
NEW EU DEFINITION OF ENTERPRISE AS STATISTICAL UNIT: THEORY AND IMPLEMENTATION

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ABSTRACT

This article describes the approach of official statisticians in Germany in introducing the EU enterprise concept in structural business statistics. It first explains the underlying reason and the implementation design. Based on this, the concrete implementation is described, in particular the profiling and the new work steps of imputation and consolidation, which have to be carried out centrally.

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1

Introduction

The introduction of the European Union's (EU's) definition of "enterprise" in structural business statistics as from reference year 2018 represents one of the biggest methodological changes in business statistics of recent decades. Official statistical offices in Germany have been preparing for this change since 2016. It is to be effected as of the publication, in mid-2020, of data for the reference year 2018. Four articles published in this journal in the period since 2016 have already dealt with this issue: Sturm/Redecker (2016) looked at the debate around business units at EU level and the technical and political relevance of the EU's definition of "enterprise". Redecker/Sturm (2017) described profiling as a method for identifying enterprises based on the EU's definition. Opfermann/Beck (2018) then described the plan of action and draft concept for introducing the EU enterprise definition in structural business statistics. Baumgärtner et al. (2018) expanded on this description and focused specifically on the concepts of imputation and consolidation as necessary new work steps.

Based on the above, this article explains how official statisticians are going about introducing the EU enterprise concept in structural business statistics. First, the reason for this change in definition and the implementation design will be outlined. Then, its concrete implementation will be described, with a particular focus on profiling and the new, centralised work steps of imputation and consolidation.

2

Implementing the EU enterprise concept in Germany

In official German statistics, an "enterprise" has up until now been defined as the smallest legal unit which keeps accounts for commercial and/or tax law reasons and for which annual accounts or similar records are available.

The definition provided in the EU Statistical Units Regulation¹ goes further than that: an enterprise is the smallest combination of legal units which is an organisational unit producing goods or services, which benefits from a certain degree of autonomy in decision-making, especially for the allocation of its current resources. An enterprise carries out one or more activities at one or more locations. It may comprise a sole legal unit. Legal units include legal and natural persons engaged in an economic activity in their own right, for instance stock corporations, limited liability companies, general partnerships and sole proprietorships.

Under the EU definition, an enterprise may thus comprise more than one legal unit. As a result, enterprises may still comprise one legal unit (simple enterprise) or else a combination of legal units (complex enterprise) in German official statistics.

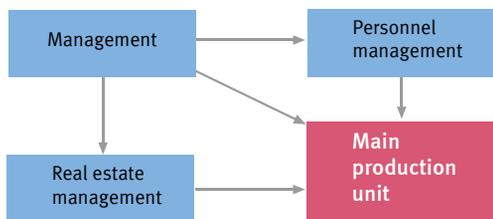
The EU's approach takes account of the fact that enterprises outsource some of their bundles of activities and factors without this resulting in any change of structure. This is the case where the external units continue to carry out activities on behalf of the parent legal unit, but they are themselves not or only marginally active on the market and not autonomous. The motives for outsourcing units include minimising taxes and duties, for example, limiting liability and avoiding being legally bound by collective agreements. The EU enterprise concept aims to combine all the bundles of factors and functions under one concept and thus to ensure the comparability of results at EU level (Sturm/Redecker, 2016). This is based on the idea that enterprises are comprised of bundles of activities, functions and factors which are typical for each specific branch (e.g. a combination of production, trade, transport and warehousing functions, management and accounting). Sturm/Redecker (2016) provide a clear, schematic example of such a complex enterprise which is reprinted here as an illustration.

➤ **Figure 1**

In the following case German structural business statistics currently identifies four enterprises (= legal units) with different main economic activities in different economic sectors. These types of units are: a production unit and the management, real-estate management and

¹ Council Regulation (EEC) No 696/93 of 15 March 1993 on the statistical units for the observation and analysis of the production system in the Community (OJ L 76, p. 1).

Figure 1
Schematic example of a complex enterprise



Source: Sturm/Redecker, 2016

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personnel management (the latter three all in the service sector). Only one player (the enterprise) operates on the market, though; the other services are provided internally. This is equivalent to an enterprise in which all these functions can be found under one roof.

Applying the expanded definition of an enterprise improves the meaningfulness of business statistics. A (complex) enterprise, that is a bundle of production factors and ancillary functions, is assigned to a specific branch and accounted for under that label. This approach permits a more realistic survey of structural changes in the business sector, both at national level and in a European comparison. It also, for instance, makes for a better analysis of small and medium-sized enterprises (SMEs) and for the more accurate measuring of the level of concentration of the market. That is why using the EU enterprise concept is not only a necessary consequence of binding EU standards, it also improves the quality and relevance of results.

