-output analysis, it was possible to tickle economic specifications that are not possible to see on aggregate level. Follow-up, chapter 4.3 concentrated on labour demand and described the employment situation in France and Germany not only on sectoral but also on occupational and educational level. Chapter 4.4 looked at the supply side of the labour market. And, finally, chapter 4.5 matched both sides of the labour market.

The most important observations are summarized in accordance to the five big sub-chapters:

1. In general, Germany is the economically more powerful country. But Germany's economic power is mostly driven by its excessive positive external balance. Germany is therefore more vulnerable to external shocks than France, on the one hand. On the other hand, Germany is able to take advantage of a growing globalisation. The labour market in both countries seems to be evenly dynamic. However, in Germany more people participate on the labour market. French employees are in general higher qualified and better paid. Also, female employment is much more pronounced in France than in Germany. The collective wage bargaining coverage is much higher in France than in Germany.
2. In both countries, the **diversification** in production gains importance. Whereas in Germany, it is mainly the manufacturing industry that is getting more diverse in production, in France it is the public sector as well as the agricultural sector which is following this strategy. In both countries, the two sectors under focus, logistic and commerce, show no or hardly no diversification strategy in the last years.

Measured in **production share**, the key production industry in Germany is the car industry, in France it is the public administration sector. Germany is more dominant in terms of production in logistics, while France is more dominant in the commerce sector. The **dynamic of (nominal) production** is stronger in Germany. But, in both countries, the increase in nominal production takes place especially in service sectors, not in the manufacturing sector. It is especially the logistic sector that shows high production increases in the past years in Germany. In France, it is especially the sector <Other transport equipment> that experienced the fastest increase between 2010 and 2016. **Indirect production effects** are the main driver of the economy in both countries. Both sectors under focus function similar: while the commerce sector shows a large degree of indirect production dependencies, the logistic sector has a stronger direct production impact. The **use of production factors** – material ("land"), capital and labour – in the production process is overall similar in France and Germany. The commerce sector has a higher percentage share of labour costs to total production in both countries. The logistic sector, however, works differently in France and Germany: the production costs in Germany's logistic sector consist mainly of material costs. In France, the share of labour and capital to production is considerably higher, instead.

Germany's production is overall more dependent on global value chains than

France. **Export-induced production** is much more dominant in Germany than in France, which confirms the strong export-exposure of the German economy. This is the case in nearly all sectors. The difference is larger in the logistic sector than in the commerce sector. Similar, the **import dependency of production** is also larger in Germany than in France. However, in France import dependency of production is more concentrated on specific sectors (especially the sector *other transport equipment*). Germany shows a more diverse import dependency of production across sectors. In both countries, production in the commerce sector has no import influence. The logistic sector, again, depends more on imports in Germany than in France.

Total final use of products is dominated with 60 percent of total use by final demand of products. The demand for intermediate products are less dominant. The shares differ, however, on sectoral level and between commerce and logistics: In France, commerce depends nearly completely on final demand, in Germany the sector also experiences demand from other sectors. The German logistic sector, instead, is nearly completely dependent on intermediate demand, while the logistic sector in France is significantly stronger influenced by final demand components as well. **Final demand** is the dominant driving force for economic activity in both economies. The composition of final demand differs in two aspects between France and Germany: while nominal GDP depends in France more on state consumption, it is in Germany the external balance. The final demand of the logistic sector is also differently decomposed: in Germany, it depends mostly on external trade, in France mostly on private consumption. It is only the commerce sector that shows a similar decomposition of final demand in Germany and in France. In both countries it is nearly only private consumption that determines final demand.

