EUROPEAN CENTRAL BANK

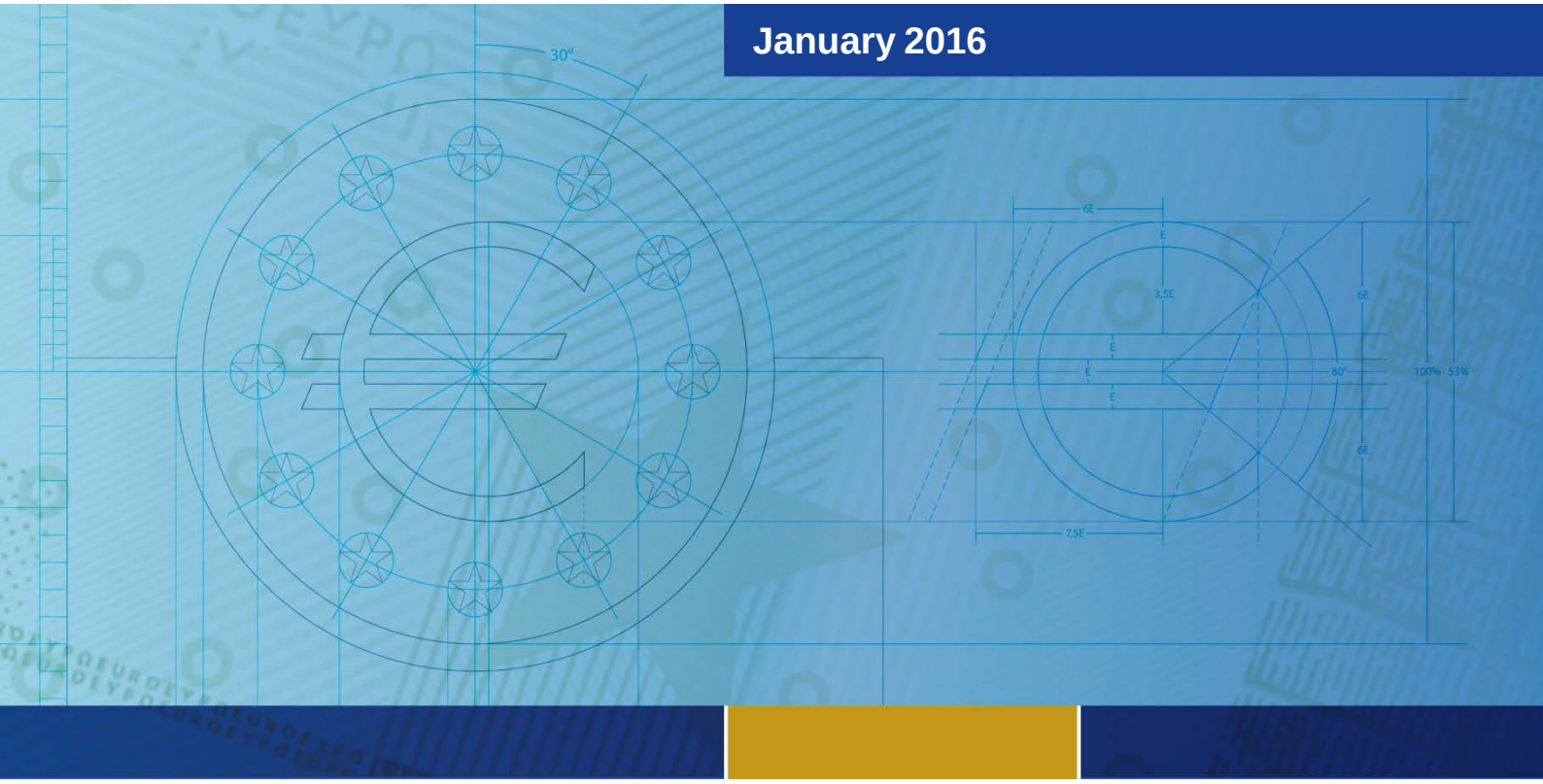
EUROSYSTEM

CompNet firm-level based dataset:

User guide for researchers
4th round of data collection

CompNet The Competitiveness Research Network

January 2016



Note: This User guide has been prepared by the CompNet team. Responsibility for any error is of the authors and not of the ECB or the EU system of Central Banks.

Contents

1 Introduction to CompNet

Firm-level based micro data provides crucial information for understanding the drivers of competitiveness. Aggregate indicators alone, when interpreted as if they had been generated by the behaviour of a representative firm, often may be misinterpreted. In fact, widespread heterogeneity at the firm level (as documented in Caves 1998, Bartelsman and Doms 2000), opens up the possibility that aggregate performance depends jointly on firm-level decisions (on factor inputs, innovation and technological capacity or export strategy) as well as on market environment (macro wage and price dynamics, structural economic conditions and strategic interactions). Thus, cross-country information on the underlying distribution of firms is essential in order to assess drivers of aggregate productivity, export performance, and competitiveness.

The analysis of the micro (firm-level) dimension of competitiveness is one of the key research areas of the Competitiveness Research Network (CompNet), set up by the EU System of Central Banks in March 2012 with the objective of analysing competitiveness from a comprehensive perspective, that is, encompassing the macro, firm-level and cross-country dimensions.

In order to preserve confidentiality of firm-level information and to improve cross-country comparability, CompNet has adopted the so-called "distributed micro-data approach" as developed by Bartelsman, E, Haltiwanger, J. and S. Scarpetta (2004). In this approach a common protocol is used to extract relevant information from existing firm-level datasets available within each National Central Bank (NCB) or National Statistical Institute (NSI) and aggregate it such that the confidentiality of firm data is preserved. The common methodology harmonizes industry coverage, variable definitions, estimation methodologies and sampling procedures, as much as the underlying raw data allows. The final outcome is a wide range of indicators, based on micro-level data, which could be used systematically for analysis of competitiveness related issues.

This user guide aims at providing the researcher with a detailed overview of the structure and characteristics of this novel database. Information on indicator comparability, recommendations for the data use as well as possible limitations are also discussed. Therefore, before using the data, reading this note is strongly recommended in order to have a better understanding of the database.

The rest of the user guide is structured as follows. Section 2 presents the methodology adopted by CompNet to collect and construct the database. Section 3 describes the sample and its coverage. Section 4 provides recommendations for the use of the database, Section 5 reports the variables available in CompNet for each category of indicators, while Section 6 explains how to navigate in the data.

2 Collection of data: micro-distributed approach

2.1 Data collection

Although the literature has long recognized that firm level data delivers crucial information about a wide range of phenomena, economic research based on these data has been so far hampered by issues of confidentiality and comparability. As a result, CompNet data collection process has been designed in such a way that both issues are resolved.

2.2 Data sources

CompNet raw data are collected from a number of sources and institutions that collaborate extensively with the network by performing the initial steps needed to ensure full confidentiality and comparability of the data. **Table 1** shows for each country the institution that collaborates with CompNet.

Table 1
Data sources

Country	Data Source	Name of the data source	Institution
Austria	Multiple sources	Balance sheet data collection of the OeNB (includes data from business register)	Oesterreichische Nationalbank
Belgium	Administrative data	Central Balance Sheet Office database, International transaction database, VAT declarations	National Bank of Belgium
Croatia	Administrative data	Annual Financial Statements Registry	Financial Agency (Financijska agencija, Fina)
Estonia	Foreign trade statistics data	Foreign trade statistics data	Statistics Estonia
	Business register	Business register	Estonian Centre of Registers and Information Systems
Finland	Administrative data	Structural Business Statistics	Statistics Finland
France	Administrative data	Fiscal Form (Fiben)	Banque de France
Germany	Multiple sources	Financial Statements Data Pool	Deutsche Bundesbank
Hungary	Administrative data and trade data	NAV panel, Customs Data and Intrastat	Central Statistical Office
Italy	Multiple sources	1) Statistical Business Register (Asia), corporate events and company group; 2) Financial statements from Chamber of Commerce; 3) Large enterprise survey (SCI); 4) Foreign Trade data	Istat – National Institute of Italy
Lithuania	Structural Business Data	Structural Business Data	Statisitics Lithuania
	External Trade Data	External Trade Data	
Malta	National Statistics Office	Structural Business Statistics	Central Bank of Malta
Poland	Administrative Data	F-01 and F-02 forms	Central Statistical Office of Poland
Portugal	Multiple sources	Informação Empresarial Simplificada	Ministry of Justice, Ministry of Finance and Public Administration, Instituto Nacional de

			Estatística - INE Portugal and Banco de Portugal.
Romania	Balance sheet and Profit and Loss Account	Ministry of Public Finance	National Bank of Romania
	Export and import data	National I(nstitute of Statistics	
Slovakia	Multiple sources	Report on production industries	Statistical Office of Slovak Republic
		Foreign trade statistics	
		Business registry	
Slovenia	Administrative data	Slovenian companies' annual reports	Agency of the Republic of Slovenia for Public Legal Records and Related Services (AJPES)
Spain	Survey	Annual Central Balance Sheet Data Office (CBA)	Banco de España
	Administrative data	Annual Accounts Deposited in Mercantile Registeries Data Base (CBB-RM)	
	Exports/Imports	Balance of Payments	

2.3 Confidentiality

As a first step of the data collection process, the country teams apply within the NCB or NSI a common procedure aiming at protecting confidential information. This procedure is structured in such a way that the user of the final data would not be able to uniquely identify individual firms based on the aggregated data. For example, in order to compute the mean value of a variable, the CompNet protocol requires a sample size of at least 3 observations[1]. The required number of observations to compute the full distribution is 11; while for a joint distribution is 101. Further country specific requirements might apply according to their own confidentiality protocol.

CompNet ultimately ensures that no private information is released within the network. The user of the database will only receive variables that group together an amount of data sufficient to ensure complete confidentiality.

2.4 Comparability

After the first phase, a common methodology to ensure cross-country comparability of all indicators is applied to the variables calculated by the NCB or NSI. This methodology has been introduced by CompNet to improve the processing of the data and bringing the dataset to the highest standards among its kind. The main focus has been on two critical areas: the treatment of outliers and the harmonization of deflation methods across countries.

However, the user of the database should be aware that full comparability is not always ensured since:

[1] This requirement refers to the simplest estimation in terms of information needed, such as labour productivity or total labour cost. For computing more complex indicators, such as TFP or TFPR, the required amount of observation will be higher.

- Different institutions are in charge of gathering the data (National Central Banks, National Statistical Institutes, a third National Agency or under the joint responsibility of several institutions)[2];
- There could be discrepancies in the definition of the target population (for instance Germany includes also some sole proprietorships);
- There could be different rules of exclusion to select the sample used to compute CompNet indicators[3]. For example, there could be differences in how countries define the size of firms like countries using the average number of employees over the year while some others using the number at the end of the year.

2.5 Deflators and PPPs

In order to produce real variables, the CompNet routine applies **sector-specific deflators**. Deflators are retrieved from NACE Rev.2, 2-digit level series on National Accounts by 64 branches from Eurostat, both in nominal and in real terms. Gross value added in millions of euros is expressed in current prices; real value added, measured in millions of euros and chain-linked with the base year 2005, is taken from the volume series. Since both series are already harmonized by Eurostat, the deflator values can be easily obtained by computing the ratio of both series. The same procedure is applied in order to obtain the country-level GDP deflators. The value added in each sector is then deflated with its corresponding sectorial deflator. Turnover, capital and intermediate inputs are deflated using the country-level GDP deflator.

Furthermore, in order to improve comparability across countries, the deflator series are adjusted by using **country** and **sector specific value added PPPs**. The latters are taken from the Groningen Growth and Development Centre productivity database for 1997[4].

2.6 Treatment of outliers

CompNet **outlier cleaning** is a multi-step procedure applied to ratios, as well as to the respective numerator and denominator. In detail, the cleaning algorithm works as follows:

1. First, if a given ratio is found to have an abnormal growth rate, it is replaced by a missing;
2. Subsequently, after identifying the reason for such an abnormal value, the corresponding numerator or the denominator is replaced with a missing.

---

[2] Please refer to Table 1 for a detailed list of the institutions that are in charge of collecting the data used within CompNet.

[3] Please refer to Section 3.2 for a detailed analysis of CompNet coverage in comparison with Eurostat and OECD database.

[4] For further information see the GGDC database.

In a second step, any variable that has a ratio with capital or labour in the top or bottom 1% of observations in that sector and year is replaced with a missing.

The financial variables are also cleaned from outliers, following usual procedures in the financial literature[5]. Finally, several financial indicators are ratios that should theoretically lie within the interval between 0 and 1. They will be dropped if they do not satisfy this condition.

Further, the following cleaning rules are applied in all countries:

1. All observations with negative or zero labour costs, capital, value added, or turnover are replaced by missing values;
2. All firms with zero employees are dropped, considering therefore only the ones with at least one employee. This is done for two reasons. First, some countries report information on firms with at least one employee, whereas other countries have no reporting thresholds in place. Second, some countries replace missing information with a zero and there is no way to disentangle "true" zero-employee firms from missing data.

[5] See Ferrando, et al. (2015).

3 Sample description and data preparation

3.1 Data span and dimension

Target populations are defined with few exceptions [6] in the same way across countries, aiming at nonfinancial corporations consistent with the definition of category S11 in the European System of Accounts (that is, excluding sole proprietors). However, as highlighted in Section 2.4, some minor discrepancies in the target population remain.

The fourth round of the CompNet database includes 17 European countries over a period of 18 years (1995-2012). The table below reports the countries that are part of CompNet and the time-availability of their data.

Table 2
Country and period availability

Country	Period
Austria	2000 - 2012
Belgium	1996 - 2010
Croatia	2002 – 2012
Estonia	1995 – 2012
Finland	1999 – 2012
France	1995 – 2012
Germany	1997 – 2012
Hungary	2003 – 2012
Italy	2001 – 2012
Lithuania	2000 – 2012
Malta	2003 – 2011
Poland	2005 – 2012
Portugal	2006 – 2012
Romania	2003 – 2012
Slovakia	2001 – 2011
Slovenia	1995 – 2012
Spain	1995 – 2012

For each country and year, data is available both at the macro-sectorial level (9 in total) and at a more granular sectorial level (56 in total). The table below shows all sectors included in the database. However, not all sectors are available for each country[7].

[6] For instance DE includes also some sole proprietorship, but possibly in an extremely limited number since participation in the register is voluntary and of little interest for such firms.

[7] See Annex 2 for a detailed list of sectors available for each country.