For the purposes of European structural business statistics, which are codified in the EU's Structural Business Statistics Regulation,¹² an "enterprise" as defined in the Statistical Units Regulation ("statistical enterprise") is the unit of presentation on which results are to be based. Germany, like many other EU Member States, has for various reasons so far not applied the EU's definition. The Statistical Office of the European Union (Eurostat) wants to do away with these varying practices so as to ensure that relevant and coherent EU structural business statistics are available. It has therefore called on all Member States to present action plans on introducing the new concept. In November 2015 the heads of

the statistical offices in Germany adopted an action plan for implementing the EU enterprise concept in German structural business statistics as from the reference year 2018.

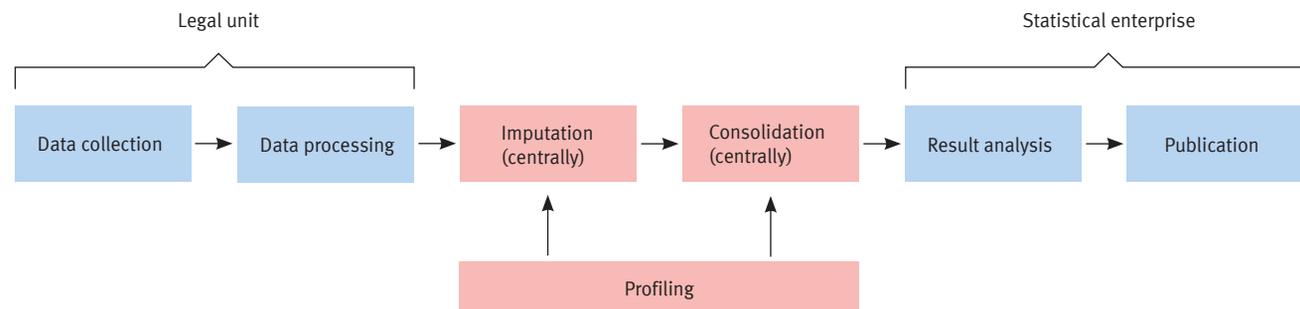
The concept for implementing the new definition which has been framed in Germany still includes the legal unit as the sampling, survey and observation unit. Results for the statistical presentation unit "enterprise" are then derived by the statistical offices during a subsequent data preparation phase. The concept in essence retains the previously applied processes and partly codified concepts for generating statistics; it enables statistical offices to keep using administrative data when generating statistics. As before, valid results are available for legal units which are needed by the federal government and the Länder to draw up national accounts as well as by other data users. The new concept is expected not to increase the workload on the business respondents supplying data. However, drawing on information derived from profiling, the two new work steps of imputation and consolidation need to be incorporated, in terms of content, organisation and time frame, into the previous steps taken to prepare the relevant centralised and decentralised structural business statistics.

➤ Figure 2

¹² Regulation (EC) No 295/2008 of the European Parliament and of the Council of 11 March 2008 concerning structural business statistics (OJ L 97, p. 13).

Figure 2

Additional work steps in structural business statistics: profiling, imputation and consolidation



The additional work steps are necessary in order to combine legal units into statistical enterprises and calculate values for them.

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3

From legal unit to enterprise

Data for enterprises are generated on the basis of the results of surveys of legal units by identifying and subtracting internal transactions as part of the process of consolidation. To be able to do that, individual data first need to be available for all those legal units which belong to a complex enterprise. This is not always the case, due to sample surveys in national structural business statistics. Therefore, the missing data need to be estimated by imputation. Second, information is needed about which legal units form part of an enterprise and to which economic sector the enterprise is to be assigned. This is done as part of profiling, which also provides other information needed in the consolidation work step.

The following sections describe how the processes of imputation, profiling and consolidation have been developed further since late 2018.¹³

3.1 Preparing data for legal units

Imputation of legal units in complex enterprises

The method used for imputing data for legal units in complex enterprises has already been described in detail (Baumgärtner et al., 2018, p. 38 ff.).

³ Baumgärtner et al. (2018) describe in detail the state of methodological development in late 2018.

Statistical offices use imputation methods to replace missing values in surveys (most often in the context of “item nonresponse”). Whilst working on introducing the EU enterprise concept, the process of imputation was expanded so that now every legal unit that is part of a complex enterprise but not included in the sample of the survey is considered as a “unit nonresponse” and the relevant variables are imputed.¹⁴ This imputation method aims to deliver high-quality information on the relevant legal units. As regards the variables, the imputed legal units should, therefore, not differ structurally from similar legal units for which data were in fact collected.