The cost and demand side of the economy together determines the role of sectors. Some sectors are more demand-driven, some are more supply/cost-driven. If a sector is both – demand and supply driven – it can be referred to as a **key sector**. Key sectors are defined as sectors with a high potential of spreading growth impulses throughout the economy due to their strong linkages with other sectors. Some sectors are key sectors in Germany as well as in France: these are for example fabricate metal products, construction or telecommunication services. However, some differences exist, too: For instance, in France, the agriculture industry is a key sector, which is a backward linkage sector only in Germany. Vice versa, postal and courier sector is a key sector in Germany, but only a weak linkage sector in France. With respect to commerce and logistic the differences persist: while commerce in Germany is more demand-driven, commerce in France is more supply-driven. The same for the logistic sector: In Germany, the logistic sector is a key sector. In France, the logistic sector is a forward linkage sector, only.

So far, Germany and France shows some similarities and some differences in their economic structure. The sectors under focus work partly very different. Labour demand by sectors may also play different roles in both countries.

The dynamic on the labour market by sectors is similar in both countries, measured in **number of hours worked**. In both countries more and more people work more and more hours. The overall similarity differs in detail and differs with respect to the sectors under observation: in Germany, hours worked are increasing in the commerce sector and declining in the logistic sector. In France, it is just vice versa. However, the distribution of employment (in person not in hours) across sectors is very similar in Germany and France. In both countries, it is the service sector with the highest **employment share**. The employment share in logistic and commerce sector is similar. Labour productivity is an important indicator that combines production and labour demand. High **labour productivity** indicates that more output can be produced with less input. Labour productivity in Germany is lower than in France. France is also more productive in the commerce and in the logistic sector. The productivity rates between France and Germany converges when labour productivity is not measured in number of persons employed but in number of hours worked. Overall, France has a higher **number of hours worked per employee** than Germany which means that Germany employs in average more part-time workers than France. This can be observed over nearly all sectors and also in commerce and logistic sector. **Indirect employment effects** are important for sector analysis as they describe a sector's importance in inducing employment in other sectors than in its own. In general, indirect employment effects are larger in manufacturing industries than in service sectors and agriculture industry. In total and in the commerce sector, the indirect employment effects are more or less equally strong in France and in Germany. The logistic sector differs: the indirect employment effects are much stronger in Germany than in France.

3. The labour market can be further disaggregated by adding the occupational and educational differentiation to the analysis. Again, interesting differences and similarities between the two countries are disclosed:

In both countries, around 54 percent of all **employees** are concentrated in three **occupations**: Professionals, technicians and associate professionals and Service and sales workers. In both countries, the increase in Professional occupations is very dynamic. While the overall occupational structure and the occupational structure of commerce sector is similar in France and Germany, the occupational structure in the logistic sector differs: The dominance of Plant and machine operators and assemblers is more pronounced in France than in Germany with over 10 percentage points difference. Clerical support workers are, instead, more important for the German logistic sector. On occupational level the tendency of more female employees in France is confirmed. In nearly all occupations, female employment is higher in France than in Germany. However, the typical female professions are the same in France and in Germany.

The majority of employees have a medium **education level** in both countries. However, the share is considerable higher in Germany than in France. Also, the share

of high skilled workers are with 40 percent significantly larger in France compared to Germany (28 percent). This indicates the strong job-oriented training approach in Germany and confirms the strong focus in France on high education. The qualification level for commerce and logistic sector are equally distributed in Germany and France with the prominence in medium-skilled workers. Again, in France, both sectors increase their share of high-skilled employees over time. The increase is in both sectors at the expense of low-skilled workers.

4. Information on a more detailed level for the supply side of the labour market are less common than for the demand side. Information exist on aggregate level and on educational level for working-age population.

The majority of working population in Germany as well as in France is medium-skilled, followed by high-skilled people. Tertiary education is increasing at the expense of low-skilled education while medium-skilled education share remains more or less stable over time. However, the speed in dynamics is significantly different between France and Germany. France shows a much faster development towards a high-skilled population than Germany. The French female working-age population is very high-skilled. The difference to Germany is more than 10 percentage points.