Table 3

Macro-sector and sectors included

NACE Rev. 2 Section	Description	Macro-sector code in CompNet	Sector code in CompNet	Description
C	Manufacturing	1	10	Manufacture of food products
			11	Manufacture of beverages
			12	Manufacture of tobacco products
			13	Manufacture of textiles
			14	Manufacture of wearing apparel
			15	Manufacture of leather and related products
			16	Manufacture of wood and of products of wood and cork, except furniture
			17	Manufacture of paper and paper products
			18	Printing and reproduction of recorded media
			20	Manufacture of chemicals and chemical products
			21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
			22	Manufacture of rubber and plastic products
			23	Manufacture of other non-metallic mineral products
			24	Manufacture of basic metals
			25	Manufacture of fabricated metal products, except machinery and equipment
			26	Manufacture of computer, electronic and optical products
			27	Manufacture of electrical equipment
			28	Manufacture of machinery and equipment n
			29	Manufacture of motor vehicles, trailers and semitrailers
			30	Manufacture of other transport equipment
			31	Manufacture of furniture
			32	Other manufacturing
			33	Repair and installation of machinery and equipment
F	Construction	2	41	Construction of buildings
			42	Civil engineering
			43	Specialised construction activities
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	3	45	Wholesale and retail trade and repair of motor vehicles and motorcycles
			46	Wholesale trade, except of motor vehicles and motorcycles
			47	Retail trade, except of motor vehicles and motorcycles
H	Transportation and storage	4	49	Land transport and transport via pipelines
			50	Water transport
			51	Air transport
			52	Warehousing and support activities for transportation
			53	Postal and courier activities
I	Accommodation and food service activities	5	55	Accommodation
			56	Food and beverage service activities
J	Information and communication	6	58	Publishing activities
			59	Motion picture, video and television programme production, sound recording and music publishing
			60	Programming and broadcasting activities
			61	Telecommunications
			62	Computer programming, consultancy and related activities
			63	Information service activities
L	Real estate activities	7	68	Real estate activities
M	Professional, scientific and technical activities	8	69	Legal and accounting activities
			70	Activities of head offices; management consultancy activities
			71	Architectural and engineering activities; technical testing and analysis
			72	Scientific research and development
			73	Advertising and market research
			74	Other professional, scientific and technical activities
			75	Veterinary activities
N	Administrative and support service activities	9	77	Rental and leasing activities
			78	Employment activities
			79	Travel agency, tour operator and other reservation service and related activities
			80	Security and investigation activities
			81	Services to buildings and landscape activities
			82	Office administrative, office support and other business support activities

3.2 Data coverage

Countries might apply different rules of exclusion to select the sample used to compute CompNet indicators. A few countries use a size criterion to exclude some of the firms belonging to the small-size class. This criterion may vary across countries in terms of definition (turnover or number of employees) or in terms of export threshold. Hence, firm coverage could potentially differ across countries.

The table below shows in detail data coverage across countries. Columns 2 and 3 report the coverage of firms (average number per year) and employment vis-à-vis the population of firms with at least 1 employee (20 or more employees in France, Poland and Slovakia) active in sectors included in CompNet and in the OECD database. Columns 4 and 5 show the coverage of CompNet with respect to the overall economy, i.e. total value added and employment reported in the National Accounts (from Eurostat).

Table 4
CompNet coverage

	Coverage vs. similar population of firms (OECD) [8]		Coverage vs. National Accounts (Eurostat) [9]	
Country	# of firms	Tot. Employment	Value added	Tot. Employment
Austria	1%	29%	20%	18%
Belgium	31%	76%	49%	39%
Croatia	32%	77%	39%	46%
Estonia	73%	95%	25%	56%
Finland	48%	96%	45%	45%
France [10]	7%	58%	42%	34%
Germany	3%	41%	32%	20%
Hungary	44%	88%	20%	50%
Italy	10%	53%	27%	30%
Lithuania	27%	82%	20%	46%
Malta	5%	48%	7%	24%
Poland [10]	77%	80%	15%	24%
Portugal	30%	80%	20%	45%
Romania	70%	93%	29%	37%
Slovakia	91%	95%	35%	29%
Slovenia	31%	85%	21%	46%
Spain	19%	47%	25%	32%

8 Coverage is computed over the period 2005-2007, with the exception of Estonia, Portugal (both 2006-2007), Malta and Croatia (both 2008-2009). Data of the population of firms with at least 1 employee were retrieved from the OECD Structural Business Statistics repository.

9 Coverage of the whole economy (not only private firm sector) is computed for 2005, with the exception of Portugal for which 2006 is used instead. Eurostat data comes from National accounts: series nama_gdp_c and nama_aux_pem, respectively.

10 France, Poland and Slovakia provide only information for firms with 20 employees or more. The coverage is computed over the population of firms with 20 employees or more.

3.3 Full and 20E samples

CompNet variables and indicators are available for two samples: the full and the 20E. The full sample covers the period 1995-2012, its target population includes countries where firm-level data is available for all size classes listed below:

(1) firms with 1-9 employees;
(2) firms with 10-19 employees;
(3) firms with 20-49 employees;
(4) firms with 50-250 employees;
(5) firms with more than 250 employees.

Data prior to 2001 often lacks of representativeness due to country specific criteria in the methodology employed to collect the data. Furthermore, in some countries firms are legally obliged to report their balance sheet data only when certain thresholds are met (e.g. in Poland only firms with at least ten employees have to report their accounting information).

In order to provide a more homogeneous sample across countries, CompNet constructed a second sample which is the 20E sample.

The 20E sample includes only firms that have at least 20 employees and has information for the period 2001-2012. A sample re-weighting technique has been also carried out in order to increase the representativeness of the sample. This technique applies the so-called population weights based on the total number of firms in each country, year, macro-sector and size class from Eurostat Structural Business Statistics (SBS), taken as the population. This sample is highly suited for qualitative and graphical analysis and comparisons.

Table 5
Effects of the re-weighting on the share of firms in 20E sample

	Share of firms out of total firms>20 employees					
	20-49 employees		50-249 employees		250 or more	
	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted
Austria	31%	65%	50%	29%	20%	6%
Belgium	65%	68%	28%	27%	6%	5%
Croatia	61%	61%	32%	32%	7%	7%
Estonia	64%	63%	32%	33%	4%	4%
Finland	62%	63%	30%	30%	8%	7%
France	65%	66%	29%	28%	6%	6%
Germany	35%	61%	49%	32%	16%	7%
Hungary	63%	64%	31%	31%	6%	6%
Italy	66%	69%	29%	26%	5%	4%
Lithuania	61%	63%	35%	33%	5%	4%
Malta	55%	57%	38%	35%	7%	8%
Portugal	67%	68%	28%	28%	4%	4%
Romania	61%	61%	33%	33%	6%	6%
Slovenia	56%	58%	36%	34%	8%	8%
Spain	74%	71%	23%	25%	3%	4%

Table 6 summarizes the differences between the two samples.

Table 6

Features comparison of the two samples

	Full	20E
Period	1995 – 2012	2001 – 2012
Countries	AT, BE, DE, EE, ES, FI, HR, HU, IT, LT, MT, PT, RO, SL	AT, BE, DE, EE, ES, FI, FR HR, HU, IT, LT, MT, PL, PT, RO, SK, SL
Macro-sectors	9	9
Sectors	56	56
Size class	1, 2, 3, 4, 5	3, 4, 5
Population weights	x	✓

For further country specific information see **Annex 1**.

4 Caveats and limitations of the dataset

4.1 Construction limitation

Data availability varies across indicators according to the procedure required to estimate them. For example, while labour productivity can be computed, on average, for 87% of all firms in the database, total factor productivity (TFP) is more data-intensive and can be estimated for 60% of the firms only. Moreover, the sample of firms for which each indicator can be computed might vary in terms of reporting standards. For this reason, basic indicators based on employment or sales figures are considered as being more comparable across countries than more complex indicators.

Moreover, in most countries sample composition does not account for market entry and exit of firms over time (see **Annex 1** for details). Ultimately, changes in the sample composition could affect point estimates of the indicators, which are particularly relevant for dynamic indicators, such as the Foster productivity decomposition.

The year of creation of the firm is an item provided in the balance sheet of only 6 countries. Currently it is neither possible to compute entry and exit rates, nor to divide firms according to their age. These features will be added in the future.

Eventually, this could also lead to the presence of outliers in the aggregates, as it is pointed out by the ECB DG-Statistics Quality report.

4.2 Analysis of indicators over time

Two issues should be taken into consideration when assessing specific indicators over time. First, changes in the compilation methods (e.g. accounting standards) of raw variables used to produce indicators are a potential source of cross-country differences. Second, as already mentioned above, the country's firm sample could feature changes in its composition or size over time.

In general, this implies that countries with a wider firm coverage (in particular Belgium, Estonia, Finland, Hungary, Poland, Portugal, Romania, Slovakia and Slovenia – see **Annex 1**) are able to provide figures that are less affected by changes in the composition of the sample population over time. For the remaining countries, yearly changes in the indicators over time could be the result of changes in the sample population, not related to firm dynamics but rather to statistical procedures. More recent data (i.e. from 2001 onwards) is considered to be more reliable than those from earlier years given that data compilation procedures in several countries have generally improved over time, mainly expressed in a substantial increase in the number of firms sampled.

4.3 Comparison with National Accounts

CompNet indicators aggregated from firm-level sources are fundamentally different from aggregate National Accounts statistics (NA) that consolidate and balance information from a variety of sources. Firm-level variables used by CompNet are collected based on national legislation on accounting rules (GAAP), while official aggregate statistics rely on National Accounts rules (ESA). Also, micro-based sources like CompNet rely on accounting figures that are mainly based on book value, although some assets are valued at market prices, following national accounting rules. National accounts, on the other hand, tend to use market values.

Although the trends detected within CompNet samples are correlated with those in National Accounts, the correlation could be weaker if the dynamics of the public sector or self-employed (not covered in the firm-level data) are substantially different from the non-financial corporate sector. Investigating case-by-case the sources of such discrepancies can be an important exercise to better assess the underlying dynamics of competitiveness of private businesses in each country.

4.4 Raw variable definition

CompNet collects information on a rather large number of raw variables. **Table 24**, in the Annex, provides the harmonized definition of each of those variables. Given the different underlying data sources and accounting rules across countries, some country-specific deviations still remain even after applying several steps to improve cross-country harmonization; they are presented in **Table 25** of the Annex.

Box 1
Recommendations for the use of existing data

a. The data is useful and suitable for **within-country** firm performance comparisons (e.g. of low and high productive firms, or of firms with or without credit constraints), as well as to compare **dynamics across sectors**, or retrieve micro-based information to calibrate macroeconomic models.

b. When performing the above-mentioned analysis, a number of precautionary practices should nevertheless be followed. Since the coverage of the sample might vary across indicators, robustness checks with **alternative indicators** should be conducted (e.g. labour productivity vs. TFP); furthermore, as time series could change in certain countries/industries due to variability of the underlying sample, **averages across years** (e.g. before/after crisis) and cumulative growth rates should be preferred rather than specific yearly figures.

c. Since cross-country comparisons are crucial for policy analysis and research, the **use** of the **20E sample is strongly recommended**, given its better quality in terms of distribution of firms across size classes and sectors. However, some within cell biases still persist. For this reason, we do not encourage the use of this dataset to perform direct cross-country comparisons of aggregate levels (e.g. simple averages of indicators at country level). In addition, restricting the analysis to the most comparable set of countries [11] is recommended. It is also recommended not to compare the absolute magnitude of micro-based variables to macro aggregates retrieved from NA statistics, preferring when possible some sort of normalization.

d. Due to the lack of full comparability, the CompNet database should be used with great **caution** for cross-country comparisons of descriptive, **unconditional** cross-country statistics. This is especially true for productivity measures. Indeed, as reported in section 5.1.4, in order to perform cross-country analysis the TFP distribution should be rescaled with the TFPR. However, if the data is used within a regression analysis, the researcher can control for country and sector differences via a rich set of dummies.

e. Despite the fact that **Germany** and **Austria** provide information on firms with more than 1 employee, for these two countries the use of the full (unweighted) sample is not encouraged. According to Table 4, the samples in both countries include only 1-3% of firms in the population but covers 30-40% of the total employment, thus indicating a clear bias towards large firms in both countries. The 20E sample (which is population weighted) is more comparable, and therefore recommended for cross-country analysis.

[11] For example, if the research question requires the use of the full sample of firms, authors should restrict the analysis to countries with good coverage of small firms. For detailed information on sample coverage, refer to the ECB DG-Statistics Quality report.

4.5 Further data quality improvements

CompNet, following the recommendations provided by DG Statistics in November 2014[12], is working to improve the database along the following lines:

i. **Comparability of samples and concepts**
ii. **Representativeness of the sample**
iii. **Missing data**
iv. **Outliers**

In the future data will be improved by both modifying the relevant programmes of data gathering at the centre of the project; and refining the methodology behind data collection and sampling.

[12] See ECB DG-Statistics Quality report.

5 Variables available in the database

The CompNet firm-level-based database offers a wide range of indicators constructed on firm-level information. For each indicator, CompNet collects the complete set of statistical moments of the distribution.

In this section, a detailed list of available statistics and their level of aggregation is presented for all indicators computed by CompNet. Furthermore, the label used in the Stata datasets and the general definitions are provided. In order to make the user guide more accessible, the variables are organised by topic of interest, i.e. productivity, financial, trade, markup, labour and joint distributions.

For more specific details on the CompNet overall dataset and its four modules see the following papers:

- CompNet overall methodological paper: Lopez-Garcia, di Mauro and the CompNet Task Force (2015) - ECB WP 1764
- Financial module: Ferrando, et al. (2015) - ECB WP 1836
- Trade module: Berthou, et al. (2015) - ECB WP 1788
- Labour module: Fernández, et al. (forthcoming)
- Markup module: Amador, et al. (forthcoming)

Indicators available in the CompNet database are aggregated at different levels, for example according to the geographical dimension or different firm's characteristics. The table below provides an overview of the specific aggregation levels with the corresponding abbreviation that are used in the user guide and a brief explanation.

Table 7
Levels of aggregation

Abbreviation	Name	Definition
Country	Country level	Aggregation on individual country level
M-Sec	Macro-sector level	Aggregation on 1-digit sector level according to NACE rev.2
Sec	Sector level	Aggregation on 2-digit sector level according to NACE rev.2
SZC	Size-class	Distinction according to the size class as explained in paragraph 3.3
CC	Credit constraint	Distinction according to the firm's access to credit. For an extensive explanation see Chapter 3 of ECB WP 1836
EXP	Export status	Distinction between exporting and non-exporting firms
GL	Growth level class	Transition matrix built on changes in firm's employment growth over a three years' time. (see Box 2 for details)
LC	Labour cost class	Transition matrix built on changes in firm's labour costs over a three years' time. (see Box 2 for details)
LPC	Labour productivity class	Transition matrix built on changes in firm's labour productivity over a three years' time. (see

		Box 2 for details)
SCD	Size class dynamics	Transition matrix built on changes in firm's size class over a three years' time. (see Box 2 for details)
PROD	Productivity class	Transition matrix built on changes in firm's TFP over a three years' time. (see Box 2 for details)
ULCC	Unit labour cost class	Transition matrix built on changes in firm's unit labour costs over a three years' time. (see Box 2 for details)

5.1 Productivity indicators

CompNet provides a large set of the most recognized indicators to analyze productivity trends and levels over time. These indicators allow researchers to take country specific snapshots, to study productivity divergence across EU countries, and to improve the understanding of the resource allocation process.

Table 8 shows the productivity indicators available within the CompNet database, together with their Stata label, general definition, available statistics and levels of aggregation.