Imputation is done using the CANCEIS software (CANCEIS Development Team, 2015) developed by Statistics Canada, the national statistical institute of Canada.¹⁵ It employs a hot-deck nearest-neighbour imputation methodology which uses the full extent of the variables for a donor unit. The sampling frame and the survey results for structural business statistics provide the basis for the imputation.

The combination of a survey and imputation provides the full extent of the variables at the micro data level for all legal units in complex enterprises. It serves as the basis for the consolidation of complex enterprises.

⁴ This approach can be described as “impute from a sample back to the frame” (Krotki et al., 2005).

⁵ CANCEIS = CANadian Census Edit and Imputation System. The software and its documentation can be acquired through Statistics Canada. CANCEIS has already been used in Germany in earnings surveys, for instance (Frentzen/Günther, 2017).

Grossing up for simple enterprises

In Germany, surveys of structural business statistics are conducted by the Federal Statistical Office (centrally) or by the statistical offices of the Länder (decentrally). They are organised by economic sector, that is by the categories “industry and construction”, “trade, accommodation and food service activities” and “services”. This is a procedure which has evolved over time. The aim was to be able to supply data for individual economic sectors which were adapted to the specific conditions of each and the specific need for information. Consequently, the individual statistics differ in methodology, content, type and extent of the surveys. However, when taken together they provide an overall picture of the German economic sectors covered, more spe-

cifically those in sections B to N (excluding K) and S95.

Chart 1

In order to be able to produce reliable results when implementing the EU enterprise concept the individual statistics need to be harmonised to a greater extent than in the past (Baumgärtner et al., 2018, p. 36 f.). This is mainly due to the fact that complex enterprises can comprise legal units in different economic sectors. That is why the sampling frames need to be harmonised across economic sectors, and thus also cross-statistically, and why different grossing methods need to be adjusted. It is therefore no longer possible to take account of specific statistical features during grossing up, which is why a standardised simple grossing method is applied. With this standardized, overall

Chart 1

Surveys of structural business statistics

Economic sector	Survey	Type of survey	Cut-off threshold	Conduct of survey ¹
Industry and construction	Cost structure survey in manufacturing, mining and quarrying	sample	enterprises with 20 or more persons employed	centrally
	Survey of investments in manufacturing, mining and quarrying	full survey	enterprises with 20 or more persons employed	decentrally
	Structural survey of small enterprises in manufacturing, mining and quarrying	sample	enterprises with fewer than 20 persons employed	centrally
	Survey of the current expenditure on environmental protection in industry	sample	enterprises with 50 or more persons employed	centrally
	Survey of environmental protection investments in industry	sample	enterprises with 20 or more persons employed	decentrally
	Cost structure survey in energy and water supply	full survey	enterprises in water supply with annual water delivery of 200,000 m ³ or more	centrally
	Survey of investments in energy and water supply	full survey	enterprises in water supply with annual water delivery of 200,000 m ³ or more	decentrally
	Cost structure survey in construction	sample	enterprises with 20 or more persons employed	centrally
	Annual survey, incl. survey of investments, in the main construction industry	full survey	enterprises with 20 or more persons employed	decentrally
	Annual survey, incl. survey of investments of building completion work	full survey	enterprises with 20 or more persons employed	decentrally
	Structural survey of small enterprises in construction	sample	enterprises with fewer than 20 persons employed	centrally
Trade, accommodation and food service activities	Annual surveys of wholesale and retail trade, maintenance and repair of motor vehicles and consumer durables	sample	none	decentrally (motor vehicle trade, retail); centrally (wholesale, commission trade)
	Annual survey of accommodation and food service activities	sample	none	decentrally
Services	Structural survey in the service sector	sample	none	decentrally

Source: Baumgärtner et al. (2018, p. 37); own additions

¹ Centrally: Federal Statistical Office; decentrally: statistical offices of the Länder.

approach, structural business statistics are now able to account for legal units switching the economic sector, something that in the past could not be done systematically for the individual statistics. Taken together, this is a better way of presenting the German economy as a whole. But it also means that releases of structural business statistics by legal unit which are oriented more to a specific sector approach will deviate from releases by statistical enterprise.