5. Labour supply and labour demand are two sides of the same medal. Labour demand is limited by labour supply, and labour supply is nothing without labour demand. Ideally, labour demand and labour supply match perfectly in the sense, that all labour demand is satisfied and all labour supply finds an identical match on the demand side of the labour market. However, such a perfect world mostly do not exist. On aggregate level, such a **labour mismatch** is called unemployment rate when labour supply exceeds labour demand. However, if the unemployment rate shrinks, a growing shortage of labour can be observed. This situation can be observed in Germany and, since a few years and to a much lower extent, also in France.

Labour supply and demand can not only be matched on aggregate level, also on educational level. In both countries, it is the medium-skilled education level that claims shortage in working-age population. High-skilled overhang exist in both countries.

Table 35 summarizes the indicators by colouring similarities and differences in total and by the two sectors commerce and logistics. Some indicators cannot be produced on sectoral level. Overall, the two economies show especially differences on the driving factors of growth (external balance versus state demand). On the labour market, the two economies are especially different with respect to female employment and educational structure of employment. In France, more female employees and more high-skilled jobs exist than compared to Germany. Similarities exist especially in the overall dynamic of the labour market.

With respect to the two sectors under observation, it is especially interesting to notice that the commerce sector functions relatively similar in both economies, but the logistic sector

discloses the most differences.

The commerce sector is similar in many aspects of production, e.g. import dependencies, or share of value added. The commerce sector depends mostly on final demand and is relatively independent of intermediate production. The labour market structure is also very much the same in terms of direct and indirect employment effects. The occupational and educational requirements are in both countries the same, as well.

Different the logistic sector. The sector functions very different in both countries which may especially be caused by the export dependency of this sector.

Table 35: Summary of indicators

		FRANCE GERMANY		
		Total	Commerce	Logistic
MAIN AGGREGATES				
1	GDP per head	1		
2	Ratio external balance	1		
3	Average growth rate of total employment	0		
4	Employment rate, total	1		
5	Employment rate, female	1		
6	Compensation of employees per hours worked	1		
7	Collective wage bargaining coverage	1		
SECTORAL DIFFERENCES				
<i>Diversification</i>				
8	Dynamic of diversification in production		0	0
<i>Nominal production, share of total employment and dynamic of hours worked</i>				
9	Share of total production		0	0
10	Average growth rate of nominal production	1	0	1
11	Share of total employment		0	0
12	Average growth rate of total hours worked	0	0	1
<i>Direct and indirect production shares and ratios</i>				
13	Ratio of direct to indirect production	0	0	0
<i>Export induced production</i>				
14	Share of export induced production to total production	1	1	1
<i>Import dependency of production</i>				
15	Share of import dependent production to total production	0	0	0
<i>Composition of production</i>				
16	Share of value added to production	0	0	1
<i>Composition of total final use</i>				
17	Share of final demand on total use	0	1	1
<i>Components of final demand</i>				
18	Share of private consumption to total final demand	1	1	1
19	Share of exports to total final demand	1	1	1
<i>Identification of key sectors</i>				
20a	Backward linkages	0	0	1
20b	Forward linkages	0	1	1
<i>Direct employment effects</i>				
21	Employment intensity	0	1	0
22	Labour productivity	1	1	1
<i>Indirect employment effects</i>				
23	Employment factor	0	0	0
<i>Hours worked per head</i>				
24	Number of hours worked per employee	1	1	1
OCCUPATIONAL AND EDUCATIONAL DIFFERENCES				
<i>Employment by occupation</i>				
25a	Occ_edu - Share of employees as professionals	0		
25b	Occ_edu - Share of employees as technicians and associate professionals	1		
25c	Occ_edu - Share of employees as service and sales workers	1		
<i>Occupational structure by sectors</i>				
26	Occ_edu - Share of major occupation	0	1	1
<i>Employment by education</i>				
27a	Occ_edu - Share of educational level - low	1	0	1
27b	Occ_edu - Share of educational level - medium	1	1	1
27c	Occ_edu - Share of educational level - high	1	1	1
<i>Employment by occupation and sex</i>				
28	Occ_edu - Share of female employment in service and sales	1		
29	Occ_edu - Share of female employment in plant and machine occupations	1		
SUPPLY SIDE OF THE LABOUR MARKET				
<i>Working-age population by qualification</i>				
30a	Supply - Share of working-age population by education - low	1		
30b	Supply - Share of working-age population by education - middle	1		
30c	Supply - Share of working-age population by education - high	1		
<i>Working-age population by qualification and sex</i>				
31a	Supply - Share of female working-age population by education - low	0		
31b	Supply - Share of female working-age population by education - middle	1		
31c	Supply - Share of female working-age population by education - high	1		
MATCHING LABOUR SUPPLY AND LABOUR DEMAND				
32	Match - Total working population over total employees	0		
Total number of indicators		38	22	22
Number of similarities		14	11	7
Number of differences		24	11	15
Share of similar indicators to total number of indicators in %		37	50	32