Table 8
Productivity indicators

Indicator	Label	Definition	Statistics[13]	Level of aggregation
Real Value Added (and growth)	rva, g_rva	Value Added Deflated With Sector Specific Deflators	All_prod[13]+ Total	Country, M-Sec, Sec, SZC, CC, LC, EXP
Real Turnover (and growth)	rturnover, g_rturnover	Turnover Deflated With GDP Deflator	All_prod[13]	Country, M-Sec, Sec, SZC
Real Capital	rk	Capital Deflated with GDP Deflator	All_prod[13]	Country, Sec, M-Sec, SZC, CC, LC
Capital Intensity	rk_l	Real Capital Divided By The Number Of Employees	All_prod[13]	Country, Sec, M-Sec, SZC, CC, LC
Capital Productivity (and growth)	kprod, g_kprod	Real Value Added Divided By Capital	All_prod[13]	Country, Sec, M-Sec, SZC, CC, LC
TFP (and growth)	tfp, g_tfp	Total Factor Productivity (for details see Box 2)	All_prod[13]	Country, Sec, M-Sec, SZC, CC, LC, EXP
TFPR	tfpr	Total Factor Productivity Revenue (for details see Box 2)	Counts, Mean, Median, IQR, SD	Country, Sec, M-Sec, SZC,
TFPR à la Hsieh and Klenow	tfpr_HK	Total Factor Productivity Revenue (for details see Box 2)	Counts, Mean, Median, IQR, SD	Country, Sec, M-Sec, SZC,
Labour productivity (and growth)	lprod g_lprod	Ratio of real value added over employees	All_prod[13]	Country, M-sec, SCZ, GL, LC, LPC, SCD, PROD, ULCC
Marginal product of labor (and growth)	mrpl g_mrpl	Marginal revenue product of labour (for details, see Box 2)	All_prod[13]	Country, M-sec, SCZ, GL, LC, LPC, SCD, PROD, ULCC
Marginal Product Capital (and growth)	mrpk, g_mrpk	Marginal revenue product of capital (for details, see Box 2)	All_prod[13]	Country, Sec, M-Sec, SZC, CC, LC
OP gap for labour and lprod	lopgap	Olley-Pakes (OP) gap or covariance between size and productivity of firms operating in a given sector/macro-sector (for details, see Box 3)	Count, OP gap	Country, M-Sec, Sec
OP gap for capital and kprod	kopgap		Count, OP gap	Country, M-Sec, Sec

[13] All_prod: Counts, Mean, Median, IQR, SD, Skewness, Percentiles, Output weighted Mean.

OP gap for inputs and TFP	tfp_inp_opgap		Count, OP gap	Country, M-Sec, Sec
Labour productivity growth Foster decomposition	labTOT_within labTOT_between labTOT_covariance labLP_l labTOT_diff	Foster-Haltiwanger-Krizan (2000) 2-years productivity growth decomposition terms (for details, see Box 3)	Count, decomposition terms	Country, M-Sec, Sec
Capital productivity growth Foster decomposition	kTOT_within kTOT_between kTOT_covariance kLP_l kTOT_diff		Count, decomposition terms	Country, M-Sec, Sec
TFP growth Foster decomposition	TOT_within TOT_between TOT_covariance LP_l TOT_diff		Count, decomposition terms	Country, M-Sec, Sec

5.1.1 TFP estimation

5.1.1.1 Wooldridge approach

While several productivity measures such as labour and capital productivity can be readily computed from raw data, estimating firm-level total factor productivity (TFP) requires a more complex estimation technique. The object of interest is A_{it}, in the following equation:

$$RVA_{it} = A_{it} K_{it}^{\alpha} L_{it}^{1-\alpha}, \quad (1)$$

where RVA is real value added, K is the real book value of net capital and L is total employment. Building on the approach developed by Olley and Pakes (1996), Levinsohn and Petrin (2003), Ackenberg et al (2006) and Wooldridge (2009), we estimate A_{it} by applying a logarithmic transformation to the above equation. Then firm-level TFP is estimated using a revision of Wooldridge (2009) proposed by Galuscak and Lizal (2011): an implementation of Olley and Pakes/Levinsohn and Petrin methodology in a GMM framework, controlling for capital measurement error.

The estimation of equation (1) is performed on a 2-digit industry level. However, in order to obtain consistent estimates with sufficient degrees of freedom, a minimum of 25 observations per sector and year is required. Sectors that do not meet the minimum cut-off have their TFP estimates replaced by a TFP estimates at the macro-sector level.

The regression used in order to obtain firm-level TFP is given by

$$rva_{it} = \beta_0 + \beta_1 k_{it} + \beta_2 k_{i(t-1)} + \beta_3 m_{i(t-1)} + \beta_4 k_{i(t-1)}^2 + \beta_5 m_{i(t-1)}^2 + \beta_6 k_{i(t-1)}^3 + \beta_7 m_{i(t-1)}^3 + \beta_8 k_{i(t-1)} m_{i(t-1)} + \beta_9 k_{i(t-1)} m_{i(t-1)}^2 + \beta_{10} k_{i(t-1)}^2 m_{i(t-1)} + \gamma Year_t + \omega L_{i(t-1)} \quad (2)$$

All variables are expressed in logs. Material inputs are measured by $m_{i(t)}$. Since labour and TFP are simultaneously determined, while capital takes time to build, labour is instrumented by its first lag. Equation (2) also contains several higher order

and interaction terms between capital and materials, to control for non-linearities. Moreover, a full set of year dummies is included to control for sector-specific trends.

Equation (2) is estimated via GMM following Wooldridge (2009). Standard errors are clustered at the firm-level.

After the estimation, firm-level TFP is retrieved as the difference between (log) real value added and the fitted values for (log) real capital, (log) labour and a year trend:

$$\mathrm{TFP}_{it} = \mathrm{rva}_{it} - \left(\hat{\beta}_0 + \hat{\beta}_1 \mathrm{k}_{it} + \hat{\gamma}\mathrm{Year}_t + \hat{\omega}\mathrm{L}_{i(t-1)}\right) \quad (3)$$

Removing year-specific means yields better (and less unrealistically high values) estimates for the distribution of TFP within a sector and country. Yet, it hampers comparability of TFP-levels across countries. In order to facilitate cross-country comparability of the computed level of TFP, individual observations are rescaled by country-specific mean or median TFP term coming from aggregate data (or alternatively an external data source such as the EU-KLEMS).

5.1.1.2 TFP estimation with Hsieh and Klenow approach

Using the estimated coefficients of capital and labour, i.e. $\hat{\beta}_1$ and $\hat{\omega}$, it is possible to estimate the marginal rate of productivity of both inputs:

$$\mathrm{MRPK}_{it} = \frac{\hat{\beta}_1 \mathrm{rva}_{it}}{\mathrm{k}_{it}} \quad (4)$$

$$\mathrm{MRPL}_{it} = \frac{\hat{\omega} \mathrm{rva}_{it}}{\mathrm{l}_{it}} \quad (5)$$

Since the production function coefficients are reported, it is possible to adjust the hypothesis about the degree of decreasing returns to scale in the post estimation stage by directly manipulating equations (4) and (5). Note that a common issue when using book value of capital is that capital share coefficient might suffer from a downward bias. Furthermore, these two equations can be used to construct an alternative measure of TFP, following Hsieh and Klenow (2009), by defining:

$$\mathrm{TFP}_{HK} = \mathrm{mrpk}_{st}^{\hat{\beta}_{1s}} * \mathrm{mrpl}_{st}^{\hat{\omega}_s}, \quad (6)$$

with s being the sector. This definition uses firm-level marginal products (of capital and labour) weighted with their respective estimated production function coefficients.

Extreme outliers in the distribution of the TFP, namely observations above the 99.5th percentile and below the 0.5th percentile, are not included in the database.

5.1.2 Dispersion measures

Following the approach outlined in Kehrig (2011), the TFP and marginal product estimates are then used to calculate a measure of dispersion over time. The measure proposed by Kehrig allows to avoid biases driven by large volatilities at the sectoral level and time trends. Kehrig's method first regresses the raw measure on a

time trend and the residuals. It retrieves the residuals of this regression. Next, the residuals are divided by the sector-specific standard deviation. The dispersion measure at the industry level is then defined as the median standard deviation of the resulting series.

5.1.3 TFPR estimation

CompNet provides a revenue based TFP, i.e. the TFPR. The steps needed to build this variable are identical to the ones described in the previous sections. The only notable difference is that capital is taken in real terms. The TFPR is estimated using the methodology presented in 5.1.1 above. Following the Woolridge approach it is:

$$\mathrm{TFPR} = \frac{\mathrm{rva}}{\mathrm{rk}^{\hat{\beta}_1} * \mathrm{l}^{\hat{\omega}}} \qquad (7)$$

where rva is the real value added as presented in the balance sheet of the firm, and rk is the real capital.

To deal with the Hsieh and Klenow approach, MRPK is computed, using real capital (rk) instead of capital (k), and then the methodology seen before is applied to compute TFPR (no changes have been done for MRPL):

$$\mathrm{MRPK} = \frac{\hat{\hat{\beta}}_1 * \mathrm{rva}}{\mathrm{rk}} \quad \text{and} \quad \mathrm{MRPL} = \frac{\hat{\omega} * \mathrm{rva}}{\mathrm{l}} \qquad (8)$$

$$\mathrm{TFPR}_{\mathrm{HK}} = \mathrm{mrpk}^{\hat{\beta}_1} * \mathrm{mrpl}^{\hat{\omega}} \qquad (9)$$

Both measures, TFPR and $\mathrm{TFPR}_{\mathrm{HK}}$, are computed at sector and macro-sector level, and expressed in levels (no more in logs).

5.1.4 TFPR rescaling

In CompNet, the most comparable measure of productivity is the TFPR. However, only the mean and the median of such measure are included in the dataset. By rescaling the TFP distribution, as shown below, the researcher will nevertheless obtain the full distribution of a cross-country comparable productivity measure.

$$TFP\ rescaled = \frac{TFP\ statistic}{TFP\ median} * TFPR\ median$$

Being computed as a residual in each sector, the estimated TFP is more suited for within-sector analysis. The absolute values of its distribution lack of comparability across sectors and across countries. Nevertheless, the TFP distribution is highly representative of the productivity distribution within each country and sector. The rescaling proposed, as stated above, overcomes these issues allowing the researcher to have a cross-country comparable measure of productivity.

5.1.5 Allocative efficiency measures

CompNet database provides estimates of different allocative efficiency indicators developed and widely used in the literature.

5.1.5.1 Static allocative efficiency (Olley and Pakes, 1996)

Olley and Pakes introduced a very simple-to-compute indicator of allocative efficiency measured by the industry-level covariance between productivity and size, usually labelled as "**OP gap**".

Let y_{st} be productivity in industry s at time t, measured as a weighted average of firm-level productivity ω_{it}, with shares of industry size as weights.
The productivity of industry s can be decomposed as:

$$y_{st} = \sum_{i \in S} \theta_{it}\omega_{it} = \bar{\omega}_{st} + \sum_{i \epsilon S} (\theta_{it} - \bar{\theta}_{st})(\omega_{it} - \bar{\omega}_{st})$$

where S is the set of firms belonging to industry s, θ_{it} and $\omega_{i,t}$ represent size and productivity of firm i at time t, respectively, $\bar{\theta}_{st}$ and $\bar{\omega}_{st}$ represent the unweighted mean size and productivity of industry s at time *t*, respectively.

The decomposition splits the weighted average of firm productivity in two components: the unweighted industry mean and the covariance between productivity and size. The latter captures allocative efficiency in industry s at time t since it reflects the extent to which firms with higher than average productivity have a greater market share in terms of size.

In the database the following variables and terms used in the decomposition are available:

Table 9
Aggregate labour productivity decomposition, Olley and Pakes (1996)

Variable label	Description	Implemented in the code
`opgap`	Covariance between relative size of each firm and its productivity	(totwlprod / totl_weight) - avlprod
`totwlprod`	Sum of firms' weighted labour productivity	total(lnlprod*l)
`totl_weight`	Sum of firms weights used (i.e. size as number of employees)	total(l)

Notes: in the codes the logarithm of labour productivity, ln(lprod), has been considered. "Avlprod" is the unweighted average labour productivity.

In addition to this "classical" decomposition using labour productivity and labour share as weights, alternative decompositions are also available.

Accordingly, the shares used in the decomposition are calculated in different ways depending on the productivity indicators analysed, as explained below.

Table 10
Alternative aggregate productivity decomposition à la Olley and Pakes

a. OP gap for capital and kprod

Variable label	*Description*	*Implemented in the code*
kopgap	Covariance between relative capital of each firm and its productivity	(totwkprod / totk_weight) - avkprod
totwkproa	Sum of firms' weighted capital productivity	total(lnkprod*k)
totK_weignt	Sum of firms weights used (i.e. size measured as capital)	total(k)

Notes: in the codes the logarithm of capital productivity, ln(kprod), has been considered. "avkprod" is the unweighted average capital productivity.

b. OP gap for inputs and TFP

Variable label	*Description*	*Implemented in the code*
iopgap_trp_int	Covariance between relative inputs of each firm and its productivity	(totw_inp_tfp / tottfp_inp_weight) - avtfp
totw_inp_trp	Sum of firms (input weighted) TFP	total(w_inp_tfp)
tottrp_inp_weignt	Sum of firms weights used (i.e. size measured as inputs)	total(inp)

Notes: in the codes the logarithm of capital productivity, ln(tfp), has been considered. "avtfp" is the unweighted average TFP.
Each firm input is defined in the following way:
$xqm_{ik} = 0.5 * ((m_{ik}/RVA_{ik}) + (m_{ik-1}/RVA_{ik-1}))$; $xqe_{ik} = 0.5 * ((lc_{ik}/RVA_{ik}) + (lc/RVA_{ik-1}))$; $inp_{it} = \left((m_{ik}^{xqm_{ik}})(l_{ik}^{xqe_{ik}})\left(k_{ik}^{(1-xqm_{ik}-xqe_{it})}\right)\right)$
Input weights are then defined as: $\theta_{ik} = inp_{it}/\sum_i inp_{ik}$

5.1.5.2 Dynamic allocative efficiency (Foster, Haltiwanger, and Krizan, 2006)

The covariance between size and productivity provides a snap-shot of market allocative efficiency, that is, of how resources are allocated at a certain moment in time.
A complementary way of exploring the question is looking at how resources move between two points in time across firms in the industry, hoping that they will be released from low productive/exiting units and reallocated to more productive/entering firms.
Let, as before, y_{st} be industry's productivity at time t, measured as a weighted average of firm-level productivity ω_{it}, with shares of industry size as weights.
Following Foster, Haltiwanger, and Krizan (2006), the change in productivity of industry's from time t-k to time t can be decomposed as:

$$\Delta y_{st} = \sum_{i\in C} \theta_{it-k}\Delta\omega_{it} + \sum_{i\in C}(\omega_{i,t-k} - \widehat{\omega}_{st-k})\Delta\theta_{it} + \sum_{i\in C}\Delta\theta_{it}\,\Delta\omega_{it} + \sum_{i\in N}\theta_{it}(\omega_{it} - \widehat{\omega}_{st-k}) - \sum_{i\in X}\theta_{it-k}(\omega_{it-k} - \widehat{\omega}_{st-k})$$

where Δ is the differential operator between t-k and t; C denotes continuing firms, N denotes entering firms, and X denotes exiting firms; θ_{it} and $\omega_{i,t}$ represent size and productivity of firm i at time t, respectively, $\hat{\theta}_{st}$ and $\widehat{\omega}_{st}$ represent the weighted mean size and productivity of industry's at time t, respectively.