When applying the new standardised simple grossing method, account must be taken of the fact that the population of legal units falls into two categories: first, the surveyed or imputed data for complex enterprises and, second, the survey data for simple enterprises. The imputation process supplies information for all complex enterprises. They effectively form what is known as a “fully enumerated stratum” and contribute, with a grossing factor of 1, to the final results. Simple enterprises, by contrast, are not imputed and the grossing up step will still need to be done. Their simple grossing factor is determined as follows: first, the number of simple enterprises per stratum N_{rEeUnt} is calculated by deducting the number of legal units in complex enterprises N_{rEkUnt} from the number of legal units N_{rE} per stratum:

$$(1) \quad N_{rEeUnt} = N_{rE} - N_{rEkUnt}$$

Then, the number of simple enterprises per stratum N_{rEeUnt} is divided by the number of surveyed simple enterprises per stratum n_{rEeUnt} and the grossing factor for simple enterprises is calculated:

$$(2) \quad HRF_{eUnt} = \frac{N_{rEeUnt}}{n_{rEeUnt}}$$

This prevents any double counting of legal units which are part of a complex enterprise.

Validating the imputation of legal units in complex enterprises

Imputing legal units in complex enterprises in principle “replaces” the grossing up step, which is a commonly used, tried-and-tested official statistical method. Validation of the quality of the imputation is thus essential.

An interactive web application can be used to compare the structures of imputed and surveyed variables (Baumgärtner et al., 2018, p. 39 f.). This web application is used to validate the imputation step. If there are conspicuously deviant patterns in the structures of surveyed and imputed variables, the specifications on which the imputation was based can be adapted.

A second step when assessing the quality of the imputation is to compare the aggregate results following imputation with those following grossing up. The specifications on which the imputation is based are chosen so as to keep this deviation as low as possible. Nevertheless, this comparison only permits conclusions to be drawn regarding the extent to which the results deviate from each other. It is not possible to say which of the approaches (imputation or grossing up) actually comes closer to the “true” result for complex enterprises, because in the case of sample surveys the true result for the population is not known and has to be estimated.

To better assess the quality of the imputation, simulated calculations were done for the reference year 2017. These were based on sub-samples for which the true results were known and which could thus be used for a comparative evaluation of the imputation and grossing up. The simulation was conducted, by way of example, for the aggregates of the divisions (two-digit categories) in section G (trade) of the Statistical Classification of Economic Activities in the European Community, 2008 version (NACE Rev. 2).¹⁶ The data collected in section G were defined as the “new population”. The aggregate values for the individual survey characteristics in the two-digit categories were known for the population on which the simulation was based and could be calculated. To simulate the concrete imputation and grossing method as close to reality as possible, a sub-sample was taken of the newly defined population for which the ratio between donor and population came as close as possible to the

6 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.

Table 1

Results of simulation: average absolute deviation (%) from newly defined population following simulation (100 repetitions)

	45: Trade in motor vehicles and motorcycles		46: Wholesale trade		47: Retail trade	
	Average absolute deviation after 100 simulations (%)					
	Imputation	Grossing up	Imputation	Grossing up	Imputation	Grossing up
Turnover	0.80	0.94	1.00	0.69	0.34	0.56
Gross value added	0.95	0.75	1.67	0.60	0.59	0.61
Wages and salaries	0.31	0.60	2.00	0.49	0.45	0.58
Gross capital formation	3.33	1.78	2.00	1.54	0.88	0.75
Persons employed	0.49	0.57	0.89	0.46	0.16	0.58

Divisions based on the Statistical Classification of Economic Activities in the European Community, 2008 version (NACE Rev. 2).

actual ratio. The sub-sample was then grossed up to the aggregate of the known population. In addition, the units not included in the sub-sample were imputed so that an aggregate could also be formed for the known population. The aggregates following grossing up and imputation were then compared to the actual aggregates of the newly defined population. To minimise accidental influences, this simulation was carried out 100 times.

Ultimately, the 100 simulations did not provide any clear evidence that imputation leads to systematically inferior results for the chosen survey characteristics in the two-digit categories than simple grossing up. This confirms both the choice of the imputation method on principle and its concrete implementation.

↘ Table 1

3.2 Profiling of enterprises

Profiling is the process used to identify enterprises under the EU's Statistical Units Regulation (Council Regulation (EEC) No 696/93) which is applied to enterprise groups. It is referred to in Chapter 19 of the EU's Business Registers, Recommendations Manual on "The handling of large and complex businesses" (Eurostat, 2010):

«Profiling is a method of analysing the legal, operational and accounting structure of an enterprise group at national and world level, in order to establish the statistical units within that group, their links and the most efficient structures for the collection of statistical data.»

Profiling in the narrower sense of the meaning is a manual work process which is divided into the sub-pro-

cesses [desktop profiling](#) and [intensive profiling](#). Staff in the business register departments of the statistical offices of the Länder use case studies to supervise these processes.