Legend: grey = no indicator; red = indicator is different between France and Germany; green = indicator is similar between France and Germany

7 SUMMARY AND OUTLOOK

The analysis based on five different angles to look at the economy: first it was the aggregate angle which helped to classify the overall economy in a more general way. Then, the observation closed in on sectoral level. By applying input-output analysis, it was possible to tickle economic specifications that are not possible to see on aggregate level. Following-up, the employment situation was described in France and Germany not only on sectoral but also on occupational and educational level. On the supply side of the labour market only a limited number of indicators were available. Nevertheless, both sides of the labour markets was matched on educational level.

In total, 32 indicators were defined and calculated for France and Germany. Due to the use of harmonized tables of Eurostat, all indicators are – in general – available for all members of the European Union. The sectoral indicators are available for all 65 sectors. However, time and priority limited the analysis on only two sectors: commerce and logistics. Occupational-based indicators are available for 10 professions and educational-based indicators differ between low-, medium- and high-skilled employees.

The indicators show, that some similarities but also some differences exist between France and Germany. Despite some important differences that can be observed already on the aggregate level, a closer look on sectoral level reveals, that on a more disaggregated level more similarities exist. The commerce sector functions in both countries very similar. Nevertheless, the logistic sector shows more differences than similarities. The labour market differs especially in terms of gender segregation, compensation and education.

Indicator-based analysis is therefore helpful and important for comparing two economies. However, the large set of indicators aggravates to draw final conclusions. Also because the analysis does not weights the indicators. Which means that the indicator e.g. GDP per head is equally important to the indicator average growth rate of working hours. The analysis is therefore not objectified.

Next steps are twofold: first, an aggregate indicator shall be developed that reduces the complexity and facilitates the interpretation of a large set of single indicators. This can be done, for example, by applying the principle component analysis. This analysis is applied on the set of indicators identified in this working paper. Second, it is planned to extent the analysis to an ex-ante level. Looking ahead, allows to identify non-favoured developments and allows to plan early-action. For this purpose, different forecast models are described and discussed whether the existing models are suitable for forecasting indicators.