Before looking at the dynamic indicators of allocative efficiency available in CompNet, please recall that we do not have information on the age of firms nor well measured data on entry and exit of firms. Given this limitation of our database, the Foster decompositions implemented by the codes do not take into account the

contribution of exiting and entering firms (the fourth and the fifth terms of the equation above).
However, we can identify the three different sources of productivity growth:

1. the contribution of productivity changes for continuing firms with initial weights ("**within component**");
2. the contribution of the reallocation of resources among continuing firms given their initial productivity ("**between component**") – it is positive if firms with higher productivity than the average are gaining market share;
3. the "**covariance term**" which captures simultaneous growth in productivity and market share among continuing firms

Please note that, as a consequence of the lack of the entry and exit margin, the within sample measure of sector productivity used in the decomposition is different from aggregate sector productivity computed elsewhere in the code. The Foster Decomposition implemented in CompNet is carried out for k=2.

Table 11
Aggregate productivity growth decomposition à la Foster, et al. (2006)

Labour productivity growth between t-2 and t

Variable label	*Description*	*Variable label*	*Description*
labTOT_within	Within component	labLP_1	Sum of the "known" components: within + between + covariance
labTOT_between	Between component		
labTOT_covariance	Covariance term		
labTOT_diff	labLP_1 minus the difference between unweighted and weighted labour productivity		

Capital productivity growth between t-2 and t

Variable label	*Description*	*Variable label*	*Description*
kTOT_within	Within component	kLP_1	Sum of the "known" components: within + between + covariance
kTOT_between	Between component		
kTOT_covariance	Covariance term		
kTOT_diff	kLP_1 minus the difference between unweighted and weighted capital productivity		

TFP growth between t-2 and t

Variable label	*Description*	*Variable label*	*Description*
TOT_within	Within component	LP_1	Sum of the "known" components: within + between + covariance
TOT_between	Between component		
TOT_covariance	Covariance term		
TOT_diff	LP_1 minus the difference between unweighted and weighted TFP		

5.2 Financial indicators

CompNet financial indicators, drawing from balance sheet and profit and loss accounts, relate the financial and financing conditions of firms to productivity measures. Firms' financing decisions are crucial in determining investment choices. Indeed, it is well documented in the literature that the existence of frictions in accessing external sources of finance significantly affects the management ability of exploiting productive investment opportunities. In this setting, the financial position of a firm and the access to external funds stand out to be key factors in explaining its performance in terms of profitability and value added generated. The availability of financial indicators offers therefore a great opportunity to investigate some of the crucial determinants of firms' investment and growth.

Table 12 shows the financial indicators available within the CompNet database, with their Stata label, general definition, available statistics and levels of aggregation.

Table 12
Financial indicators

Indicator	Label	Definition	Statistics [14]	Level of aggregation
Investment Ratio (and growth)	invest_ratio, g_invest_ratio	(Growth Rate Of Capital + Depreciation) Divided By Capital	All_fin[14]	Country, Sec, M-Sec, SZC, CC, LC, EXP
Leverage (and growth)	leverage, g_leverage	Debt Divided By Total Assets	All_fin[14]	Country, Sec, M-Sec, SZC, CC, LC, EXP
Return On Assets (and growth)	roa, g_roa	Operating Profit-Loss Divided By Total Assets	All_fin[14]	Country, Sec, M-Sec, SZC, CC, LC, EXP
Cash Holdings (and growth)	cash_holdings, g_cash_holdings	Cash Divided By Total Assets	All_fin[14]	Country, Sec, M-Sec, SZC, CC, LC, EXP
Financial Gap (and growth)	financial_gap, g_financial_gap	Approx Investment - Cash Flow	All_fin[14]	Country, Sec, M-Sec, SZC, CC, LC, EXP
Collateral (and growth)	collateral, g_collateral	Capital Divided By Total Assets	All_fin[14]	Country, Sec, M-Sec, SZC, CC, LC, EXP
Equity _Debt (and growth)	equity_debt, g_equity_debt	Equity Divided By Debt	All_fin[14]	Country, Sec, M-Sec, SZC, CC, LC, EXP
Cash Flow Ratio (and growth)	cash_flow_ta, g_cash_flow_ta	Cash Flow Divided By Total Assets	Counts, Mean, Median, SD, IQR	Country, Sec, M-Sec, SZC, CC, LC, EXP
Implicit Interest Rate (and growth)	implicit_rate g_implicit_rate	Interest paid over the stock of debt	Counts, Mean, Median, SD, IQR, Skewness	Country, Sec, M-Sec, SZC, CC, EXP
Trade Credit (and growth)	trade_credit g_trade_credit	Accounts payable over total assets	Counts, Mean, Median, SD, IQR, Skewness	Country, Sec, M-Sec, SZC, CC, EXP
Trade Debit (and growth)	trade_debt g_trade_debit	Accounts receivable over total assets	Counts, Mean, Median, SD, IQR, Skewness	Country, Sec, M-Sec, SZC, CC, EXP
Capital Depreciation (and growth)	depr_k g_depr_k	Depreciation rate over total assets	Counts, Mean, Median, SD, IQR, Skewness	Country, SEC, M-Sec, SZC, CC, EXP
Debt Burden (and growth)	debt_burd g_debt_burd	Interest paid over total assets	Counts, Mean, Median, SD, IQR, Skewness	Country, SEC, M-Sec, SZC, CC, EXP
Equity Ratio (and growth)	equity_ratio g_equity_ratio	Equity over total assets	Counts, Mean, Median, SD,	Country, Sec, M-Sec, SZC,

[14] All_fin : Counts, Mean, Median, IQR, SD, Skewness, Percentiles, Weighted Mean.

			IQR, Skewness	CC, EXP
Profit Margin (and growth)	profitmargin g_profitmargin	EBIT over Turnover	Counts, Mean, Median, SD, IQR, Skewness	Country, Sec, M-Sec, SZC, CC, EXP
Inventory Turnover	inv_turnover	Inventories as a fraction of turnover	Counts, Mean, Median, IQR, SD, Skewness, Percentiles	Country, Sec, M-Sec, SZC, CC, LC, EXP
Indicator of Credit Constraints	SAFE	Share of credit constrained firms based on information derived on their financial situation (from the Survey on Access to Finance of Enterprises)	Counts, Mean	Country, Sec, M-Sec, SZC, EXP
Investment And Financing Conditions Of Firms	absconstrained	Share of firms affected by financial restrictions when planning their investments based on the Ferrando and Ruggieri (2015) approach	Counts, Mean	Country, Sec, M-Sec, SZC, EXP

For further information and descriptive analysis of the financial indicators, refer to the Financial module, Ferrando, et al. (2015).

5.3 Labour indicators

The main objective of the labour module is to provide cross-country comparable indicators of firm growth in terms of employees. Data in general comes from various sources although most countries rely on administrative data (firm registries) and few on surveys carried out by the national central banks. The indicators presented allow the researcher to analyse employment dynamics at a granular level and over time.

Table 13 shows the labour indicators available within the CompNet database, with their Stata label, general definition, available statistics and levels of aggregation.

Table 13
Labour indicators

Indicator	Label	Definition	Statistics [15]	Level of aggregation
Labour (and growth)	l g_l	Labour employed	Counts, Mean, Median, IQR, SD, Skewness, Weighted Mean, Percentiles (only for growth)	Country, M-sec, SCZ, GL, LC, LPC, SCD, PROD, ULCC
Labour Cost (and growth)	lc g_lc	Nominal Labour Costs, inlcuding wages and employers'social security contributions	All_labour[15]	Country, M-sec, SCZ, GL, LC, LPC, SCD, PROD, ULCC
Labour Cost Per Employee (and growth)	lc_l g_lc_l	Nominal Labour Costs Divided By The Number Of Employees	All_labour[15]	Country, M-sec, SCZ, GL, LC, LPC, SCD, PROD, ULCC
Labour Productivity Revenue (and growth)	lprod_rev	Real Turnover Divided By The Number Of Employees	All_labour[15]	Country, Sec, M-Sec, SZC, CC, LC
Unit Labour Cost (and growth)	ulc g_ulc	Nominal Labour Costs Divided By Real Value Added	All_labour[15]	Country, M-sec, SCZ, GL, LC, LPC, SCD, PROD, ULCC
Wageshare (and growth)	wageshare g_wageshare	Nominal Labour Costs divided by Nominal Value Added	All_labour[15]	Country, M-sec, SCZ, GL, LC, LPC, SCD, PROD, ULCC
Employment change	empchange	Employment percentage change over three-year period	Counts, Mean	M-sec, CC

For further information and descriptive analysis of the labour indicators, refer to the Labour module, Fernández, et al. (forthcoming).

[15] All_labour: Counts, Mean, Median, Percentiles, IQR, Skewness, Weighted Mean, Percentiles.

Box 2
CompNet transition matrices

In the labour section, CompNet offers to the users a variety of transition matrices built on several indicators i.e. firm growth level (`high_growth`), firm number of employees (`lclass`), labour productivity (`lprodclass`), total factor productivity (`tfpclass`), size class (`szclass`), and unit labour cost (`ulcclass`).

Transition matrices track the evolution of firms in terms of these indicators in a given country/macro-sector over a three years period. For example, imagine observing a firm belonging to the first quintile of the TFP distribution in a given year, the TFP transition matrix enables to identify whether these firms belong three years later to an upper quintile (e.g. increased their labour productivity on average). A number of firms' characteristics and statistics at time t are also provided, so that it is possible to analyse firms' features in detail before the growing or shrinking episode.

Transition matrices have been assembled also within the framework of the OECD DynEmp project; it is therefore possible to compare results across these two datasets.

Below, a brief explanation of the variables that form the transition matrices is given:

- **labour_hg_all_countries_:** in this dataset the transition matrix is called `high_growth`. It shows whether firms in a given year/country/macsector experienced a change in the level of employment growth over a three years' time.
- **labour_sz_all_countries**: in this dataset the transition matrix is called `size_class_growth`. This matrix shows whether firms in a given country/macro sector experienced a change in size over a three years' time. This dataset allows identifying not only the dynamic within size classes (i.e. identifying the firms as decline, equal, growth) but also the former size class of the firms through a variable called szclass.
- **labour_l_all_countries_**: in this dataset two variables, `lclass` and `lclass_plus3`, form the transition matrix. This matrix shows whether firms in a given country/macro sector experienced a change in the number of employees, by displaying in which quintile of the labour distribution the firms belong at time t (`lclass`) and at time t+3(`lclass_plus3`).
- **labour_lprod_all_countries_**: in this dataset, two variables, `lprodclass` and `lprodclass_plus3`, form the transition matrix. This matrix shows whether firms in a given country/macro sector experienced a change in the number of employees in labour productivity, by displaying in which quintile of the labour productivity distribution the firms belong at time t (`lprodclass`) and at time t+3 (`lprodclass_plus3`).
- **labour_tfp_all_countries_**: in this dataset, two variables, `tfpclass` and `tfpclass_plus3`, form the transition matrix. This matrix shows whether firms in a given country/macro sector experienced a change in the number of employees in TFP, by displaying in which quintile of the TFP distribution the firms belong at time t (`tfpclass`) and at time t+3 (`tfpclass_plus3`).
- **labour_ulc_all_countries_**: in this dataset, two variables, `ulcclass` and `ulcclass_plus3`, form the transition matrix. This matrix shows whether firms in a given country/macro sector experienced a change in the number of employees in their

unit labour cost, by displaying in which quintile of the unit labour cost distribution the firms belong at time t (`ulcclass`) and at time t+3 (`ulcclass_plus3`).

5.4 Markup indicators

A competitive business environment is a key ingredient for achieving an efficient allocation of resources and sustainable growth. It is thus relevant to understand the drivers of countries' productivity and competitiveness. However, the analysis of competition in the empirical literature is mostly performed at the country-level dimension, which does not allow for a useful benchmark. CompNet with its large set of markup indicators can therefore provide useful policy guidelines.

Table 14 shows the markup indicators available within the CompNet database, with their Stata label, general definition, available statistics and levels of aggregation.

Table 14
Markup indicators

Indicator	Label	Definition	Statistics[16]	Level of aggregation
Price-Cost Margin	`pcm`	Non Parametric Measure Of Market Power: (Turnover - Labour Costs - Nominal Materials /Turnover	All_markup[16], Mean and Weighted Mean	Sec, SZC, AGE, EXP
Price-Cost Margin with a proxy for Capital costs	`pcm_k`	Non Parametric Measure Of Market Power: (Turnover - Labour Costs - Nominal Materials - Capital Cost)/Turnover	All_markup[16], Mean and Weighted Mean	Sec, SZC, AGE, EXP
Yearly change in Price-Cost Margin	`dif_pcm`, `dif_pcm_k`	Difference in PCM by year computed as PCMt1-PCMt1	All_markup[16]	Sec, SZC, AGE, EXP
Market share	`ms`	Share of a firm's turnover over total turnover	All_markup[16]	Sec, SZC, AGE, EXP
Implicit interest rate	`i`	Interest (financial charges) paid over total (costly) debt	All_markup[+/-] and Weighted Mean	Sec, SZC, AGE, EXP
Export share	`exp_ratio`	Export value over turnover	All_markup[+/-] and Weighted Mean	Sec, SZC, AGE, EXP
Concentration ratio for the 10 largest firm	`c10`	Sum of turnover shares of the 10 largest firms	Index	Sec
Herfindahl-Hirschman index	`HHI`	Squared sum of firms' market shares	Index	Sec

For further information and descriptive analysis of the markup indicators, refer to the Markup module, Amador, et al. (forthcoming).

[16] All_markup : Median, IQR, SD, p1, p5, p10, p25, p75, p90, p95, p99.

5.5 Trade indicators

Understanding how aggregate exports can be sustained by a more dynamic productivity growth is essential for implementing competitiveness enhancing policies. Moments of the distribution of a set of variables related to export activities have been computed at various levels of aggregation. Moreover, to shed light on the question whether exporting firms tend to be more productive, CompNet database includes computation of the productivity premia by international trade status.

Table 15 shows the trade indicators available within the CompNet database, with their Stata label, general definition, available statistics and levels of aggregation.