Given the time and effort involved in case processing, it is not possible to conduct nuanced analyses for all enterprise groups, which is why the most important enterprise groups need to be prioritised. However, in terms of business statistics, it is essential to fully adapt to the new unit of presentation, that is to delimit simple from complex enterprises for all enterprise groups in Germany. This is done by means of [automatic profiling](#), in which automated algorithms are used to meaningfully combine legal units into enterprises. The algorithms first analyse the characteristics of legal units to see whether they fulfil certain functions (e.g. ancillary functions) within the enterprise group. Second, the relationships between certain legal units engaged in economic activities (e.g. production unit and trading unit, vertical integration of units) are analysed in order to be able to define their common business purpose. These links are identified based on business register and survey data.

Automatic profiling is applied to all enterprise groups for which no manual profile is available. The decision is taken directly after the annual field studies in manual profiling have been finalised. The results of the automatic profiling are listed in the business register with a data structure similar to that of manual profiling, meaning that it is possible in principle to switch profiling methods at any time in subsequent reference years. For technical reasons, though, the switch is not generally made from manual profiling to automatic profiling.

Instead, the previous year’s profiles are manually tested to see whether any changes are necessary.

For the reference year 2017 a total of around 208,000 profiled enterprises which belong to German (parts of) enterprise groups was detected for the population of structural business statistics (sections B to N, except K, and S95). Some 40,000 complex enterprises (19%) are included. [↘ Table 2](#)

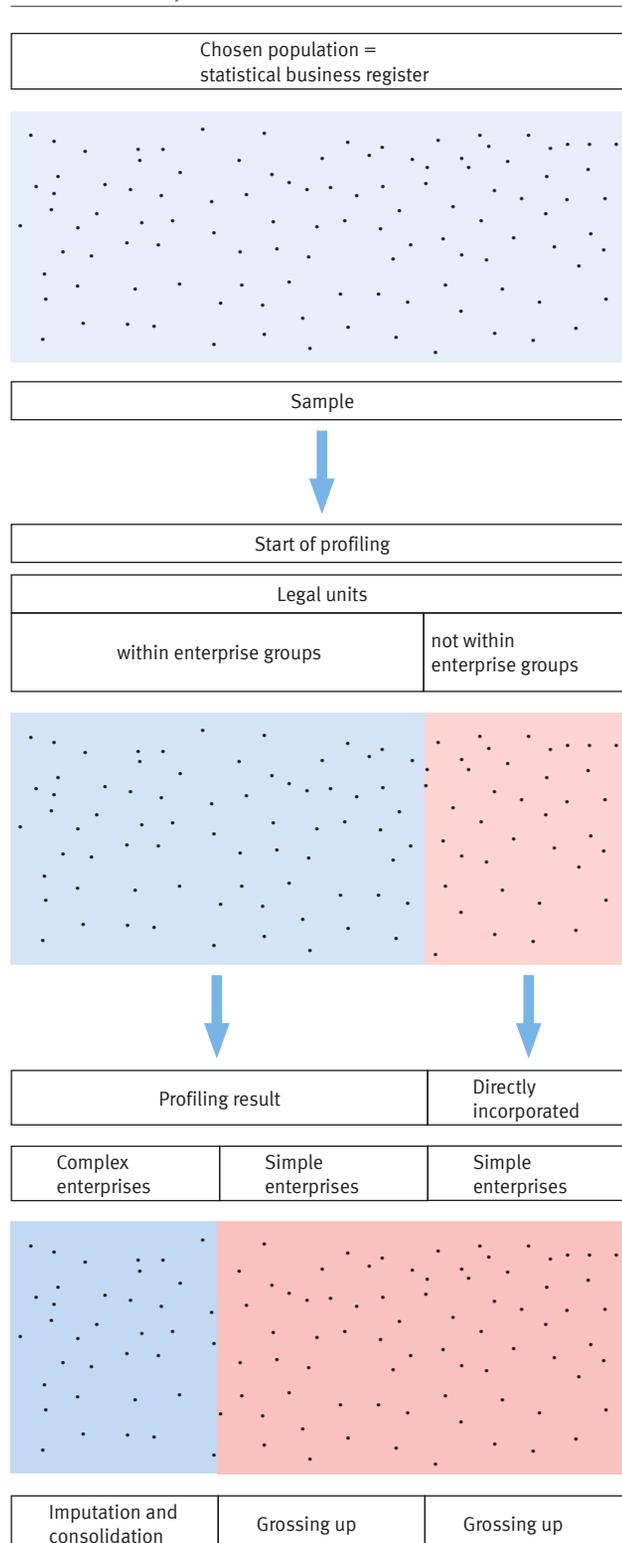
Table 2
Profiled enterprises in enterprise groups in reference year 2017