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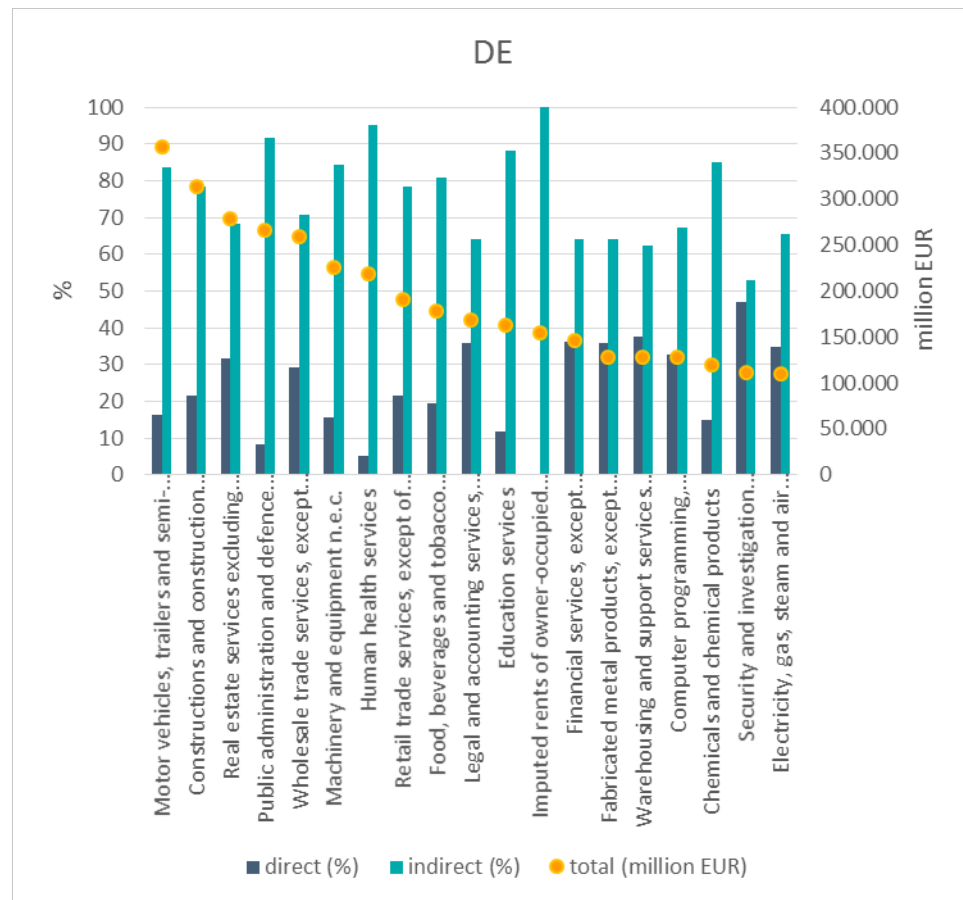
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9 ANNEX

Table 36: Overview of indicators

1	Products of agriculture, hunting and related services
2	Products of forestry, logging and related services
3	Fish and other fishing products, aquaculture products, support services to fishing
4	Mining and quarrying
5	Food, beverages and tobacco products
6	Textiles, wearing apparel, leather and related products
7	Wood and of products of wood and cork, except furniture, articles of straw and plaiting materials
8	Paper and paper products
9	Printing and recording services
10	Coke and refined petroleum products
11	Chemicals and chemical products
12	Basic pharmaceutical products and pharmaceutical preparations
13	Rubber and plastic products
14	Other non-metallic mineral products
15	Basic metals
16	Fabricated metal products, except machinery and equipment
17	Computer, electronic and optical products
18	Electrical equipment
19	Machinery and equipment n.e.c.
20	Motor vehicles, trailers and semi-trailers
21	Other transport equipment
22	Furniture and other manufactured goods
23	Repair and installation services of machinery and equipment
24	Electricity, gas, steam and air conditioning
25	Natural water, water treatment and supply services
26	Sewerage services, sewage sludge, waste collection, treatment and disposal services, materials recovery services, remediation services and other waste management services
27	Constructions and construction works
28	Wholesale and retail trade and repair services of motor vehicles and motorcycles
29	Wholesale trade services, except of motor vehicles and motorcycles
30	Retail trade services, except of motor vehicles and motorcycles
31	Land transport services and transport services via pipelines
32	Water transport services
33	Air transport services
34	Warehousing and support services for transportation
35	Postal and courier services
36	Accommodation and food services
37	Publishing services
38	Motion picture, video and television programme production services, sound recording and music publishing, programming and broadcasting services
39	Telecommunications services
40	Computer programming, consultancy and related services, Information services
41	Financial services, except insurance and pension funding
42	Insurance, reinsurance and pension funding services, except compulsory social security
43	Services auxiliary to financial services and insurance services
44	Real estate services excluding imputed rents
45	Imputed rents of owner-occupied dwellings
46	Legal and accounting services, services of head offices, management consultancy services
47	Architectural and engineering services, technical testing and analysis services
48	Scientific research and development services
49	Advertising and market research services
50	Other professional, scientific and technical services and veterinary services
51	Rental and leasing services
52	Employment services
53	Travel agency, tour operator and other reservation services and related services
54	Security and investigation services, services to buildings and landscape, office administrative, office support and other business support services
55	Public administration and defence services, compulsory social security services
56	Education services
57	Human health services
58	Residential care services, social work services without accommodation
59	Creative, arts, entertainment, library, archive, museum, other cultural services, gambling and betting services
60	Sporting services and amusement and recreation services
61	Services furnished by membership organisations
62	Repair services of computers and personal and household goods
63	Other personal services
64	Services of households as employers, undifferentiated goods and services produced by households for own use
65	Services provided by extraterritorial organisations and bodies