Table 15
Trade indicators

Indicator	Label	Definition	Statistics[17]	Level of aggregation
Share of Exporting Firms	exp, exp_no, exp_3y, exp_new, stop_exp, exp_switch, exp_no3y, imp, imp_no, twoway	Share of exporting firms over the total population indicating if they are exporting, continuous exporting, newly exporting, switching exporting or importing.	Index	Country, Sec, SZC, TFPC, RVA
Export Value	exp_value	Share of Turnover Deriving from Exporting Activities	All_trade[17]	Country, Sec, SZC, TFPC, RVA
Export Ratio	exp_ratio	Export Value Divided By Total Turnover	All_trade[17]	Country, Sec, SZC, TFPC, RVA
Export Value Added	exp_vad	The Share Of Value Added In Exports	All_trade[17]	Country, Sec, SZC, TFPC, RVA
Correlation of Firms' Characteristics with Export Value	corr_lnexp_value_l corr_lnexp_value_lnlprod corr_lnexp_value_lnmarkup corr_lnexp_value_lntfp corr_lnexp_value_lnulc	Correlation of Firms' Turnover Deriving from Export with Labour, Labour Productivity (log), Markup(log), TFP(log), Unit Labour Cost(log)	Index	Country, Sec
Correlation of Firms' Characteristics with Export Ratio	corr_lnexp_ratio_l corr_lnexp_ratio_lnlprod corr_lnexp_ratio_lnmarkup corr_lnexp_ratio_lntfp corr_lnexp_ratio_lnulc	Correlation of Firms' Export Turnover over Total Turnover with Labour, Labour Productivity (log), Markup(log), TFP(log), Unit Labour Cost(log)	Index	Country, Sec
Correlation of Firms' Characteristics with Export Value	corr_lnexp_vad_l corr_lnexp_vad_lnlprod corr_lnexp_vad_lnmarkup corr_lnexp_vad_lntfp corr_lnexp_vad_lnulc	Correlation of Firms' Value Added deriving from Export with Labour, Labour Productivity (log), Markup(log), TFP(log), Unit Labour Cost(log)	Index	Country, Sec

The export status classification in CompNet is indicated in the first variable, i.e. "label", and assumes the following specification:

- **Exporter** (exp): If the balance sheets report a minimum turnover of 1.000 EUR[18] from sales in a country different from the firm's country of origin in the observed year;

[17] All_trade: Counts, Mean, Median, Lagged Log Mean, Lagged Log Median, IQR, SD, Skewness, Percentiles

- **Permanent exporter** (`exp_3y`): If the balance sheets report minimum turnover of 1.000 EUR from sales in a country different from the firm's country of origin in the observed year as well as the previous and the next ones;
- **New exporter** (`exp_new`): If the balance sheets report minimum turnover of 1.000 EUR from sales in a country different from the firm's country of origin in the observed year as well as the next one;
- **Non exporter** (`exp_no`): If the balance sheets do not report any turnover from sales in a country different from the firm's country of origin in the observed year;
- **Permanent non exporter** (`exp_no3y`): If the balance sheets report turnover from sales in a country different from the firm's country of origin neither in the observed year nor the previous nor the next ones;
- **Temporary exporter** (`exp_switch`): If the balance sheets report minimum turnover of 1.000 EUR from sales in a country different from the firm's country of origin in the observed year but not in the previous and next year;
- **Exiter** (`stop_exp`): If the balance sheets report minimum turnover of 1.000 EUR from sales in a country different from the firm's country of origin in the observed year as well as in the previous one but not in the next year;
- **Importer** (`imp`): If the balance sheets report costs sustained by the firm against firms in a country different from the firm's country of origin in the observed year;
- **Non importer** (`imp_no`): If the balance sheets do not report costs sustained by the firm against firms in a country different from the firm's country of origin in the observed year;

An additional classification is provided to extend the analysis of firms' international activities, namely:

- **Two-way trader** (`twoway`): If the firm is considered both an exporter and an importer in the observed year;
- **Firms where the export is not relevant** (`catx_1`): When the export accounts for 1% or less of total turnover;
- **Firms where the export is hardly relevant** (`catx_1to5`): When the export accounts for 1% to 5% of total turnover;
- **Firms where the export is slightly relevant** (`catx_5to10`): When the export accounts for 5% to 10% of total turnover;
- **Firms where the export is relevant** (`catx_10to50`): When the export accounts for 10% to 50% of total turnover;
- **Firms where the export is largely relevant** (`catx_50`): When the export accounts for more than 50% of total turnover;
- **Top 5 exporters** in a given level of aggregation by turnover deriving by exporting activities (`top5_x`) or employment (`top5_l`);
- **Top 10 exporters** in a given level of aggregation by turnover deriving by exporting activities (`top10_x`) or employment (`top10_l`);

[18] Note that for countries that use custom or intra-Stat / extra-Stat declarations to observe exports at the firm level, the minimum amount of exports may be much larger (for instance, in Belgium for the 2006-2010 period, intra EU trade is observed for firms exporting to the EU 27 at least 600,000 EUR in a given year).

- **Exporters that account for 60% of the total value of export** by turnover in a given level of aggregation (`top60pct_x`).

For further information and descriptive analysis of the trade indicators, refer to the Trade module paper, Berthou, et al. (2015).

5.6 Joint distributions

The CompNet database offers a variety of joint distributions namely the average and/or the median of a variable for firms in a certain decile of another variable's distribution. For example, using the joint distributions it is possible to investigate the real capital of firms located on the tails of the TFP distribution (i.e. the more and the least productive firms).

The available indicators can be retrieved by the table below.

Table 16
Available joint distributions

Mean and median of — **Characteristic**

Variable	Label
Real value added	rva
TFP	tfp
Capital	rk
Capital intensity	rk_l
Labour	l
Labour Costs	lc_l
ULC	ulc
Total Employment	tot_l
Labour Productivity	lprod
Investment ratio	invest_ratio
Leverage	leverage
ROA	roa
Cash holdings	cash_holdings
Financing gap	financial_gap
Collateral	collateral
Debt burden	debt_burd
Equity debt ratio	equity_debt
Share of credit constrained	SAFE

of firms at different deciles of — **Distribution**

Variable	Label
Labour Productivity	lprod
Labour Productivity Growth	g_lprod
Labour	l
Labour Growth	g_l
Labour Cost per Employee	lc_l
ULC	ulc
Real Capital	rk
Capital Intensity	rk_l
Real Value Added	rva
TFP	tfp

The variables, within the Joint Distributions, have the following naming conventions:

distribution_percentile_**characteristic**_mean (or median)

For a correct interpretation, the name must be read as from general to specific.

Precisely the first word is the variable relevant in terms of distribution, the second part is the percentile of interest, the third part displays the characteristic investigated, while the last part tell the user whether the statistic reported is the median or the average of the characteristic investigated. Some examples are:

- `g_lprod_p30_tfp_median` indicates the median of TFP for the 3rd decile of the growth rate of labour productivity.
- `rva_p90_SAFE_mean` indicates the average share of credit constrained firms in the 90th percentile of real value added.

6 How to use the database

This chapter provides a detailed description of the datasets available within CompNet. Datasets are grouped by content i.e. descriptive, productivity, financial, labour, markup, trade and joint distributions.

Each section provides the following information: names of the datasets (presented in a table), list of all the indicators included and their availability.

General introduction to the datasets

Before moving to a detailed description of each dataset, some general rules according to which the user can easily navigate in the database are provided below.

Each dataset name is structured as follows:

Content_dimension_sample.dta

The three different labels represent different information regarding the data:

1. Content: states the area of study covered by the dataset. The table below shows the contents available in the CompNet database with corresponding description.

Table 17
Contents available

Section	Content				Description
6.1	descriptive_all_countries_				Additional trade statistics
6.2	productivity_decomposition_all_countries_				Allocative efficiency indicators
	dispersion_all_countries_				Measures of dispersion for productivity indicators
	tfp_tfpr_all_countries_				Cross-country comparable TFP
6.3	financial_	_absconstrained/SAFE_		_all_countries_	Descriptive by category of credit constrained firm
6.4	labour_	_hg/l//lprod/size/tfp/ulc_		_all_countries_	Descriptive by category of firms
	joint_distributions_all_countries_				Joint distribution between distribution and characteristics
6.5	markup-descriptive				Descriptive statistics by category of age or size or exporter/non-exporter
6.6	trade_all_countries_				Descriptive statistics by category of exporter
	additional_trade_statistics_all_countries_				General descriptive statistics
	export_performances_by_	_l/lprod/rva/size/tfp_		_class_all_countries_	Descriptive by export category
6.7	transition_matrix_	_absconstrained/SAFE_	_cc_to_nocc/nocc_to_cc	_all_countries_	Transition Matrices by credit constraint indicators

2. Dimension: specifies the level of aggregation of the database.

Table 18
Dimension's abbreviations

country level	*countryl*
2 digit NACE	*sector*
1 digit NACE	*mac_sec*
country*size class	*country_szclass*
1 digit*size class	*macsec_szclass*

3. Sample: indicates the sample the dataset has been built on:
   a. *all* includes all firms with at least 1 employee
   b. *20e* includes all firms with at least 20 employees

See paragraph 3.3 for more information regarding the two samples available in CompNet.

Box 3
An example

The dataset that contains general descriptive statistics for the full sample, at country level, can be found under the name:

descriptive_all_countries_countryl_all.dta

Accordingly the export performances statistics, by firm size, for the 20E sample, at sector level, will be in:

export_performances_by_size_class_all_countries_sec_20e.dta

By adding the following **prefixes/suffix** to the variable names, the user will be able to find the growth rate, the sum, and the total number of firms upon which the indicators have been computed in a given year/country/sector:

Table 19
Contents available

Prefix/Suffix	Use
*tot_*	sum the variable for the specific level considered
*g_*	growth rate of the variable (i.e. difference in logarithms of the variable in t and t-1 at firm level)
_count	number of firms available to compute the statistic

6.1 The Descriptive section

Content	Dimension	Sample
descriptive_all_countries_	countryl_	20e /all
	country_szclass_	
	macsec_	
	macsec_szclass_	
	sec_	

The Descriptive Section provides the user with a general overview of indicators available in CompNet.

The available indicators within this database are:

- **Productivity**: Real Capital (`rk`), Capital Intensity (`rk_l`), Real Turnover (`rturnover`), Real Value Added (`rva`), Labour Productivity (`lprod`), Labour Productivity Based on Revenue (`lprod_rev`), TFP (`tfp`), Marginal Product Capital (`mrpk`), Marginal Product Labour (`mrpl`);

- **Labour**: Labour Costs (`lc`), Labour Cost Per Employee (`lc_l`), Unit Labour Cost (`ulc`), Wageshare (`wageshare`);

- **Financial**: Return On Asset (`roa`), Profit Margin (`profitmargin`), Equity Over Debt (`equity debt`), Cash Holdings (`cash_holdings`), Collateral (`collateral`), Leverage (`leverage`), Investment Ratio (`invest_ratio`), Investment To Turnover (`inv_turnover`), Financial Gap (`financial_gap`), Implicit Rate (`implicit_rate`), Equity Ratio (`equity_ratio`), Debt Burden (`debt_burd`), Capital Depreciation (`depr_k`), Cash Flow Ratio (`cash_flow_ta`), Dividends (`DIV`), Indicator Of Constraint Indicator (`SAFE`), Trade Credit (`trade_credit`), Trade Debt (`trade_debt`).

These variables are:

- available for both samples (*_all* and *_20e*);
- computed for the period 1995-2012 for the full sample and for the period 2001-2012 for the 20e sample;
- the full sample available for 14 countries, i.e. Austria, Belgium, Germany, Estonia, Finland, Croatia, Hungary, Italy, Lithuania, Malta, Portugal, Romania, Slovenia and Spain, while the 20E sample is available also for France, Poland and Slovakia, for a total of 17 countries;
- aggregated at country level, macro-sectors, sectors, and by size-class.

A number of different statistics (e.g. mean, median, sd) are also available for each variable. Please refer to Section 0, 5.2 and 5.3 for a complete list of the statistics.

6.2 The Productivity section

The CompNet Productivity Section is divided in three groups of datasets: **Productivity decomposition**, **Productivity dispersion measures** and **TFP and TFPR estimations**.

6.2.1 Productivity decomposition dataset

Content	Dimension	Sample
productivity_decompositions_all_countries_	countryl_	20e/all
	macsec_	
	sec_	

The productivity decomposition dataset contains the estimates of different allocative and dynamic efficiency measures.

The available indicators within this dataset are:

- **Aggregate productivity decomposition à la Olley and Pakes**: OP gap (`lopgap`, `kopgap`, `lopgap_tfp_int`), Sum of weighted productivity (`totwlprod`, `totwkprod`, `totw_inp_tfp`), Sum of firms weights used (`totl_weight`, `totk_weight`, `tottfp_inp_weight`).

- **Aggregate productivity growth decomposition à la Foster**: Within component (`labTOT_within`, `kTOT_within`, `TOT_within`), Between component (`labTOT_between`, `kTOT_between`, `TOT_between`), Covariance term (`labTOT_covariance`, `kTOT_covariance`, `TOT_covariance`), Sum of the components (within + between + covariance) (`labLP_l`, `kLP_l`, `LP_l`).

The variables are available:
- for both samples (*_all* and *_20e*);
- computed for the period 1995-2012 for the full sample and for the period 2001-2012 for the 20e sample;
- all the countries within CompNet: 14 for the full sample and 17 for the 20E sample;
- aggregated at country, macro-sector, and sector level.

Regarding the OP gap for implicit rate and TFP, in the database at country and macro-sector aggregation level is available also by size-class (the suffix `_sz`1/2/3/4/5 is simply added to the variable labels).

A number of different statistics (e.g. mean, median, sd) are also available for each variable. Please refer to Section 0 for a complete list of the statistics.

6.2.2 TFP and TFPR

Content	Dimension	Sample
tfp_tfpr_all_countries_	country_szclass_	20e /all
	countryl_	
	macsec_szclass	
	macsec_	
	sec_	

The TFP/TFPR datasets contain several TFP estimates aiming at providing a cross-country comparable measure. The available indicators are listed below:

- **Productivity indicators**: Total Factor Productivity (`tfp`), Total Factor Productivity Revenue (`tfpr`), Total Factor Productivity à la Hsieh and Klenow (2009) (`tfpr_HK`)

Indicators in the TFP_TFPR database are:

- available for both samples (*_all* and *_20e*);
- computed for the period 1995-2012 for the full sample and for the period 2001-2012 for the 20E sample;
- the full sample is available for 14 countries, i.e. Austria, Belgium, Croatia, Estonia, Finland, Germany, Hungary, Italy, Lithuania, Malta, Portugal, Romania, Slovenia and Spain, while the 20E sample is available also for France, Poland and Slovakia, for a total of 17 countries;
- aggregated at country level, macro-sector, sector, and by size class.

A number of different statistics (e.g. mean, median, sd) are also available for each variable. Please refer to Section 0 for a complete list of the statistics.

6.2.3 Productivity dispersion

Content	Dimension	Sample
dispersion_all_countries_	macsec_szclass	20e /all

The dispersion datasets provide dispersion measures of the indicators in the TFP_TFPR dataset and Marginal Product Revenue of Labour and Capital .The available indicators are listed below:

- **Productivity dispersion**: Total Factor Productivity Dispersion (`dispersion_tfp`), Total Factor Productivity Revenue Dispersion (`dispersion_tfpr`), Total Factor Productivity Dispersion according to Hsieh and Klenow (`dispersion_tfpr_HK`), Marginal Revenue Product of Labour Dispersion (`dispersion_mrpl`), Marginal Revenue Product of Capital Dispersion (`dispersion_mrpk`)

Indicators in the productivity dispersion database are:

- available for both samples (_all and _20e);
- computed for the period 1995-2012 for the full sample and for the period 2001-2012 for the 20E sample;
- the full sample is available for 14 countries, i.e. Austria, Belgium, Croatia, Estonia, Finland, Germany, Hungary, Italy, Lithuania, Malta, Portugal, Romania, Slovenia and Spain, while the 20E sample is available also for France, Poland and Slovakia, for a total of 17 countries;
- aggregated exclusively at macro-sector level.

A number of different statistics (e.g. mean, median, sd) are also available for each variable. Please refer to Section 0 for a complete list of the statistics.