	Number	%
1 legal unit in enterprise (= simple enterprise)	169,240	81.5
Complex enterprises:		
2 legal units in enterprise	24,399	11.7
3 legal units in enterprise	6,946	3.3
4 to 5 legal units in enterprise	4,195	2.0
6 to 9 legal units in enterprise	1,856	1.0
10 to 19 legal units in enterprise	816	0.4
20 to 49 legal units in enterprise	223	0.1
50 or more legal units in enterprise	58	> 0.0
Total	207,733	100

When it comes to imputation and consolidation, the business register supplies data sets on the profiled enterprises and the legal units belonging to them, which are supplemented by descriptive, profiling-specific variables. In an overall analysis, the data structures can be divided into group-relevant (= profiling-relevant) and non-group-relevant enterprises, tailored to the population of structural business statistics. The legal units included in surveys are not evenly distributed across the two sub-populations, though without being actively allocated to either. The non-group-relevant enterprises are always simple enterprises, which is why the structural variables are either surveyed or grossed up. The group-relevant enterprises are either simple or complex and thus relevant for the imputation and consolidation, depending on the approach taken. [↘ Figure 3](#)

Profiling supplies the information needed for the imputation work step regarding which legal units form simple enterprises and which belong to complex enterprises. Profiling also supplies the information needed for consolidation regarding the economic sector and the registered address of complex enterprises, as well as regarding the role and function of legal units in complex

Figure 3
Population components used to prepare statistical enterprises



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enterprises which are important for the concrete steps in the consolidation process.

3.3 Consolidating complex enterprises

Basic considerations

Only the values relating to market activities of enterprises are to be included when preparing the variables which are relevant for EU structural business statistics. The legal units which belong to a complex enterprise can, however, also be engaged in transactions with each other. That is why it is not always possible to simply add up the variables for the legal units which continue to represent survey units. The aim of the consolidation work step is to eliminate these “internal” transactions when calculating the variables for the complex enterprise. After completing the profiling and imputation work steps, which both provide essential information for the consolidation work step, the consolidation enables the generation of final results for enterprises.

As neither surveyed values are available for complex enterprises themselves nor is information about internal transactions, the consolidated variables need to be estimated by making assumptions and doing certain calculations. The surveyed and imputed values for all the legal units in a complex enterprise can be used for that.¹⁷

The calculations to be done when consolidating the values are automated for all statistical enterprises using an algorithm in SAS¹⁸ for all complex enterprises. So far, no consolidation is being done using manual steps or intermediate steps, for instance for very large, complex enterprises.

Consolidating two legal units

The variables for two legal units of a complex enterprise are consolidated in a three-stage process: 1. by determining the types of transactions, 2. selecting the consol-

idation method, and 3. calculating the value of the internal transactions. Methodological developments initially focused on consolidating the variables for two linked legal units.¹⁹ The following description focuses on more recent developments and refers to the consolidation of any number of legal units in a complex enterprise.

(1) Determining types of internal transactions

One possible reason for assigning legal units to a complex enterprise is that they exercise certain functions in relation to the main economic activity of the complex enterprise. Such assignment is, for instance, done when legal units provide good and services internally to the “main units” which determine the economic focus of the enterprise. A distinction is drawn between two basic functions: units performing ancillary activities and vertically integrated units. There may also be units in complex enterprises which perform neither an ancillary nor a vertically integrated activity. Such units are assigned to a complex enterprise based on other criteria as part of profiling.

They can be legal units which perform secondary activities or are subject to the economic control of the main unit (Redecker/Sturm, 2017, p. 16). A distinction is thus drawn between four different functions of legal units in complex enterprises which are important as regards the assumption that internal transactions occur. [↪ Chart 2](#)

Chart 2

Functions of legal units in complex enterprises

Function	Description
Main units	... determine the main economic activity of the statistical enterprise.
Vertically integrated units	... can, for instance, provide intermediate inputs for the main unit (upstream activity) or sell the goods manufactured by the main unit on the market (downstream activity).
Ancillary units	... are usually units in the service sector which provide specific services to the main unit(s).
Other units	... cannot be assigned to any of the above-mentioned activities, but are still part of the statistical enterprise (e.g. secondary activities).

Information about the function of a legal unit is gathered during profiling and passed on to the consolidation work step in the form of labelling of the profiling

7 Other, possibly external, sources of information are not used when consolidating the variables. This is because the way in which enterprises are delimited in external data sources, such as data included in consolidated accounts, is only very rarely consistent with the statistical unit of presentation.