Figure 19: Direct and indirect production shares of top-20 sectors of total production



COMPARATIVE QUANTITATIVE DATA ANALYSIS FOR LOGISTIC AND E-COMMERCE SECTOR IN FRANCE AND GERMANY

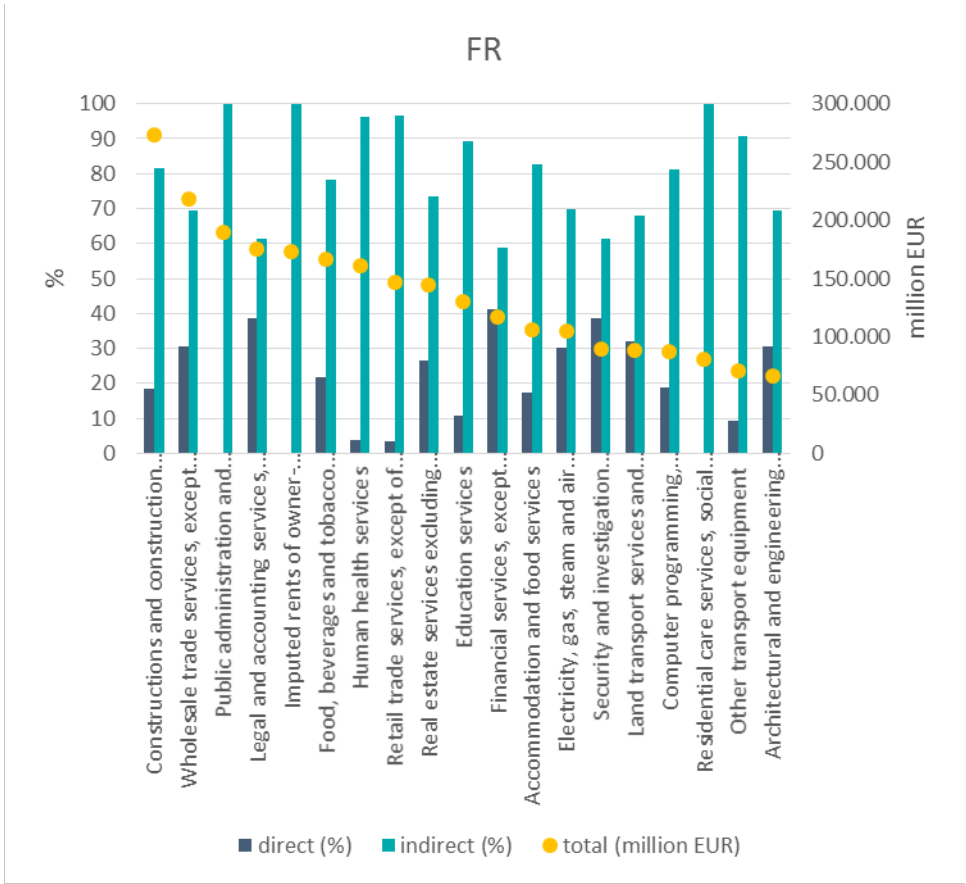


Figure 20: Employment factor by sectors, 2016