6.3 The Financial section

Content			Dimension	Sample
financial _	SAFE_	all_countries_	country_szclass_	20e /all
			countryl_	
	absconstrained_		macsec_	
			macsec_szclass_	
			sec_	

The financial module of the CompNet database includes among others a full set of indicators describing both the financial and financing position of the firm. The available indicators are listed below:

- **Productivity indicators**: Real Value Added (`rva`), Real Turnover (`rturnover`), Real Capital (`rk`), Capital Intensity (`rk_l`), Labour Productivity (`lprod`), Labour Productivity Based On Revenue (`lprod_rev`), Total Factor Productivity (`tfp`), Capital Productivity (`kprod`) Marginal Product Capital (`mrpk`), Marginal Product Labour (`mrpl`);

- **Labour indicators**: Number of Employees (`l`) Labour Costs (`lc`), Labour Cost Per Employee (`lc_l`), Unit Labour Cost (`ulc`), Wageshare (`wageshare`);

- **Financial indicators**: Dividends (`DIV`), Indicator of Credit Constrain (`SAFE`, `absconstrained`), Cash flows Ratio (`cash_flow_ta`), Cash holdings (`cash_holdings`), Collateral (`collateral`), Debt Burden (`debt_burd`), Capital Depreciation (`depr_k`), Equity over Debt (`equity_debt`), Equity Ratio (`equity_ratio`), Financing Gap (`financial_gap`), Implicit Rate (`implicit_rate`), Investment to Turnover (`inv_turnover`), Investment Ratio (`invest_ratio`), Leverage (`leverage`), Profit Margin (`profitmargin`), Returns on Assets (`roa`), Trade Credit (`trade_credit`), Trade Debt (`trade_debt`).

The Financial database provides information (e.g. descriptive statistics) on firms by "credit constraint status". Each dataset includes a variable that groups the observations (in a given year/country/sector) in credit constrained and non-credit constrained firms. The table below shows the two measures of credit constraints available in CompNet:

Table 20
Types of credit constraint available

Credit constraint indicator	Name in the dataset
ICC (Indicator of credit constraints)	SAFE
FR (Ferrando Ruggieri)	absconstrained

Indicators in the financial database are:

- available for both samples (_all and _20e);
- computed for the period 1995-2012 for the full sample and for the period 2001-2012 for the 20e sample;
- the full sample is in principle obtainable for 14 countries, i.e. Austria, Belgium, Croatia, Estonia, Finland, Germany, Hungary, Italy, Lithuania, Malta, Portugal, Romania, Slovenia and Spain, while the 20E sample is available also for France, Poland and Slovakia, for a total of 17 countries;
- aggregated at country level, macro-sector, sector, and by size class.

A number of different statistics (e.g. mean, median, sd) are also available for each variable. Please refer to Section 5.2 for a complete list of the statistics.

6.4 The Labour section

Content			Dimension	Sample
labour_	hg_	all_countries_	countryl_	all/20e
	l_			
	lprod_			
	tfp_		macsec_	
	sz_			
	ulc_			

The Labour datasets offer a large number of financial, productivity, and labour indicators. In addition, this datasets provide descriptive statistics for various sub-categories of firms, depending on their growth pattern over a 3-year window, and a reduced set of descriptive statistics for firms that in three years' time move from one quintile of the distribution (i.e. employment, labour productivity, TFP and ULC distribution) to another, within the considered dimension (macro-sector or country level).

All indicators available in the Labour datasets are listed below:

- **Productivity indicators**: Real Turnover (`rturnover`), Real Value Added (`rva`), marginal product capital (`mrpk`), marginal product labour (`mrpl`), total factor productivity (`tfp`), Capital Productivity (`kprod`), Labour Productivity (`lprod`).

- **Labour Indicators**: Labour (`l`), Labour cost (`lc`), Labour cost per employee (`lc_l`), Labour productivity revenue (`lprod_rev`), Unit labour cost (`ulc`), Wageshare (`wageshare`), Employment change (`empchange`).

- **Financial Indicators**: SAFE (`SAFE`), absconstrained (`absconstrained`), Cash Flow ratio (`cash_flow_ta and g_cash_flow_ta`), Cash Holdings (`cash_holdings`), Collateral (`collateral`), Debt Burden (`debt_burden`), Capital Depreciation (`depr_k`), Ratio Equity Debt (`equity_debt`), Ratio Equity Total Assets (`equity_ratio`), Financial Gap (`financial_gap`), Implicit Interest Rate (`implicit_rate`), Inventory turnover (`inv_turnover`), dividends (`DIV`), trade credit (`trade_credit`), trade debt (`trade_debt`), profit margin (`profitmargin`), leverage (`leverage`), investment ratio (`invest_ratio`), return on asset (`roa`), real capital (`rk`), capital intensity (`rk_l`).

Indicators in the Labour datasets are:

- available for both the full (_all) and the 20E sample (_20e);
- computed for the period 1995-2009 for the full sample and for the period 2001-2009 for the 20E sample;
- the full sample is in principle obtainable for 12 countries, i.e. Austria, Belgium, Croatia, Estonia, Finland, Germany, Hungary, Italy, Lithuania, Malta, Portugal, Romania, Slovenia and Spain, while the 20E sample is available also for France, Poland and Slovakia, for a total of 17 countries;
- aggregated by country and macro-sectors.

The distinguishing factor, which characterizes the four datasets, is the presence of transition matrices related to a number of sub-dimensions (i.e. level of growth, labour class, labour productivity, size, total factor productivity and unit labour cost). These sub-dimensions are:

- **Level of employment growth** (*Labour_hg_all_countries*): In this dataset, all variables listed above can be found. Within this dataset, there is a variable that categorizes the different firms observed (in year/country/macro-sector) depending on their cumulative percentage growth in employment over a 3-years period, named `high_growth`. Accordingly, five classes of firms arise: (1) decline (negative growth larger than -3.03% over 3 years); (2) remain equal (growth between -3.03% and +3.03%); (3) small growth (between 3.03% and 33.1%); (4) high growth (between 33.1% and 72.8%) and (5) very high-growth firms (over 72.8%).
- **Number of Employees** (*Labour_l_all_countries*), all variables listed above can be found. In this dataset, there is a variable called `lclass` that assumes values from 1 to 5 indicating the quintiles of the distribution of the number of employees. The result is that the overall number of observations is distributed into 5 different size classes according to the amount of workers employed within the firm.
- **Labour Productivity** (*Labour_lprod_all_countries*), all variables listed above can be found. In this dataset, there is a variable called `lprodclass` that assumes values from 1 to 5 indicating the quintiles of the labour productivity distribution. Accordingly, observations are divided by the ten deciles of the labour productivity distribution in the relevant level of aggregation (country/sector);
- **Total Factor Productivity (***Labour_tfp_all_countries***)**: In this dataset, there is a variable called `tfpclass` that assumes values from 1 to 5 indicating the quintiles of the total factor productivity distribution. Accordingly, observations are divided by the five quintiles of the total factor productivity distribution in the relevant level of aggregation (country/sector);
- **Size Class (***Labour_sz_all_countries*): In this dataset, there is a variable called `szclass` that assumes values from 1 to 5 (3 to 5 in the 20E sample) and indicates the size class of the firms considered in that specific cell. Accordingly, observations are divided by the 5 size class used within CompNet (1-9, 10-19, 20-49, 50-249, 250+ employees) in the relevant level of aggregation;
- **Unit Labour Cost** (*Labour_ulc_all_countries*): In this dataset, there is a variable called `ulclass` that assumes values from 1 to 5 indicating the quintiles of the unit labour cost distribution. Accordingly, observations are divided by the five quintiles of the unit labour cost distribution in the relevant level of aggregation (country/sector).

A number of different statistics (e.g. mean, median, sd) are also available for each variable. Please refer to Section 5.3 for a complete list of the statistics.

6.5 The Markup section

Content			Dimension	Sample
markup_		descriptive_	sec_	all
markup_	age_			
	exp_			
	size_			

The Markup database in CompNet includes among others a number of indicators of market concentration and product market competition. All variables available in the Markup database are listed below:

Price-Cost Margin (`pcm`), Price-Cost Margin with a proxy for Capital costs (`pcm_k`), Yearly change in Price-Cost Margin (`dif_pcm, dif_pcm_k`), Market share (`ms`), Implicit interest rate (`i`), Concentration ratio for the 10 largest firm (`c10`), Herfindahl-Hirschman Index (`HHI`), Input shares (`Labour, Materials, Capital`) (`alpha_lc, alpha_m_nom, alpha_K_PK`), Relevance of negative PCM (`neg_pcm`)

Indicators in the Markup database are:

- available exclusively for the full sample (_all);
- computed for the period 2000-2012;
- available for 15 countries i.e. Italy, Estonia, Portugal, Slovenia, Slovakia, Finland, Belgium, Germany, Poland, France, Latvia, Romania, Austria and Lithuania;
- aggregated by macro-sector and sector.

The distinguishing factor, which characterizes the four markup datasets, is the presence of variables that classify the different firms across a number of sub-dimensions (i.e. age of the firms, exporter status, or firms' size). These sub-dimensions are:

1. **Descriptive** (*markup_descriptive_sec_all*): For this database, five macro-sectors defined by CompNet (i.e. Manufacturing, Construction, Wholesale and retail trade, Transportation and storage, and Other services) and 53 sectors are available. The macro-sectors definition follows the classification defined in (…). However, for the Markup database the macro-sectors under the letters I, J, L, M and N are group under the label Other services.

2. **Age** (*markup_age_descriptive_sec_all*): In this dataset, five macro sectors (i.e. Manufacturing, Construction, Wholesale and retail trade, Transportation and storage, and Other services) and 53 sectors are available.

Within this dataset, it is possible to categorize the different observations (in year/country/macro-sector/sector) by firm' age, via a variable named: `d_age`. Variable `d_age` takes value 0 when the firms are classified as young and takes value 1 when firms are classified as old. Young firms are defined as those with at most 10

years of business experience while old firms are those above that threshold. This taxonomy splits the sample, as 46% of firm-year observations across individual country samples are classified as young. Given the peculiar information needed to compute `d_age`, this dataset covers only a limited number of countries (i.e. Spain, Italy, Estonia, Portugal, Slovenia, Slovakia, France and Lithuania).

3. **Exporter** (*markup_exp_descriptive_sec_all)*: However, only one macro sector (i.e. Manufacturing) and consequently only 22 sectors are present in this dataset. Within this dataset it is possible to categorize the different firms observed (in year/country/macro-sector/sector) by exporter status. That is, the dataset includes a variable named `d_exp` which takes value 1 when firms are according to a certain threshold exporters and take value 0 otherwise. To define the variable `d_exp`, CompNet computes the ratio of export revenues over total turnover. If export revenues accounts for at least 5% of total turnover in a given year the firms are considered exporters. Given the peculiarity of the information needed to compute `d_exp` this dataset covers only a limited set of countries, i.e. Italy, Estonia, Portugal, Slovenia, Slovakia, Finland, Belgium, Poland, France, Romania and Lithuania.

4. **Size class** (*markup_size_descriptive_sec_all)*: Five macro sectors (i.e. Manufacturing, Construction, Wholesale and retail trade, Transportation and storage, and Other services) and 53 sectors are available in this dataset. This dataset includes a variable called `d_size`, which takes value 1 when firms are considered large firms and takes value 0 otherwise. Large firms are considered firms that have least 50 employees or a turnover of at least 10 million Euro.

A number of different statistics (e.g. mean, median, sd) are also available for each variable. Please refer to Section 5.4 for a complete list of the statistics.

6.6 The Trade section

The Trade Section is divided in: **General indicators, Additional trade statistics** and **Exporter performance**.

6.6.1 General indicators

Content	Dimension	Sample
trade_all_countries_	countryl_	20e/all
	countryl_adjusted_	
	sec_	
	sec_adjusted_	

These datasets provide general indicators divided by firms' export status. The available indicators are listed below:

- **International trade indicators**: Export Value (`exp_value`), Export Ratio (`exp_ratio`), Export Value Added (`exp_vad`);

- **Productivity indicators**: Real Value Added (`rva`), Real Turnover (`rturnover`), Real Capital (`rk`), Capital Intensity (`rk_l`), Labour Productivity (`lprod`), Labour Productivity Based On Revenue (`lprod_rev`), Total Factor Productivity (`tfp`), Capital Productivity (`kprod`), Marginal Product Capital (`mrpk`), Marginal Product Labour (`mrpl`);

- **Labour indicators**: Number of Employees (`l`) Labour Costs (`lc`), Labour Cost Per Employee (`lc_l`), Unit Labour Cost (`ulc`), Wageshare (`wageshare`);

- **Financial indicators**: Dividends (`DIV`), Indicator of Credit Constrain (`SAFE`, `absconstrained`), Cash flows Ratio (`cash_flow_ta`), Cash holdings (`cash_holdings`), Collateral (`collateral`), Debt Burden (`debt_burd`), Capital Depreciation (`depr_k`), Equity over Debt (`equity_debt`), Equity Ratio (`equity_ratio`), Financing Gap (`financial_gap`), Implicit Rate (`implicit_rate`), Investment to Turnover (`inv_turnover`), Investment Ratio (`invest_ratio`), Leverage (`leverage`), Profit Margin (`profitmargin`), Returns on Assets (`roa`), Trade Credit (`trade_credit`), Trade Debt (`trade_debt`);

- **Markup indicators**: Price-Cost Margin (`markup`)

The export status classification in CompNet is indicated in the first variable, i.e. "`label`", and summarised in **Table 21**:

Table 21
Firm's classification according to international activities

Status	t	t - 1	t + 1
Exporter	Yes	-	-
Permanent exporter	Yes	Yes	Yes
New exporter	Yes	No	Yes
Non exporter	No	-	-
Permanent non exporter	No	No	No
Temporary exporter	Yes	No	No
Exiter	Yes	Yes	No
Importer	Yes	-	-
Non importer	No	-	-

A further condition to be fulfilled in order to be considered exporter is that turnover deriving from export accounts for at least 0.5% of the total turnover[19].

[19] As the observed total exports in the custom databases and alike can be larger than the total turnover

Indicators in the trade database are:

- available only for manufacturing sectors for both samples (_all and _20e);
- computed for the period 1995-2012 for the full sample and for the period 2001-2012 for the 20E sample;
- the full sample is available for 12 countries, i.e. Belgium, Croatia, Estonia, Finland, Hungary, Italy, Lithuania, Malta, Portugal, Romania, Slovenia and Spain, while the 20E sample is available also for France, Poland and Slovakia, for a total of 15 countries;
- constructed on both raw data and on data with exports values adjusted to changes in reporting threshold for the intra-EU trade (the latter is indicated by the following suffix: _adjusted).

A number of different statistics (e.g. mean, median, sd) are also available for each variable. Please refer to Section 5.5 for a complete list of the statistics.

6.6.2 Additional trade statistics

Content	Dimension	Sample
additional_trade_statistics_all_countries_	countryl_	20e /all
	countryl_adjusted_	
	sec_	
	sec_adjusted_	

These datasets provide additional information by exporter status both at sector and country level.