8 SAS is a data analysis software which comprises components for data management and for conducting tabular and graphic analyses and complex data analyses using multivariate procedures. It is the standard software used by the Federal Statistical Office and the statistical offices of the Länder in Germany.

9 Baumgärtner et al. (2018) provide first insights into consolidation methods based on the state of development at the time.

data. These functions indicate whether or not there are any internal transactions between units. The vertically integrated activities of legal units are labelled either as “upstream” or “downstream” activities, since the direction of the flows of goods or services is key in the consolidation work step (Baumgärtner et al., 2018, p. 42). If legal units are labelled as an ancillary or a vertically integrated activity, it is assumed that there are transactions – involving goods or services – with the main unit. No internal flows with the main unit are assumed for all the other units which neither carry out ancillary activities nor are vertically integrated. In such cases, all the variables are added together, as no internal transactions need to be subtracted (= additive consolidation).

It is not sufficient to only know the function of the legal unit in order to determine the type of internal transaction. The type of internal transaction with the main unit can only be derived when combined with information relating to the relevant economic sector. [Chart 3](#) provides an example and non-exclusive list of possible types of internal transaction which can be determined based on the function of a legal unit and the economic sector to which it is assigned (= types of legal units). Determining the type of transaction means making an assumption about what is most likely based on available information. All other possible transactions that can not be derived directly from the function and the economic sector are not considered.

When it comes to ancillary activities, very fine distinctions can be drawn in terms of the types of transaction and economic sector (e.g. employment activities). This is because structural business statistics deliver precise variables of expenses for these specific services which can then be used to calculate the value of the internal transaction.

(2) Consolidation method

The chosen consolidation method (Baumgärtner et al., 2018, p. 42) divides variables into additive and non-additive ones. In the case of non-additive variables, the value of the internal transaction is deducted from the sum of the values for the two legal units. In the case of additive variables, by contrast, the values of two legal units are added, as there is no assumption of any internal transactions, or these are not relevant.

(3) Value of the internal transaction

A transaction between two legal units involving goods or services leads to the booking of income in one and of expenses in the other legal unit.¹⁰

Which concrete income and expenses items need to be considered depends on the assumption made about the type of transaction. The minimum of these income and

10 An example provided in Baumgärtner et al. (2018, p. 42 f.) shows how the value of the internal transaction can be estimated based on the available income and expenses variables in the structural business statistics.

Chart 3

Determining the type of transaction by type of legal unit

Type of legal unit		Economic sector (of the German Classification of Economic Activities)	Internal transactions with main unit	Type of transaction with main unit
Function				
Main units		not assigned (same economic sector as the statistical enterprise)		
Vertical integration	upstream	G – Trade	yes	Purchasing unit. Commercial goods are purchased on the market and resold internally to the main unit.
		B to F – Industry	yes	The unit manufactures intermediate goods for the main unit. Own products are resold internally to the main unit.
	downstream	G – Trade	yes	Sales or marketing unit. It purchases goods or services internally (regardless of the economic sector of the main unit) from the main unit and sells them on the market.
Ancillary activities		68 – Real estate activities	yes	Service in corresponding economic sector is provided to main unit.
		70 – Activities of head offices	yes	Service in corresponding economic sector is provided to main unit.
		78 – Employment activities	yes	Service in corresponding economic sector is provided to main unit.
Other units		Not assigned	no	

expenses is assumed as the value of the internal transaction to be deducted. It is presumed that the difference between the two is realised on the market. It is included in the complex enterprise's consolidated results.

Consolidating several legal units

The majority of complex enterprises comprise two legal units and can thus be consolidated in a single step. However, very large enterprise groups in particular which are manually profiled can result in complex enterprises with, in some cases, 50 or more legal units (see Table 2). In order to be able to do a step-by-step consolidation using the above-described methods, work began back in 2018 on developing an automated procedure. The step-wise consolidation of several legal units will be described in the following based on an example. [↘ Figure 4](#)

In the first step, legal units of the same type (see Chart 3) are first additively consolidated. The variables for all the units of the same type are added together (= additive consolidation of units) and form a new sub-unit on the way to a complex enterprise. In the example in Figure 4 there are nine legal units (image 1 on left): three

main units (2 + 5 + 7), two intermediate input units in manufacturing (1 + 4) and two ancillary units in group 68.2 (8 + 9) are additively consolidated. The reason for doing this additive consolidation of the same types of units is that there is no reason to assume that there are any transactions between these units. There are two other types of units (3 & 6), which initially remain unchanged. Additive consolidation of the same types of units is a simple way of reducing the level of complexity of the enterprise so that the complex enterprise is limited to only a few (sub-)units. In the example in Figure 4, nine legal units are reduced to five sub-units (image 2 in Figure 4).