Information on the mean (`m_{variable of interest}`), median (`med_{variable of interest}`), standard deviation (`s_{variable of interest}`) and number of observations (`count_{variable of interest}`) of all the following variables are available according to the exporting status of the firms:

Labour Productivity (`lprod`; growth rate [t – (t-1)], `dlnlprod`; growth rate [(t+1) – t], `dlnlprod1`), Total Factor Productivity (`tfp`; growth rate [t – (t-1)], `dlntfp`; growth rate [(t+1) – t], `dlntfp1`), Unit Labour Cost (`ulc`; growth rate [t – (t-1)], `dlnulc`; growth rate [(t+1) – t], `dlnulc1`), Real Value Added (`rva`; growth rate [t – (t-1)], `dlnrva`), Price-Cost Margin (`markup`), Export Value (`exp_value`), Export Value Added (`exp_vad`).

In these datasets are included also correlation between selected firms' characteristics, namely *Number of employees* (l), *log of Labour Productivity* (`lnlprod`), log of Markup (`lnmarkup`), *log of Total Factor Productivity* (`lntfp`) , *log of Unit Labour Cost* (`lnulc`), and variables indicating the share of exporting

recorded in the annual accounts, values of exports exceeding 150% of total turnover have been considered to be misreported and omitted.

activities, namely *Export Value* (`exp_vad`; growth rate [t – (t-1)], `dlnexp_vad`; `growth rate` [(t+1) – t], `dlnexp_vad1`) and *Export Ratio* (`exp_ratio`)

In addition, every variable in **additional_trade_statistics** has as suffix the export classification of the firms that it refers to, e.g. `m_tfp_exp` indicates the mean TFP of all the exporting firms in a given year in a given sector/country.

The suffixes indicate the exporter status following the classification described in Section 5.3 plus the additional classification shown below:

Table 22
Firm's additional classification according to international activities

Status	Suffix
Two-way trader	twoway
Firms where the export is not relevant	catx_1
Firms where the export is hardly relevant	catx_1to5
Firms where the export is slightly relevant	catx_5to10
Firms where the export is relevant	catx_10to50
Firms where the export is largely relevant	catx_50
Top 5 exporters	top5_x; top5_1
Top 10 exporters	top10_x; top10_1
Exporters that account for 60% of the total value of export	top60pct_x

A number of different statistics (e.g. mean, median, sd) are also available for each variable. Please refer to Section 5.5 for a complete list of the statistics.

6.6.3 Export performance:

Content			Dimension	Sample
export_performances_by_	l_	class_all_countries_	countryl_	20e /all
	lprod_		countryl_adjusted_	
	rva_		sec_	
	tfp_		sec_adjusted_	
	sz_			

The distinguishing factor between the five datasets is that firms, within a given year/country/sector, are categorized according to several sub-dimensions (e.g. number of employees, labour productivity). These sub-dimensions are:

- **Number of Employees** (*export_performances_by_lclass*): In this dataset, there is a variable called `lclass` that assumes values from 1 to 10 indicating the deciles of the distribution of the number of employees. Accordingly, observations are divided by the ten deciles of the distribution of the number of employees in the relevant level of aggregation (country/sector);

- **Labour Productivity** (*export_performances_by_lprodclass*): In this dataset, there is a variable called `lprodclass` that assumes values from 1 to 10 indicating the deciles of the labour productivity distribution. Accordingly, observations are divided by the ten deciles of the labour productivity distribution in the relevant level of aggregation (country/sector);

- **Real Value Added** (*export_performances_by_rvaclass*): In this dataset, there is a variable called `rvaclass` that assumes values from 1 to 10 indicating the deciles of the real value added distribution. Accordingly, observations are divided by the ten deciles of the real value added distribution in the relevant level of aggregation (country/sector);

- **Total Factor Productivity** (*export_performances_by_tfpclass*): In this dataset, there is a variable called `tfpclass` that assumes values from 1 to 10 indicating the deciles of the total factor productivity distribution. Accordingly, observations are divided by the ten deciles of the total factor productivity distribution in the relevant level of aggregation (country/sector);

- **Size Class** (*export_performances_by_szclass*): In this dataset, there is a variable called `szclass` that assumes values from 1 to 5 (3 to 5 in the 20E sample) and indicates the size class of the firms considered in that specific cell. Accordingly, observations are divided by the 5 size class used within CompNet (1-9, 10-19, 20-49, 50-249, 250+ employees) in the relevant level of aggregation.

Information on the mean ({variable of interest}), median (variable of interest}_p50) and number of observations ({variable of interest}_count) of all the following variables are available according to the exporting status of the firms:

Labour Productivity (`lprod`; growth rate $_{t-(t-1)}$, `dlnlprod`; growth rate $_{(t+1)-t}$, `dlnlprod1`), Total Factor Productivity (`tfp`; growth rate $_{t-(t-1)}$, dlntfp; growth rate [(t+1) – t], `dlntfp1`), Export Value (`exp_value`; growth rate [t – (t-1)], `dlnexp_value`; growth rate [(t+1) – t], `dlnexp_value1`), and Export Ratio (`exp_ratio`; growth rate [t – (t-1)], `dlnexp_ratio`; growth rate [(t+1) – t], `dlnexp_ratio1`)

Furthermore, the following variables are also available in this datasets: `exp`, `exp_no`, `exp_3y`, `exp_new`, `stop_exp`, `exp_switch`, `exp_no3y`, `imp`, `imp_no`, and `twoway`. These variables indicate the share of firms related to a certain export status, as reported in Section 5.3, compared to the total population.

For example, the variable `imp_no` will indicate the percentage of non-importing firms in a given year/country/sector.

A number of different statistics (e.g. mean, median, sd) are also available for each variable. Please refer to Section 5.5 for a complete list of the statistics.

6.7 The joint distributions section

Content	Dimension	Sample
joint_distributions_all_countries_	countryl_	20e/all
	macsec_	
	sec_	

The joint distribution dataset contains the average and median of a given variable considering firms in a specified decile of the distribution of another variable.

The **characteristic variables** for which mean and median value can be retrieved are the following: Real value added (`rva`), Total Factor Productivity (`tfp`), Capital (`rk`), Capital intensity (`rk_l`), Labour (`l`), Labour Costs (`lc_l`), Unit Labour Costs (`ulc`), Total Employment (`tot_l`), Labour Productivity (`lprod`), Investment ratio (`invest_ratio`), Leverage (`leverage`), Return on Asset (`roa`), Cash holdings (`cash_holdings`), Financing gap (`financial_gap`), Collateral (`collateral`), Debt burden (`debt_burd`), Equity debt ratio (`equity_debt`), Share of credit constrained (`SAFE`).

The other variables whose deciles of the **distribution** are considered are: Labour Productivity (`lprod`), Labour Productivity Growth (`g_lprod`), Labour (`l`), Labour Growth (`g_l`), Labour Cost per Employee (`lc_l`), Unit Labour Cost (`ulc`), Real Capital (`rk`), Capital Intensity (`rk_l`), Real Value Added (`rva`), TFP (`tfp`).

Each joint distribution is available:

- for both samples (*_all* and *_20e*);
- for all the countries within CompNet (the usual 14 in the *_all*, 17 in the *_20e*)
- for the period 1995-2012 and 2001-2012, respectively (however, with several differences across countries);
- aggregated at country, macro-sector and sector level.

A number of different statistics (e.g. mean, median, sd) are also available for each variable. Please refer to Section 5.6 for a complete list of the statistics.

References

Ackerberg, D., Caves, K. and F. Garth (2006): "Structural identification of production functions," MPRA Paper 38349, University Library of Munich, Germany.

Bartelsman, E. and M. Doms (2000), "Understanding productivity: Lessons from longitudinal microdata," Journal of Economic Literature (38): 569-594.

Bartelsman, E, Haltiwanger, J. and S. Scarpetta (2004), "Microeconomic evidence of creative destruction in industrial and developing countries", The World Bank, Policy Research Working Paper No. 3464.

Berthou A., E. Dhyne, M. Bugamelli, A. Cazacu, C. Demian, P. Harasztosi, T. Lalinsky, J. Meriküll, F. Oropallo and A. C. Soares (2015), "Assessing European firms' exports and productivity distributions: the CompNet trade module", ECB Working Paper Series No. 1788.

Caves, R. (1998), "Industrial Organization and New Findings on the Turnover and Mobility of Firms," Journal of Economic Literature (36): 1947-1982.

Ferrando, A., Iudice, M., Altomonte, C., Blank, S., Felt, M.H., Meinen, P., Neugebauer, K.M. and I. Siedschlag (2015), "Assessing the financial and financing conditions of firms in Europe: The financial module in CompNet", ECB Working Paper Series No. 1836.

Foster, L., Haltiwanger, J and C. J. Krizan, (2006): "Market Selection, Reallocation, and Restructuring in the U.S. Retail Trade Sector in the 1990s," The Review of Economics and Statistics 88(4): 748-758.

Galuscak, K. and L. Lizal (2011): "The Impact of Capital Measurement Error Correction on Firm-Level Production Function Estimation," Working Papers 2011/09, Czech National Bank, Research Department.

Hsieh and Klenow (2009): "Misallocation and manufacturing TFP in China and India", Quarterly Journal of Economics, Volume 124 Issue 4. MIT Press.

Kehrig, M. (2011): "The cyclicality of productivity dispersion", Meeting papers 484, Society for Economic Dynamics.

Levinsohn, J. and a. Petrin (2003): "Estimating Production Functions Using Inputs to Control for Unobservables," Review of Economic Studies Vol. 70 (2): 317-342.

Lopez Garcia, P., Di Mauro, F., and the CompNet Task Force (2015), "Assessing European Competitiveness: The new CompNet micro-based database", ECB Working Paper Series No. 1764.

Olley, G.S. and A. Pakes (1996): "The dynamics of productivity in the telecommunications equipment industry," Econometrica 64(6): 1263-1297.

Wooldridge, J.M (2009): "On estimating firm-level production functions using proxy variables to control for unobservables," Economics Letters, 104(3):112-114.

Annex 1. Country-specific breaks and biases

Austria

- The Austrian dataset is very biased towards large firms: it covers about 3% of the population of firms and one-third of total employment.

  This is the result of the groups of firms reporting data to the Bank of Austria:

  1. Firms receiving passive direct investment from abroad are legally obliged to report their balance sheet data to the OeNB. These firms constitute the most important group in the data;
  2. All firms from the commercial register for which balance sheet data are available (i. e. corporations);
  3. Firms receiving a loan from the ERP (European Recovery Programme);
  4. Austrian "Top-500" firms;
  5. Firms receiving larger loans (above EUR 5 million)

- No information on financial statements or exporting activities of the firms.

Belgium

- Change in reporting thresholds for EU intra trade: Reporting of intra-EU and extra-EU trade activities of Belgian firms are conditional on reporting thresholds. Exports to non-EU countries of at least 1,000 EUR per year have to be reported. Concerning intra-EU trade flows, firms only have to report their intra-EU exports if the total of their exports to EU countries over the last 12 months are above the intra-EU threshold. This threshold is varying over time and has been set to fulfill Eurostat requirements in terms of the coverage of total export activities. That intra-EU threshold was 104.115 EUR from 1995 to 1997, 250.000 EUR from 1998 to 2005 and 1.000.000 EUR from 2006 onwards.
- The Belgian dataset covers the universe of firms that have to provide complete or abbreviate standardized annual accounts.

Croatia

- Relevant methodological changes were adopted in 2008 and 2010: these changes affected the construction of the intermediate input variable which is not directly comparable between methodologies. There is some uncertainty about tracking energy costs in different profit and loss statement items because there is no explicit item for energy costs in the 2007-2008 and 2010-2012 methodologies. Specifically, before 2008 energy costs are reported separately, and afterwards it is assumed that they are included in costs of raw materials or costs of sold goods.
- From 2002 onwards (the Croatian dataset goes from 2002 to 2012), non-reporting to the firm registries is subject to penalties for all legal firms.
- Although this database is widely used for statistical purposes, there are still some issues regarding non-reporting of firms which suggest taking results with some caution. More concretely, some firms drop from the database and then reappear but it is not known this caused by statistical or economic reasons.

Estonia

- With the accession to the EU in 2004 there was a change in the methodology for foreign trade statistics. More concretely:
  - 1995-2003
    - Special trade system, i.e. commodities to free circulation or goods where some value is added after importing and before exporting;
    - Full population of exporters/importers is covered, based on declarations to tax and customs board;
  - 2004-onwards
    - Extra EU, same as before, i.e. special trade system and whole population is covered (Extrastat);
    - Intra EU, important change (Intrastat): Includes commodities re-exported through customs warehouses without free circulation; includes import/export only above a certain threshold. The threshold is time-varying , 100 000 EUR for yearly export and 140 000 EUR for yearly import in 2012;
- Switch from print-out paper reports to the electronic reports in 2009. This change concerned mostly one item - employment. It was not compulsory to report employment before the switch, although the majority of firms did report it; since 2009 it has become compulsory. As a result the smallest firms started reporting employment and the median size of a firm decreased from 3 to 2 and the average from 11 to 8 between 2009 and 2010.

Finland

- There was a change in taxation records data in 2005-2006: The financial statements statistics data had to be constructed from a new database and detailed information on all items was no longer available. The perspective changed from accounting to taxation. Although these changes do not seem to result in any break of the series, they should be kept in mind when using the data.
- The Finnish data covers the full universe of firms during the entire time period covered in CompNet.

France

- Only firms with more than 750.000 euros of turnover report data to the Bank of France.

Germany

- There is a severe bias towards large firms. For this reason the use of the 20E sample is strongly recommended.
- There is a bias towards manufacturing firms. Some service sectors feature a rather poor coverage.
- Selection bias is present for multiple reasons (firms report to get a rating, for example).

Hungary

- Data starts in 2004 because the accession to the EU resulted in a break in trade data.
- Change in NACE from rev.2.1 to rev.2.2 in 2008.

- Otherwise, no reported breaks or biases.
- The Hungarian dataset covers the universe of firms subject to corporate income tax.

Italy

- New NACE classification was adopted in 2008 (from NACE rev. 1 to NACE rev.2).
- The Italian dataset all Limited Liability Companies with employees, that is, excluding (differently from the figures provided from the Italian Business Register), all self-employed, sole proprietorships and partnerships (not Limited Liability Companies).
- Introduction of a new depreciation reform (Finance Law for 2008 n. 244 of 24th of Dec. 2007 - Chap. V - abolition of accelerated depreciation) produced a large increase in investment ratios in 2008, especially in some service sectors (in particular small-medium sized computer companies).

Lithuania

- In 2004 the new national business accounting standards were implemented (new financial asset value assessment and some new accounting rules were introduced).
- Until 1 May 2004 the main source of information for external trade data was customs declarations. As of 1 May 2004 foreign trade data is based on the data from two statistical surveys – Intrastat and Extrastat.
- The dataset covers all the surveyed firms excluding a few (just a few) very large companies dropped for confidentiality causes.

Malta

- Only firms with more than 5 employees.

Poland

- New NACE classification was adopted in 2008 (although firm-level statistics had double NACE codes from 2005).
- The Polish dataset covers the universe of firms with more than 10 employees, although CompNet indicators are only computed for firms with at least 20 employees (in the 20E sample).

Portugal

- New accounting standards were introduced in 2010: This introduction led to a break in the Survey, which can have implications on some variables, namely financial variables related to debt and interest expenses.

Romania

- There were changes in accounting standards (2005) related to a better harmonization of the national framework with the European standards although it did not result in any structural break in the number of companies or the values of the indicators used in the CompNet.
- Changes in national classification in 2008 (from NACE rev 1 to NACE rev 2) but again, with no reported breaks in the series.

- The Romanian dataset covers the universe of mercantile societies.

Slovakia

- Euro adoption in 2009.
- Total imports are retrieved from customs data (change in reporting threshold for EU intra trade), but total exports' source is balance sheet data (no reporting threshold).
- Slovak dataset covers the universe of firms with more than 20 employees.

Slovenia

- There is no trade (custom-based) data prior 2000.
- There is no separate data on "financial expenses attributable to operating liabilities" prior 2006.
- Prior 2006, there are breaks and biases present in many sub-items of the financial statements due to changes in accounting regulations.
- The Slovenian dataset covers the universe (more than 90%) of registered firms.

Spain

- It has to be taken into account that there is a positive trend in the number of firms until around 2002/03 due to improvements in data compilation capacity, not to genuine firm dynamics. The Spanish sample is thus less representative of the firm population in the period 1995-2002.
- We have identified problems when computing aggregates for productivity, labour share, profit share and unit labour costs from 2007 on. The previous problems are partially related to a change in general accounting rules that took place in 2007 (effective in 2008), which somehow produced a break in the series of some of the variables used to compute productivity, profits and labour costs. This change might affect both the level and the trend of these variables, but heterogeneity of those variables between sectors appears to be more resilient to the change.
- The above mentioned change in accounting rules was accompanied by a somewhat more detailed information on liabilities, allowing the incorporation of the leverage ratio (and the subsequent indicators based on this ratio) to the list of financial indicators that can be provided for Spain (before 2007, data on costly debt is not available).
- The change in accounting rules affected the way machinery acquired through leasing was recorded (formerly as an intangible asset and currently as a tangible asset). This issue only affects firms from the CBB sample (i.e. the one coming from Mercantile Registries). As a solution, the Spanish measure of the stock of capital is the sum of both tangible and intangible assets. This should be taken into account when computing variables in levels that use the stock of capital.
- Finally, concerning trade data, the Balance of payments Statistics (BoP) is used to identify whether a Spanish firm has exported goods between 1995 and 2011. There is a simplification reporting threshold, below which any exporting firms do not have to report about the nature of the external transaction. This reporting threshold has change over time: 3.000 € from 1995 to 2000; 12.500 € from 2001 to 2007; and, finally, 50.000 € from 2008 onwards. Any increase in the threshold automatically reduces the sample of exporting firms and introduces a break in the time series. In Spain, this break was relevant in 2008, when there was a significant decrease in the number of goods exporting firms that had the obligation to report to the Banco de España to compile the BoP. Despite this reduction in the sample of exporting firms, the exported value

reported by these firms still accounted for around 95% of total Spanish exports of goods according to the official figures since 2008 (around 20% in terms of total goods exporting firms, 55% before 2008). Nevertheless, this percentage decreases when the BoP data are combined with other statistics to obtain firm level information, such as, the number of employees or the labour cost, that it required to compute ULCs or productivity at firm level.

Annex 2. Sectors excluded

During the process of data validation, participating countries applied different rules for inclusion/exclusion of 2-digit sectors.
The table below specifies which sectors have been excluded for each country.

Table 23
Sectors excluded

Country	Time coverage	Sectors excluded (deviations from default)
Austria	2000-2012	12, 50, 53, 60, 75, 80
Belgium	1996-2010	-
Croatia	2002-2012	12
Estonia	1995-2012	12
Finland	1999-2012	12, 68
France	2001-2012	12
Germany	1997-2012	12, 55, 56, 68, 75, 77, 78, 79, 80, 81, 82
Hungary	2003-2012	12
Italy	2001-2012	-
Lithuania	2000-2011	12
Malta	2003-2011	12, 13, 15, 24, 29, 30, 45, 46, 47, 49, 50, 51, 52, 53, 63, 68, 75
Poland	2005-2012	75
Portugal	2006-2012	-
Romania	2003-2012	53
Slovakia	2001-2011	12, 50, 51, 53, 59, 60, 65
Slovenia	1995-2012	12
Spain	1995-2012	-

Annex 3. Raw variables

Table 24
Raw variables

Raw variables	Common definition
Total fixed assets	Tangible, intangible and other fixed assets
Intangible fixed assets	Total intangible fixed assets
Other fixed assets	Total fixed assets - tangible fixed assets - intangible fixed assets
Other current assets	Current assets – Trade debtors – Total inventories
Cash and cash equivalents	Cash and balances at banks
Total assets	Total assets
Capital (Tangible fixed assets)	Tangible fixed assets
Non-current liabilities	Non-current liabilities
Long term debt	Loans due in more than 1 year
Other non-current liabilities	Provisions
Current liabilities	Current liabilities
Short-term debt	Loans due within 1 year
Other current liabilities	Other current liabilities
Shareholder funds (equity)	Equity
Current assets	Current assets
Number of employees	Average number of employees calculated in full-time equivalents
Turnover	Total sales
Profits and losses before taxes	Earnings before taxes (EBT)
Raw materials	Consumption of raw materials + energy+ external services
Labour cost	Gross employee compensation
Depreciation	Depreciation on intangible assets and tangible assets
Interest paid (or financial charges)	Interest on financial debts + other financial expenses
Cash flow (from profit/loss statement)	Net income + depreciation+ extraordinary income
Value added	Turnover - raw material
Profit/loss	EBIT
Total exports	Total exports by the firm; may be adjusted for reporting threshold. For details, see the trade-specific paper
Total Imports	Total imports by the firm
Total inventories	Inventories and consumable biological assets
Trade credit (accounts payable)	Trade credit or Accounts payable (Liabilities related to purchased goods and services)
Trade debt (accounts receivable)	Trade debt or Accounts receivable
Firm's birth year	Year of establishment of the firm (limited availability)

Annex 4. Deviation

Table 25

Deviation from variable definition

Variables	Austria	Belgium	Croatia	Estonia
Total fixed assets				
Intangible fixed assets	NA			
Other fixed assets	NA			Fixed assets - tangible fixed assets - intangible fixed assets. Consists of long-term investments into financial assets and real estate, and biological assets.
Other current assets	NA			Current assets - cash and cash equivalents - inventories - trade debt. Consists of biological assets and fixed assets waiting to be sold.
Cash and cash equivalents	NA			
Total assets	NA			
Capital (Tangible fixed assets)				
Non-current liabilities	NA			
Long term debt	NA			
Other non-current liabilities	NA			Non-current liabilities - long-term debt. Consists of other long-term debt, long-term target financing and long-term allocations.
Current liabilities	NA			
Short-term debt	NA			
Other current liabilities	NA			Current liabilities - short-term debt - trade credit. Consists of target financing and short-term allocations.
Shareholder funds (equity)	NA			
Current assets	NA			
Number of employees				
Turnover				
Profits and losses before taxes	NA			
Raw materials Labour cost			Before 2008 energy costs are reported separately, and afterwards it is assumed that they are included in costs of raw materials or costs of sold goods.	
Depreciation	NA			
Interest paid (or financial charges)	NA			Interest expenses consists of expenses from loans, finance lease and bonds, and other interest expenses.
Cash flow (from profit/loss statement)	NA			Net profit + depreciation. Definition from Amadeus.
Value added	Turnover - intermediate inputs			
Profit/loss	NA			
Total inventories				
Trade credit (accounts payable)	NA			
Trade debt (accounts receivable)	NA			
Dividends	NA			From cash-flow statements
Firm's birth year	NA		-	Date of registration

Variables	Finland	France	Germany
Total fixed assets			
Intangible fixed assets	Not included	Net figure. Research expenses are now intermediates consumption and are not registered in assets, contrary to patents	
Other fixed assets			Financial assets
Other current assets		NA	Current asset securities + Cash, Bundesbank balances, balances at credit institutions and cheques + Prepaid expenses + Deferred tax assets + Deficit not covered by equity + Other adjustments
Cash and cash equivalents	Cash and cash holdings		
Total assets			
Capital (Tangible fixed assets)	Includes intangible assets		
Non-current liabilities	Long term debt + other non-current liabilities + compulsory provisions	NA	All liabilities due in more than 1 year
Long term debt	Total debt	Total debt	
Other non-current liabilities	Not included	NA	
Current liabilities	Short term debt + accounts payable +other current liabilities	Total Dettes + produits constatés d'avance	All liabilities due within 1 year
Short-term debt		Not available	
Other current liabilities	Not included	NA	Payments received on account due within 1 year + Liabilities arising from the acceptance of drafts and issue of own bills due within 1 year + Liabilities to partners due within 1 year + Liabilities to affiliates due within 1 year + Liabilities to enterprises in which the company has participating interests due within 1 year + Other liabilities due within 1 year + Deferred income
Shareholder funds (equity)	Includes other reserves and accumulated closing entries		Includes also special items with equity portion; other special items - unclaimed outstanding contributions - Deficit not covered by equity.
Current assets		Total de l'actif circulant + charges constatées d'avance (net figure)	Current assets + Prepaid expenses + Deferred tax assets + Deficit not covered by equity + Other adjustments
Number of employees			
Turnover			
Profits and losses before taxes	Ebit + financial profit/loss		EBIT + Financial result
Raw materials Labour cost	Turnover - value added	Just materials	Cost of materials: expenses for raw, auxiliary and process for purchased goods + external materials, services
Depreciation			Includes depreciation on capitalized start-up and business expansion expenses.
Interest paid (or financial charges)			
Cash flow (from profit/loss statement)			
Value added	Value added at factor cost		
Profit/loss			
Total inventories			
Trade credit (accounts payable)			
Trade debt (accounts receivable)			
Dividends	Not included		NA
Firm's birth year	Not included		NA

Variables	Hungary	Italy	Lithuania	Malta
Total fixed assets				
Intangible fixed assets				NA
Other fixed assets	NA	Financial assets		NA
Other current assets	NA			NA
Cash and cash equivalents				NA
Total assets				NA
Capital (Tangible fixed assets)				NA
Non-current liabilities	Long term liabilities			NA
Long term debt				NA
Other non-current liabilities	NA			NA
Current liabilities	Short term liabilities + Deferred income			NA
Short-term debt	Short term liabilities			NA
Other current liabilities	NA			NA
Shareholder funds (equity)	Share Capital + unpaid subscribed capital +Capital surplus + accumulated profit reserve + fixed reserve+ Revaluation reserve+General reserves			NA
Current assets	Inventories+ Accounts receivable+Accrued assets+Cash equivalents (liquid assets)+securities			NA
Number of employees				
Turnover				
Profits and losses before taxes	Operating surplus			NA
Raw materials Labour cost	total cost of materials: raw, including energy and services			Turnover – Value Added
Depreciation				NA
Interest paid (or financial charges)				NA
Cash flow (from profit/loss statement)	NA			NA
Value added				
Profit/loss	Sales+ Capitalized value of self-manufactured assets-materials and material services			NA
Total inventories				NA
Trade credit (accounts payable)				NA
Trade debt (accounts receivable)	NA			NA
Dividends			NA	NA
Firm's birth year				

Variables	Poland	Portugal	Romania
Total fixed assets			
Intangible fixed assets	Direct translation: Non-material and legal assets – wartosci niematerialne i prawne	Net of depreciations	Material costs= Raw materials and consumables expenses + other material and consumables expenses + Electricity, heating and water expenses (utilities expenses) + cost of goods for resale
Other fixed assets	NA	Other tangible and intangible fixed assets net of depreciations	
Other current assets	NA	Cash and Bank deposits	turnover+net changes in inventories + capitalized production – raw materials and consumables expenses – other material expenses – utilities expenses – costs of goods for resale
Cash and cash equivalents			
Total assets			
Capital (Tangible fixed assets)			
Non-current liabilities	Long-term liabilities	Other accounts payable + Obtained funding	
Long term debt			CF Total = CF Operational + CF Financing + CF Investment
Other non-current liabilities	NA	Other accounts payable	
Current liabilities	Short-term liabilities	Suppliers + State and other public entities + Obtained funding + Deferred income + Other current liabilities	
Short-term debt			Not available
Other current liabilities	Current liabilities	Financial instruments + Salaries payable + Attributable net income + Investments suppliers + Creditors for accrued expenses + other operations (liabilities) + other debtors and creditors (liabilities)	Not available
Shareholder funds (equity)			
Current assets		Cash and bank deposits + Inventories and consumable biological assets + Customers	
Number of employees			Not available
Turnover			
Profits and losses before taxes			
Raw materials Labour cost			Not available
Depreciation		Depreciation on intangibles not included	
Interest paid (or financial charges)			
Cash flow (from profit/loss statement)			Not available
Value added			
Profit/loss	Net profits		
Total inventories			
Trade credit (accounts payable)			Not available
Trade debt (accounts receivable)			
Dividends	NA	NA	
Firm's birth year	NA		

Variables	Slovakia	Slovenia	Spain
Total fixed assets			Total assets – Current assets
Intangible fixed assets			Includes brands, patents, copyrights, licenses, research and development expenses capitalized etc.,. This item also includes the Goodwill recognized separately
Other fixed assets	Not available		Net of investment property
Other current assets	Not available		
Cash and cash equivalents	Not available		
Total assets			Fixed assets + Current assets
Capital (Tangible fixed assets)			Includes investment properties and assets under leasing
Non-current liabilities	Not available		Special debts+ Long-term funds from financial institutions+ Other long-term external funds
Long term debt	Not available		
Other non-current liabilities	Not available		Non-current liabilities – Long-term debt
Current liabilities	Not available		Liabilities linked to non-current assets held for sale+ Short-term interest-bearing external funds+ Short-term non interest-bearing external funds
Short-term debt	Total Bank Loans		
Other current liabilities	Not available		Current liabilities – Loans – Suppliers Includes also valuation adjustments, grants, donations and legacies received
Shareholder funds (equity)	Not available		Inventories + Trade and other receivables + Short-term financial investments + Cash and cash equivalents + Prepayments + Non- current assets held for sale
Current assets			
Number of employees			
Turnover	Gross Profit/Loss		Profit and losses (including extraordinary items) + corporate income tax
Profits and losses before taxes		Total costs of merchandise, material (including energy), and services	
Raw materials Labour cost	Gross Wages + Employers' Social Contributions		
Depreciation			Net of capital subsidies transferred to results of the exercise
Interest paid (or financial charges)			
Cash flow (from profit/loss statement)	Gross Profit-Depreciation		
Value added	Total Sales - Intermediate Consumption		
Profit/loss	Gross Profit/Loss - Taxes		Total Incomes – Total Expenses
Total inventories			
Trade credit (accounts payable)			
Trade debt (accounts receivable)			
Dividends	Not available	NA	Not available
Firm's birth year		the first year of reporting if the registration data not available	

Competitiveness Research Network

Description of the database

Acknowledgements

Paloma Lopez-Garcia
European Central Bank; e-mail: Paloma.Lopez-Garcia@ecb.europa.eu

Elena Ashtari Tafti
European Central Bank; e-mail: Elena.Ashtari_Tafti@ecb.europa.eu

Filippo Biondi
European Central Bank; e-mail: Filippo.Biondi@ecb.europa.eu

Sante De Pinto
European Central Bank; e-mail: Sante.de_Pinto@ecb.europa.eu

Paolo Mengano
European Central Bank; e-mail: Paolo.Mengano@ecb.europa.eu

Daniel Stöhlker
European Central Bank; e-mail: Daniel.Stohlker@ecb.europa.eu