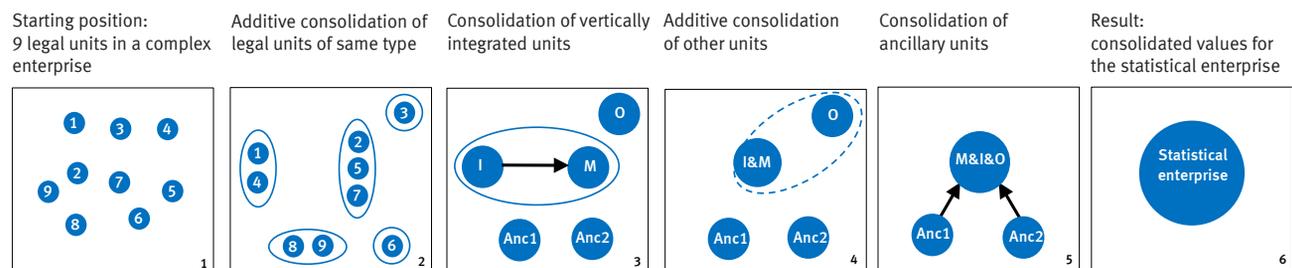
The next step is to consolidate the vertically integrated units (image 3 in Figure 4). In this example, these are units with vertically integrated intermediate inputs and main units.

Following consolidation of the vertically integrated units, the "other units", for which there are no indications that there are any internal transactions, are additively consolidated (image 4 in Figure 4). This step is done prior to consolidating the ancillary units. This is based on

Figure 4

Example of the consolidation of a complex enterprise (21.1)

No.	Function	Group	
1	Intermediate input (I)	20.5	Manufacture of other chemical products
2	Main unit (M)	21.1	Manufacture of basic pharmaceutical products
3	Other unit (O)	20.6	Manufacture of manmade fibres
4	Intermediate input (I)	20.5	Manufacture of other chemical products
5	Main unit (M)	21.1	Manufacture of basic pharmaceutical products
6	Ancillary (Anc)	78.2	Temporary employment agency activities
7	Main unit (M)	21.1	Manufacture of basic pharmaceutical products
8	Ancillary (Anc)	68.2	Renting and operating of own or leased real estate
9	Ancillary (Anc)	68.2	Renting and operating of own or leased real estate



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the assumption that ancillary units providing services within the complex enterprise offer their services to all the units in the group (e.g. including for secondary economic activities) and not only to the main unit.

Finally, the ancillary units are consolidated with the result of the steps illustrated in images 2 to 4 (image 5 in Figure 4). Different types of ancillary units can be consolidated in parallel because different variables of expenses of the already consolidated sub-units are relevant for calculating the values of internal transactions. The result of these consolidation steps is the statistical enterprise (image 6 in Figure 4).

Validating consolidation results

Validating the consolidation methods is very important for the purpose of quality assurance of the assumptions made and estimates done. This validation is carried out using routines which are normally applied at the level of the main economic activity aggregates (which Eurostat uses to validate data). Rules include retaining the ratios between certain variables which are either generally valid or valid in regard to a specific economic sector. For instance, a check is done to establish whether the production value is smaller than turnover or that the share of wages and salaries of personnel costs is between 70% and 90%. The method used is thus stricter, as these routines are applied at the level of the individual complex enterprise. They confirm the validity of previously applied methods (Baumgärtner et al., 2018, p. 43).

4

Outlook

A second article, which is also included in issue no. 3/2020 of this journal, analyses the anticipated impacts of introducing the EU enterprise concept on the results of structural business statistics based on test runs and simulations for the reference year 2017. [📄](#)

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Abbreviations

WISTA	=	Wirtschaft und Statistik
JD	=	annual average
D	=	average (for values which cannot be added up)
Vj	=	quarter of a year
Hj	=	half-year
a. n. g.	=	not elsewhere classified
o. a. S.	=	no main economic activity
St	=	piece
Mill.	=	million
Mrd.	=	billion

Explanation of symbols

–	=	no figures or magnitude zero
0	=	less than half of 1 in the last digit occupied, but more than zero
.	=	numerical value unknown or not to be disclosed
...	=	data will be available later
X	=	cell blocked for logical reasons
I or —	=	fundamental change within a series affecting comparisons over time
/	=	no data because the numerical value is not sufficiently reliable
()	=	limited informational value because numerical value is of limited statistical reliability